



SAN JOAQUIN COUNTY ALTERNATIVE FUELS VISION PLAN

EXISTING CONDITIONS REPORT

September 2022

PREPARED FOR:

SAN JOAQUIN COUNCIL OF GOVERNMENTS

PREPARED BY: DKS ASSOCIATES AND FRONTIER ENERGY, INC.

TABLE OF CONTENTS

- BACKGROUND..... 5**
- ALTERNATIVE FUELS 6**
 - ELECTRICITY 6
 - LEVEL 2 EVSE 6
 - DC FAST (LEVEL 3) CHARGERS 7
 - HIGH POWER DCFC 8
 - TESLA DCFC/HIGH POWER CHARGERS..... 9
 - MEGAWATT CHARGING SYSTEM (MCS) 9
 - HYDROGEN 9
 - LIQUIFIED PETROLEUM GAS (LPG/PROPANE) 10
 - NATURAL GAS (LNG & CNG) 11
 - GREEN HYDROGEN AND RENEWABLE NATURAL GAS PRODUCTION 11
- EXISTING ALTERNATIVE FUELS INFRASTRUCTURE 13**
 - ALTERNATIVE FUEL INFRASTRUCTURE LOCATIONS 13
 - ROUTES IN RELATION TO FUELING STATION LOCATIONS 16
 - TRAVEL DATA 17
 - CHARGER TYPES 18
 - CHARGING NETWORKS..... 18
- EQUITY..... 21**
 - CALENVIROSCREEN AND JUSTICE 40..... 21
 - EXISTING EV CHARGING IN PROXIMITY TO MULTIFAMILY HOUSING 24
- FUNDING OPPORTUNITIES..... 28**
 - FEDERAL PROGRAMS..... 28
 - CALIFORNIA STATE PROGRAMS..... 28
 - LOCAL AND REGIONAL PROGRAMS 30
 - PRIVATE FINANCING..... 30
- REGULATIONS 31**
 - 2020 ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE) REGULATION (2021-2031) 31
 - ASSEMBLY BILL 841 ELECTRIC VEHICLE INFRASTRUCTURE TRAINING PROGRAM AND ENERGY EFFICIENCY PROGRAMS (2022+)..... 32
 - STATE AND LOCAL BUILDING CODES (2022+)..... 32
 - INNOVATIVE CLEAN TRANSIT (2023)..... 32
 - ADVANCED CLEAN FLEET (ACF) REGULATION (2024-2027) 33
 - ADVANCED CLEAN TRUCK (ACT) REGULATION (2024-2035)..... 33

ADVANCED CLEAN CARS (ACC) II REGULATION (2026-2035)	34
PENDING FEDERAL ACTIONS	34

LIST OF FIGURES

FIGURE 1. EV CHARGING	6
FIGURE 2. LEVEL 2 CHARGING CONNECTORS	6
FIGURE 3. LEVEL 2 EVSE AT A RETAIL STORE IN STOCKTON, CA	7
FIGURE 4. DCFC CONNECTORS	7
FIGURE 5. DCFC AT A RETAIL STORE IN TRACY, CA.....	8
FIGURE 6. FUEL CELL ELECTRIC VEHICLE	10
FIGURE 7. NATURAL GAS FUELING STATION	11
FIGURE 8. DAIRY CARES MAP OF DAIRY DIGESTERS IN CA.....	12
FIGURE 9. DAIRIES IN SAN JOAQUIN COUNTY.....	13
FIGURE 10: LOCATIONS OF ALTERNATIVE FUELING STATIONS WITHIN SAN JOAQUIN COUNTY .	15
FIGURE 11: EXISTING ALTERNATIVE FUEL STATION LOCATIONS WITH JUSTICE40 AND CALENVIROSCREEN OVERLAY	23
FIGURE 12: EXISTING ALTERNATIVE FUEL STATION LOCATIONS WITH MULTIFAMILY HOUSING AND CALENVIROSCREEN 4.0 OVERLAYS	25
FIGURE 13: EXISTING ALTERNATIVE FUEL STATION LOCATIONS WITH MULTIFAMILY HOUSING AND JUSTICE40 OVERLAYS.....	26
FIGURE 14: ACT REGULATION.....	34

LIST OF TABLES

TABLE 1: EXISTING ALTERNATIVE FUEL STATIONS WITHIN SAN JOAQUIN CO. AND 5 MILE BUFFER.....	14
TABLE 2: EXISTING EV CHARGERS WITHIN SAN JOAQUIN COUNTY WITHIN 1 MILE OF STATE HIGHWAYS	17
TABLE 3: EXISTING EV CHARGERS WITHIN SAN JOAQUIN COUNTY & 5 MILE BUFFER BY TYPE	18
TABLE 4: NON-TESLA, NETWORKED EVSE WITHIN SAN JOAQUIN COUNTY AND 5-MI. BUFFER BY NETWORK PROVIDER.....	19
TABLE 5: TESLA EVSE WITHIN SAN JOAQUIN COUNTY & 5-MI. BUFFER	20
TABLE 6: NON-NETWORKED EVSE WITHIN SAN JOAQUIN COUNTY AND 5-MI. BUFFER.....	20
TABLE 7: EXISTING EVSE WITHIN DISADVANTAGED COMMUNITIES IN SAN JOAQUIN COUNTY (PER CALENVIROSCREEN, HIGHEST % IS MOST VULNERABLE).....	22
TABLE 8: EXISTING EVSE WITHIN DISADVANTAGED COMMUNITIES IN SAN JOAQUIN COUNTY (PER JUSTICE40 AND CES).....	22
TABLE 9: EXISTING MULTI-UNIT DWELLINGS (MUD) WITHIN DISADVANTAGED COMMUNITIES IN SAN JOAQUIN COUNTY (PER CALENVIROSCREEN AND JUSTICE40)	27
TABLE 10: EXISTING MULTI-UNIT POPULATION WITHIN DISADVANTAGED COMMUNITIES IN SAN JOAQUIN COUNTY (PER CALENVIROSCREEN AND JUSTICE40)	27
TABLE 11: PERCENTAGE OF BUS PURCHASES THAT MUST BE ZEBS BY YEAR ...	33
TABLE 12: SUMMARY OF ACF REGULATION	33

BACKGROUND

The San Joaquin Council of Governments (SJCOG) seeks to facilitate the use of, and access to, alternative fuels in San Joaquin County. To support this goal, the Electric Vehicle (EV) and Alternative Fuels Vision Plan (AFVP) will include a County-wide inventory of infrastructure for charging EVs and fueling stations for vehicles powered by hydrogen, propane, Liquified and Compressed Natural Gas (LNG and CNG) and identify clean fueling infrastructure opportunities along major freight corridors and other regionally significant roadways.

Objectives of the AFVP in San Joaquin County include:

- Assess existing alternative fuel infrastructure networks and coverage within San Joaquin County. This includes intra-city as well as unincorporated rural areas between cities that experience significant interregional travel and goods movement.
- Identify key challenges, gaps, and barriers to alternative fuel vehicle operations for travelers including long-distance commuters; freight and other users as determined through input solicited from key stakeholders.
- Identify existing equity issues to access of alternative fuel stations and ensure infrastructure improvements and investments will be equitable and accessible to all users including traditionally underserved populations.
- Recommend infrastructure improvements and related investments, policies, and implementation strategies to promote alternative fuel adoption through charging and alternative fuel infrastructure investments based on analysis and stakeholder input. The recommended improvements will contribute to quantifiable on-road mobile source GHG emission reductions that can be justifiably credited towards climate action planning efforts including SJCOG's SB 375 GHG emission reduction targets established by the California Air Resources Board (CARB) and align with California's pending Advanced Clean Fleet regulation.
- Identify any programs and incentives as well as provide potential funding opportunities. This includes ensuring that the AFVP meets all the requirements of FHWA's Alternative Fuels Corridor Program designation for all alternative fuels.

This Existing Condition Technical Report describes the existing alternative fuel infrastructure within San Joaquin County as well as relevant land use, travel patterns, goods movement, socio-economic data, vehicle adoption and regulation that may impact this adoption. This establishes a baseline for analyses that will follow to identify future alternative fuel infrastructure needs in the County.

ALTERNATIVE FUELS

This section provides an overview of different types of alternative transportation fuels and their method of delivery to the vehicle including electricity, hydrogen, propane, liquified and compressed natural gas (LNG and CNG).

ELECTRICITY



FIGURE 1. EV CHARGING

Electricity remains the most prevalent alternative fuel for batteries in light duty vehicles such as cars and trucks but can also be used in medium to heavy duty vehicles such as vans, buses, and trucks for goods movement. Electricity can be produced from many different sources: Combustion of natural gas, renewable natural gas, coal, and plant material (biomass) as well as solar, wind, hydro, geothermal energy, and nuclear power. Depending on the source and generation method of the electricity, it may be high carbon, low carbon, zero carbon, or carbon negative. Electric vehicles (EVs) recharge their

batteries at charging stations as seen in **Figure 1**, which can be a simple wall outlet or a specialized charging station, known as Electric Vehicle Supply Equipment (EVSE) at home, work, or a public location.

LEVEL 2 EVSE

The most common type of EVSE is known as a Level 2 charger, though, technically speaking, the charger is on board the EV to convert Alternating Current (AC) power to Direct Current (DC) for storage in the EV's battery. In that sense, Level 2 EVSE is the electrical supply that powers an EV's on-board charger. In general, Level 2 EVSE supplies 220-240 Volts of alternating current (AC) and is usually capable of delivering 6-12 kW of power, though some Level 2 EVSE can deliver up to 19.2 kW when supplied by 100amp circuits. Level 2 EVSE can typically add between 15 and 40 miles of range to an electric vehicle per hour of charge, depending on the amperage of the circuit and the charging capabilities of the vehicle. As illustrated in **Figure 2**, there are two main connector types for Level 2 EVSE. The North American standard is the J1772 connector, which is compatible with all current plug-in vehicles (although Tesla vehicles need to use an adapter). The less typical, but often faster, connector is the Tesla connector. This connector is only compatible with Tesla vehicles, and there is currently no approved adapter to connect a Tesla charger to a non-Tesla vehicle. It should be noted, that while most Tesla



J1772



Tesla

FIGURE 2. LEVEL 2 CHARGING CONNECTORS

Destination chargers (the kind currently deployed locally) have Tesla connectors, the Company has recently started producing, and selling destination chargers with J1772 connectors.

Given that an EV with a depleted battery requires several hours or even overnight to re-charge, drivers typically use Level 2 chargers for the two most common charging applications—residential and workplace charging. Residential charging typically takes place overnight while the EV is parked at the driver’s home. The residential charger generally belongs to the owner of the home or property in the case of rentals, though some renters may use available 240v or even 120v (Level 1) outlets to plug in their own charger. Workplace charging occurs at the EV driver’s place of employment with the charger provided by the employer or property owner/manager.



The relatively long nightly parking (dwell) time for residential charging or daily dwell time for workplace charging makes this practical and convenient, and Level 2 charging can be provided at relatively low costs for many applications.

Hotels, restaurants, and other local destinations may provide Level 2 chargers operated by commercial charging networks for public use as a customer amenity, often providing free or low-cost charging for patrons such as the one shown in **Figure 3**. Many models of networked or smart Level 2 chargers are available that can be managed to provide scheduled or reserved charging, automated load management or demand response functionality to avoid charging during peak power demand periods reducing the cost of electricity.

FIGURE 3. LEVEL 2 EVSE AT A RETAIL STORE IN STOCKTON, CA

Source: Plugshare

DC FAST (LEVEL 3) CHARGERS

As previously discussed, EVs have on-board chargers capable of slowly converting AC power to DC for storage. An EV can be charged faster directly though DC using powerful chargers sometimes referred to as Level 3 or simply DC Fast Chargers, (DCFC). These operate on 400+ volts and are currently capable of between 25kW and 350kW power output. These chargers can add anywhere between 60 miles to 500+ miles of range per hour of charge depending on the power supply, charger rating and EV’s acceptance rate.

As illustrated in **Figure 4**, There are three main types of connectors associated with DC Fast chargers. The first, and oldest type of charging connector is the CHAdeMO connector. This connector was developed in Japan and is typically compatible with vehicles manufactured in Japan and some older European and North American EVs. Typically, CHAdeMO chargers operate at a maximum of 50 kW power. The second, and newest type of DCFC connector is the CCS COMBO connector (more commonly known as simply “CCS”) consisting of AC



FIGURE 4. DCFC CONNECTORS

connectors in the same pattern as the J1772 connector above two DC connectors. This connector was developed more recently in Europe and is compatible with most EVs produced in the past few years. (Newer Nissan models use CCS chargers, so CHAdeMO is expected to be replaced by CCS going forward.) CCS chargers deliver between 50kW to 350kW power output, making them capable of the fastest maximum charging speeds currently available to light duty EVs, depending on the vehicle being charged. It should be noted that lower capacity plug-in hybrid vehicles (PHEV) typically cannot use DCFC connectors.



FIGURE 5. DCFC AT A RETAIL STORE IN TRACY, CA

Source: Plugshare

pay higher per-kWh charging costs in exchange for the convenience of much quicker charging speeds.

DCFC is the preferred charging technology for opportunity charging facilities serving travelers along freeway corridors and for the public when in need of a quick charge while performing short errands like shopping as illustrated in **Figure 5** and dining out. On a per-unit basis, DC Fast Chargers are far more expensive to purchase and install (including required electrical service upgrades) than Level 2 chargers though they can charge far more EVs within the same amount of time. They are also more likely to incur demand charges from utilities and require more maintenance. Due to the higher capital and operations costs, users

HIGH POWER DCFC

DC Fast Chargers that can deliver greater than 150 kW are considered “high power” chargers due to their ability to charge EVs at much faster rates than typical 50kW chargers commonly used for public EV charging. High power DC Fast Chargers have charging speeds ranging from 150 – 350kW, which allows a typical light-duty EV to charge to 80% in 35 minutes or less, depending on the EV’s acceptance rate and charger’s capability. With such rapid charging speeds, high power chargers are especially suitable for interregional travelers in need of a quick charge as well as for trucks and other heavy-duty EVs needing to charge large capacity batteries. For this reason, the National Electric Vehicle Infrastructure (NEVI) Formula Program requires that new chargers funded by the program will operate at a minimum of 150 kW. Since California’s share from the NEVI Formula Program is estimated at \$384 million over 5 years and significant additional discretionary Charging and Fueling Infrastructure (CFI) grant program funding will also be available, a major focus of this project will be planning for future high power charger deployment. Because of their much higher purchase and installation costs and power demands, it is generally more cost-effective to cluster high power chargers near major transportation corridors for convenient access.

TESLA DCFC/HIGH POWER CHARGERS

As with Level 2 chargers, Tesla has its own DCFC for exclusive use by Tesla vehicles. These use the same **Tesla** connector as on its Level 2 chargers shown previously. Tesla DCFC include 72 kW “urban DC Fast chargers” as well as second (V2) and third (V3) generation high-power chargers branded as “Superchargers” that have maximum charging speeds up to 150 kW and 250 kW respectively. The vast majority of Tesla Superchargers are located within incorporated areas.

MEGAWATT CHARGING SYSTEM (MCS)

An even more powerful charging standard called the Megawatt Charging System (MCS) is beginning to be deployed for the purpose of quickly charging medium and heavy duty EVs. CharIN, who also developed the popular Combined Charging System (CCS), is currently working on an MCS¹. The proposed MCS would be rated to deliver up to 3.75 MW of direct current (DC) power and can be expected to become the worldwide standard charging system for medium- and heavy-duty commercial vehicles. The system, if established, could significantly reduce charging times to as little as 10-20 minutes, even for heavy-duty (Class 7 or 8) applications.

Heliox Energy, for example, has developed a 1 MW DCFC system, that allows for the charging of 6 vehicles simultaneously at varying power levels from 180 kW to 1 MW². Heliox thus provides a high-end, future-proof charging solution that could become viable for medium- and heavy-duty fleets in the coming years. Such MW-level charging systems, however, require tremendous electrical capacity that is typically not present at any given site. Cost estimates are thus highly uncertain, but early future projects will provide more insight into the needs and issues associated with Megawatt-level charging.

HYDROGEN

Hydrogen can be used as a transportation fuel in cars, trucks, buses, material handling equipment, and emergency backup power systems. Most of the hydrogen in the United States is produced through a process called “steam-reforming” which uses high-temperature steam to extract hydrogen from natural gas³. This process produces what the industry refers to as “blue hydrogen”. Hydrogen can also be produced using water and electricity in a process called electrolysis. While energy intensive, if renewable energy is used, carbon emissions will be avoided in its production and “green hydrogen” will be produced.

¹ Megawatt Charging System (MCS). <https://www.charin.global/technology/mcs/> (accessed Aug. 04, 2022).

² Megawatt Charging System (MCS) | Heliox. <https://www.heliox-energy.com/megawatt-charging-system> (accessed Aug. 04, 2022).

³ [Alternative Fuels Data Center, Department of Energy-Hydrogen Basics](#)

Most hydrogen vehicles on the market today use fuel cells to convert hydrogen into electricity technically making them electric vehicles. **(Figure 6)** For this reason they are referred to as Fuel Cell Electric Vehicles (FCEVs)⁴. While the carbon emissions associated with hydrogen will depend on its method of production, the vehicles using hydrogen as fuel only emit water vapor and warm air as exhaust. Most fuel cell

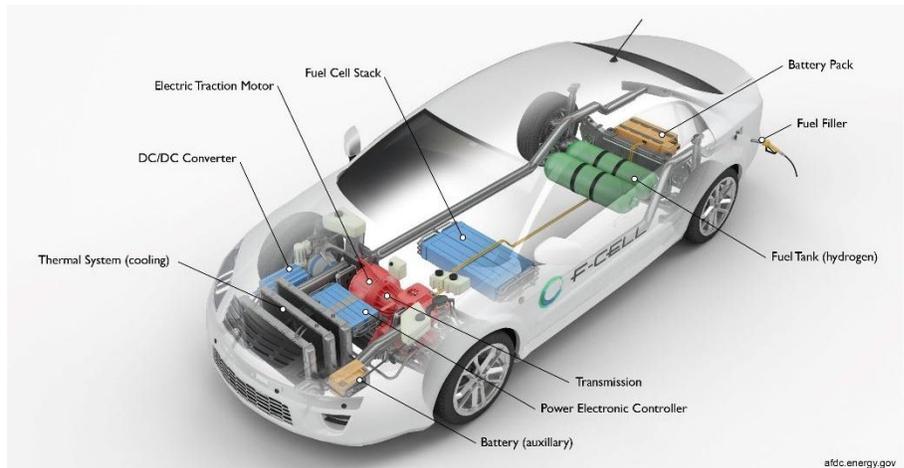


FIGURE 6. FUEL CELL ELECTRIC VEHICLE

Source: Alternative Fuels Data Center

vehicles use hydrogen as a compressed gas, although bigger vehicles like ships and locomotives use liquid hydrogen. Hydrogen can also be used as a combustion fuel, however, using hydrogen in this way is less efficient than in a fuel cell and produces tailpipe emissions. Vehicles fill their tanks at a hydrogen station, which can be a stand-alone station or a dispenser at a station that sells several types of fuel.

LIQUIFIED PETROLEUM GAS (LPG/PROPANE)

LPG, also known as “propane autogas” is an inexpensive, clean-burning alternative fuel for internal combustion engines. LPG has been used as a vehicle fuel for decades, mostly in buses, material handling equipment such as forklifts, and some cars and light trucks⁵. It is a byproduct from refining petroleum and has a significantly lower carbon footprint than gasoline and diesel. Renewable propane is a byproduct from the production of ethanol and biodiesel and can be carbon neutral or even carbon negative when its production prevents GHG emissions. Other tailpipe emissions are comparable to gasoline vehicles. LPG must be stored in pressurized tanks which are filled at LPG stations. While LPG has a higher octane than gasoline, it has a lower BTU (British Thermal Units) rating meaning it burns at a lower temperature. This results in more fuel being needed than a gasoline powered vehicle would require for the same driving distance⁶.

⁴ [Alternative Fuels Data Center, Department of Energy-Fuel Cell Electric Vehicles](#)

⁵ [Alternative Fuels Data Center, Department of Energy-Propane Fuel Basics](#)

NATURAL GAS (LNG & CNG)

Natural gas is widely used in energy generation but can also be used as an alternative transportation fuel for combustion engines. Used mostly in trucks and buses; natural gas has fewer greenhouse gas emissions than gasoline and diesel. When made from renewable sources, like methane gas from landfills, wastewater treatment plants, and agricultural processes, it can be carbon negative.

Natural gas and renewable natural gas (called RNG) are sold as a compressed gas (CNG) or as a liquid (LNG). LNG has a higher production and storage cost as it requires cryogenic tanks which limits its commercial use. Vehicles fill their tanks at an LNG or CNG station, which can be a stand-alone station⁶ as seen in **Figure 7** or a dispenser at a station that sells several types of fuel. Although natural gas vehicles have been used for some time, only about two-tenths of 1% of natural gas in the United States is used as a transportation fuel⁷.



FIGURE 7. NATURAL GAS

Source: US Department of Energy

GREEN HYDROGEN AND RENEWABLE NATURAL GAS PRODUCTION

Biogas can be a source of renewable natural gas (RNG) once processed to remove impurities. Biogas can also be “reformed” into hydrogen. Biogas comes from a variety of sources: landfills, digesters at wastewater treatment plants, livestock farms, food production facilities, and organic waste management operations. It’s important that the biogas source is a large, consistent quantity. For example, seasonal crops are not a consistent quantity whereas manure from animal ranches can be more consistent.

Current laws require that landfills and wastewater treatment plants contain their methane emissions. Some have waste-to-energy systems that capture the gas and burn it in a generator to produce electricity, which they then sell. Others “flare” the methane, burn it as it emerges from a pipe, which reduces GHGs by up to 98%. However, many of these collection systems leak methane. The Federal Government and State of California recently started research to quantify the leaking methane.

According to the U.S. EPA RNG project mapping tool, the RNG facilities closest to San Joaquin County are at the Altamont Landfill near Livermore and two dairy digesters in Ceres. The U.S. EPA’s FLIGHT tool also displays data from large facilities that emit greenhouse gases. According to FLIGHT, potential sources of biogas for RNG and hydrogen in San Joaquin County are the Foothill Sanitary landfill, which produces 4.3MW of electricity by burning methane in generators. The North County Sanitary Landfill which produces 93,473 metric tons of CO₂ annually and has an active gas collection system that does not have excess capacity. Forward Landfill produces 104,480 metric tons of CO₂ annually and has an active gas collection system with no excess capacity.

⁶ [US Department of Energy, Alternative Fuels Data Center Natural Gas Fuel Basics](#)

⁷ [Energy Information Administration](#)

The California Air Resources Board (CARB) estimates that dairy and livestock produce half of California’s methane emissions. Animal manure and urine is often directed to a lagoon; a large concrete basin that is exposed to the air. The waste eventually becomes a fluid. Microbes break down the organic waste and create greenhouse gases like methane.

Anaerobic digesters remove the exposure to the air. The lagoon is covered, and the methane is trapped. As it accumulates, the gas is directed to a scrubber to remove the contaminants like sulfur, and the “upgraded” gas is directed to a pipeline. Most often, dairies are clustered so they can share a scrubber and connection to the pipeline. The Dairy Cares map⁸ shown in **Figure 8**, shows the locations of the 217 dairy farms that have digesters. Most are in the San Joaquin Valley, but not in the county.

California Dairy Digester Development

Total CA Digesters
206 digesters,
serving 217 dairies
(primarily in the San
Joaquin Valley)

California is home to 16 “clusters” of dairy digesters in various stages of development. Clusters are groups of digesters that share a centralized gas clean-up facility, where the captured dairy biogas is upgraded and then injected into natural gas pipeline, so it can be used as carbon-negative transportation fuel or generate hydrogen. This is known as a “hub and spoke” model. A total of 182 dairy farms are currently planned to be included within the 16 developing clusters. Additionally, another 35 California dairy farms have digesters (operating or in development) that are not a part of a cluster. **In total, California has 206 dairy digester projects, capturing methane from 217 dairy farms**, and creating either renewable electricity, renewable natural gas, or hydrogen fuel.

About 89 of the digesters are currently in operation, with the rest in various stages of development.

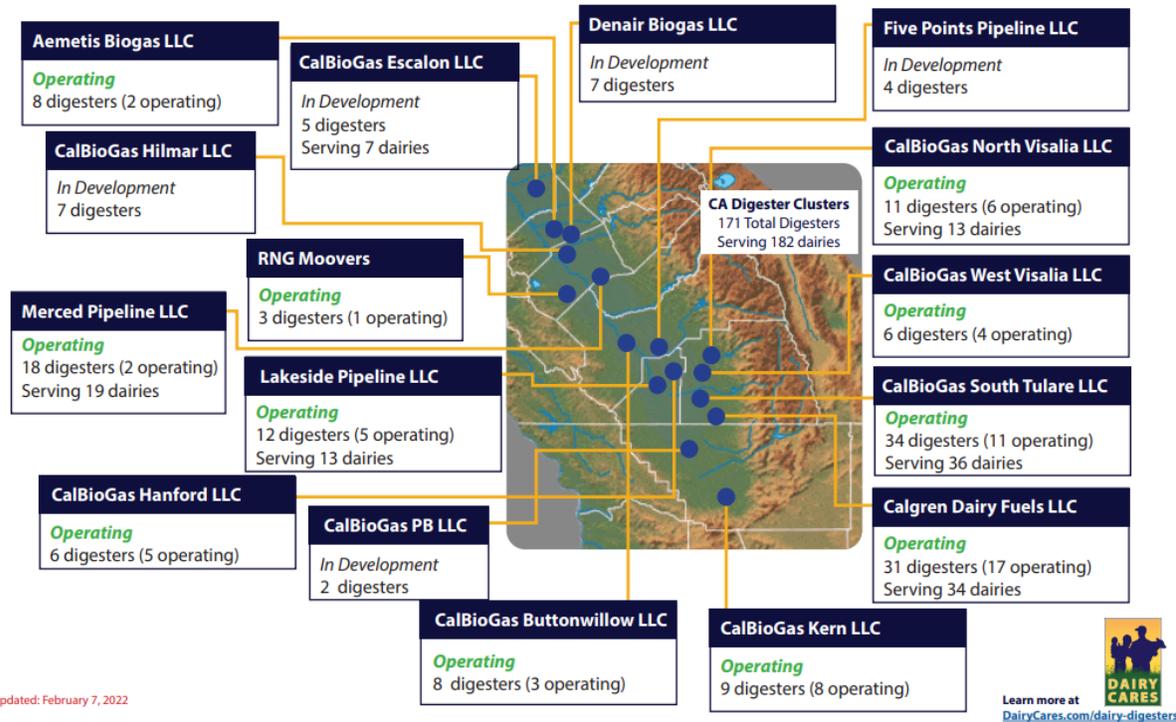


FIGURE 8. DAIRY CARES MAP OF DAIRY DIGESTERS IN CA

Source: Dairy Cares

⁸ Dairy Cares Map - https://www.dairycares.com/files/ugd/e8c369_b8e47af9d6e04bd4a417bb66f5825260.pdf

The California Department of Food and Agriculture (CDFA) administers a grant program to help dairies convert their lagoons to digesters. None of the dairies in San Joaquin County, shown in **Figure 9**, have been awarded a grant. CDFA does not release the names of applicants not awarded so it is unknown if any dairies in San Joaquin County have applied.

For natural gas generating facilities, The Northern California Power Alliance (NCPA) operates the Lodi Energy Center, a 225 MW facility at 12745 North Thornton Road.

The California Energy Commission approved NPCA’s two-phase plan to convert the plant from natural gas to a 45% blend of renewable hydrogen. NCPA proposes to produce hydrogen by electrolysis and store it as a liquid or in the natural gas pipeline. Because this project is in the early stages, it may be possible to coordinate with NCPA about producing hydrogen for an adjacent fueling station.

At the time of this writing, none of the companies that produce hydrogen or RNG have been approached about renewable fuel production in San Joaquin County but may be open to starting discussions with local methane producers.

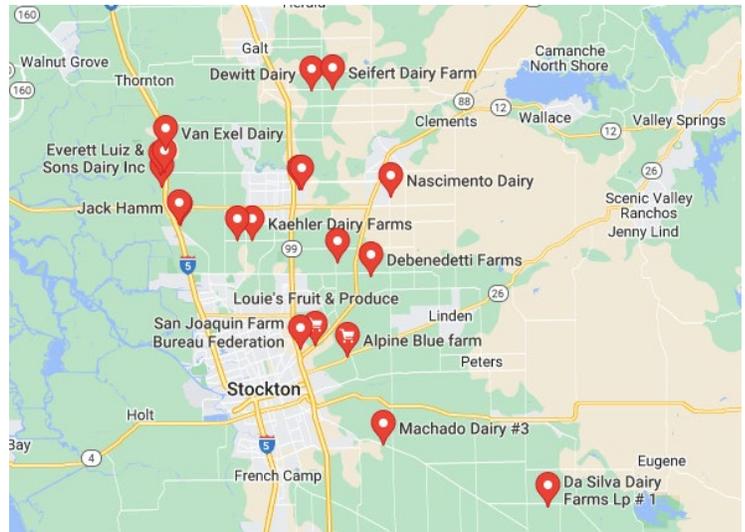


FIGURE 9. DAIRIES IN SAN JOAQUIN COUNTY

Source: Google Maps

EXISTING ALTERNATIVE FUELS INFRASTRUCTURE

This section summarizes alternative fuel infrastructure available for the public within San Joaquin County and their location in relation to disadvantage populations.

ALTERNATIVE FUEL INFRASTRUCTURE LOCATIONS

Geographically, most existing EVSE are concentrated within the region’s cities. EV Chargers can be found in far higher numbers than all other alternative fueling stations as seen in **Table 1** and **Figure 10**. Stockton has the largest number of EV chargers of any city in the study area; nearly 50% of total public chargers available county-wide. Lodi has the second most, and Manteca the third. Stockton and Lathrop both have the largest number of other alternative fueling stations at five each. This included CNG and LPG stations. There are currently a total of 24 publicly accessible EV chargers in unincorporated areas of San Joaquin County and no other alternative fueling stations. Ripon had the fewest number of chargers with only six and half as many other alternative fueling stations which include CNG and LPG. There were no Hydrogen fueling stations found in San Joaquin County.

TABLE 1: EXISTING ALTERNATIVE FUEL STATIONS WITHIN SAN JOAQUIN CO. AND 5 MILE BUFFER

JURISDICTION	PUBLIC					PRIVATE	
	ELEC	CNG	LNG	RNG	LPG	ELEC	LPG
STOCKTON	133	1	-	-	3	36	-
LODI	47	-	-	-	1	-	-
MANTECA	38	-	-	-	1	-	-
TRACY	34	-	-	-	-	1	-
RIPON	6	2	-	-	1	-	-
LATHROP	8	2	2	1	-	-	-
UNINCORPORATED SAN JOAQUIN COUNTY	24	-	-	-	-	5	1
TOTAL SAN JOAQUIN COUNTY	290	5	2	1	6	42	1
SACRAMENTO CO	6	-	-	-	1	2	-
STANISLAUS CO	31	-	-	-	-	3	-
CONTRA COSTA CO	3	-	-	-	-	-	-
TOTAL 5 MILE BUFFER	40	-	-	-	1	5	-

Sources: Alternative Fuels Data Center (AFDC), PlugShare

ROUTES IN RELATION TO FUELING STATION LOCATIONS

According to the Alternative Fuels Data Center, there are currently a total of 201 publicly accessible EV chargers within one mile of freeway interchanges and highway access points within the study area. The majority of these existing public EV chargers, especially DC Fast chargers are primarily clustered in commercial areas within the boundaries of incorporated cities. Public DC Fast chargers used by interregional travelers are generally located in publicly accessible parking lots close to retail and other amenities of potential interest to EV drivers. Most public Level 2 chargers are considered destination chargers (non-residential, non-workplace). These are typically located at public destinations such as retail centers, hotels, parks, or are co-located with DC Fast Chargers for use by drivers with more available time for charging.

Outside of inner-urban areas, public EV chargers are typically located along main travel corridors. A total of 84 Level 2 J1772 chargers and 6 Tesla chargers are located within one mile of state highways in San Joaquin County. Due to their ability to deliver electricity at a fast rate, DC Fast Chargers can usually be found in greater quantities near these traffic corridors where people are more likely to be traveling greater distances. San Joaquin County is no exception as 112 DC Fast Chargers can be found within one mile of state highways within the County; 22 being CCS, another 22 CHAdeMO with the greatest quantity being Tesla at 68.

SR 99 has the greatest number of Level 2 chargers with 31 J1772 and 1 Tesla, whereas I-5 has the greatest number of DC Fast Chargers with 30 (9 CCS, 9 CHAdeMO and 12 Tesla). I-205 has the second greatest number of DC Fast chargers with 24 but only four Level 2 chargers. SR 120 had the greatest number of Tesla fast chargers at 20 but zero CCS, CHAdeMO or J1772 chargers. State Routes 4, 12 and 88 have fewer than ten chargers each. State Routes 26, 33, 88 and I-580 had no chargers within one mile. **Table 2** includes a summary of chargers within one mile of state highways in San Joaquin County.

TABLE 2: EXISTING EV CHARGERS WITHIN SAN JOAQUIN COUNTY WITHIN 1 MILE OF STATE HIGHWAYS

PUBLIC CHARGERS WITHIN 1 MILE HIGHWAY BUFFER	LEVEL 2		DCFC			TOTAL
	J1772	TESLA	CCS	CHAdEMO	TESLA	
I-5	8	4	9	9	12	41
I-5 & SR 4	6	-	-	-	-	6
I-5 & SR 12	2	-	2	2	-	5
I-5 & SR 120	2	-	-	-	-	2
SR 99	31	1	4	4	12	51
SR 99 & SR 4	-	-	-	-	-	-
SR 99 & SR 12	18	-	1	1	-	20
SR 99 & SR 120	4	-	-	-	12	16
I-205	4	-	6	6	12	28
I-580	-	-	-	-	-	-
SR 4	1	-	-	-	-	1
SR 12	6	-	1	1	-	8
SR 12 & SR 88	-	1	-	-	-	1
SR 26	-	-	-	-	-	-
SR 33	-	-	-	-	-	-
SR 88	-	-	-	-	-	-
SR 120	2	-	-	-	20	22
TOTAL WITHIN 1 MILE BUFFER	84	6	22	22	68	201

Sources: Alternative Fuels Data Center, PlugShare

TRAVEL DATA

“Big data” will be obtained to estimate travel within the county and to and from areas outside the county. Streetlight Data, a nationally known source of anonymized person travel data based on GPS cell-data from personal mobile devices (such as mobile phones) and connected vehicles. This data yields origins and destinations of vehicles entering, exiting, or passing through a particular location or set of locations. The data also allows for the estimate of time a person or vehicle is stopped at a location (also known as “dwell time”). Dwell time data is key to determining whether slower chargers (Level 2) or faster chargers (DCFC) may be more appropriate for a particular location based on how long most existing vehicles stop at a given location. For this analysis a zone system consisting of one mile highway interchange buffers (consistent with NEVI prioritization formulas) locations of existing gas stations (where people currently fuel their vehicles) and larger geographic areas (census tracts for more general origin destination analysis) has been developed.

CHARGER TYPES

Level 2 chargers make up the majority of existing chargers in San Joaquin County (**Table 3**). There is a total of 169 public chargers with J1772 ports and 13 Tesla Chargers. Within the 5-mile buffer around San Joaquin County, there are 19 public J1772 chargers and zero Tesla chargers. There are a total of 108 DC Fast Chargers within the county, the majority being Tesla at 68. Another 20 are CCS and another 20 are CHAdeMO. An additional 22 DC Fast chargers can be found in the 5-mile buffer around the county, the majority again being Tesla at 12, two being CCS and another five CHAdeMO.

TABLE 3: EXISTING EV CHARGERS WITHIN SAN JOAQUIN COUNTY & 5 MILE BUFFER BY TYPE

JURISDICTION	PUBLIC					TOTAL	PRIVATE	
	LEVEL 2		DCFC				LEVEL 2 J1772	TOTAL PUBLIC & PRIVATE
	J1772	TESLA	CCS	CHADeMO	TESLA			
STOCKTON	89	4	8	9	24	133	36	169
LODI	41	2	2	2	-	47	-	47
MANTECA	6	-	-	-	32	38	-	38
TRACY	10	-	6	6	12	34	1	35
RIPON	2	-	2	2	-	6	-	6
LATHROP	5	2	1	-	-	8	-	8
UNINCORPORATED SAN JOAQUIN COUNTY	16	5	2	2	-	24	5	29
TOTAL SAN JOAQUIN COUNTY	169	13	20	20	68	290	42	332
SACRAMENTO CO	4	-	1	1	-	6	2	8
STANISLAUS CO	12	-	4	4	12	31	3	34
CONTRA COSTA CO	3	-	-	-	-	3	-	3
TOTAL 5 MILE BUFFER	19	-	5	5	12	40	5	45

Sources: Alternative Fuels Data Center, PlugShare

CHARGING NETWORKS

Eight charging networks operate the 291 chargers within San Joaquin County which includes: ChargePoint, Tesla (including Tesla Destination), Shell Recharge Solutions (SRS, formerly Greenlots), EV Connect, SemaConnect, Electrify America, Blink and EVgo. Another 41 chargers within the county are non-networked meaning they essentially function like a 240v plug for an EV but do not have the capability of tracking usage or collecting payment. Of the 291 networked chargers in the county, Tesla chargers account for 83, meaning 208 chargers are usable for non-tesla vehicles. At the time of this writing, another 12 Tesla Superchargers are planned for later this year (2022) and four locations in 2022-2023 including Lodi, Lathrop, Tracy and Rippon.⁹

⁹ Tesla.com/findus

Another 45 chargers are available in the 5-mile buffer around San Joaquin County, 12 of these being Tesla chargers. An additional 17 non-networked chargers are also available within this buffer. **Tables 4-6** includes summaries of existing EV chargers by network within San Joaquin County and the 5-mile buffer.

TABLE 4: NON-TESLA, NETWORKED EVSE WITHIN SAN JOAQUIN COUNTY AND 5-MI. BUFFER BY NETWORK PROVIDER

JURISDICTION	CHARGE POINT	SRS	EV CONNECT	SEMACONNECT	ELECTRIFY AMERICA	BLINK	EVGo	TOTAL
STOCKTON	26	43	34	2	8	7	-	120
LODI	28	-	2	1	-	-	-	31
MANTECA	6	-	-	-	-	-	-	6
TRACY	14	-	-	-	4	-	3	21
RIPON	-	-	6	-	-	-	-	6
LATHROP	3	-	3	-	-	-	-	6
UNINCORPORATED SAN JOAQUIN COUNTY	5	-	-	12	-	1	-	18
TOTAL SAN JOAQUIN COUNTY	82	43	45	15	12	8	3	208
SACRAMENTO CO	-	-	-	4	-	-	2	6
STANISLAUS CO	4	-	-	-	-	-	3	7
CONTRA COSTA CO	-	3	-	-	-	-	-	3
TOTAL 5 MILE BUFFER	4	3	-	4	-	-	5	16

Sources: Alternative Fuels Data Center (AFDC), PlugShare

TABLE 5: TESLA EVSE WITHIN SAN JOAQUIN COUNTY & 5-MI. BUFFER

JURISDICTION	TESLA	TESLA DESTINATION	TOTAL
STOCKTON	24	4	28
LODI	-	3	3
MANTECA	32	-	32
TRACY	12	-	12
RIPON	-	-	-
LATHROP	-	2	2
UNINCORPORATED SAN JOAQUIN COUNTY	-	6	6
TOTAL SAN JOAQUIN COUNTY	68	15	83
SACRAMENTO CO	-	4	4
STANISLAUS CO	12	-	12
CONTRA COSTA CO	-	-	-
TOTAL 5 MILE BUFFER	12	4	16

Sources: Alternative Fuels Data Center (AFDC), PlugShare

TABLE 6: NON-NETWORKED EVSE WITHIN SAN JOAQUIN COUNTY AND 5-MI. BUFFER

JURISDICTION	NON-NETWORKED
STOCKTON	21
LODI	13
MANTECA	-
TRACY	2
RIPON	-
LATHROP	-
UNINCORPORATED SAN JOAQUIN COUNTY	5
TOTAL SAN JOAQUIN COUNTY	41
SACRAMENTO CO	2
STANISLAUS CO	15
CONTRA COSTA CO	-
TOTAL 5 MILE BUFFER	17

Sources: Alternative Fuels Data Center (AFDC), PlugShare

EQUITY

Social equity is a critical consideration for this study which aims to provide alternative fuel options not just to meet the needs of geographically underserved areas, but of socioeconomically underserved populations as well. The majority of publicly accessible alternative fueling infrastructure has been installed by commercial companies and EV charging networks like Tesla, the region's dominant network to boost Tesla EV sales, or ChargePoint, the second most common network to attract EV drivers to retail and other commercial activities. Commercial chargers are typically located in areas with maximum demand for charging by EV drivers, often irrespective of the needs of disadvantaged populations who, due to the relatively high cost of most available EV models, generally don't drive EVs. As seen in the previous section, access to other alternative fueling stations is even more limited or in the case of hydrogen not available at all within San Joaquin County.

To pave the road for a future where EVs are more common, affordable, and increasingly accessible to drivers at different income levels, chargers need to be more equitably located.

CALENVIROSCREEN AND JUSTICE 40

One way to evaluate baseline conditions is to compare existing charger locations with the geographic distribution of disadvantaged communities (DACs). Low-income communities are defined as census tracts in California with median household incomes at or below 80 percent of the statewide median income or with median household incomes at or below the threshold designated as low income by the Department of Housing and Community Development. The team utilized the following tools to geographically identify disadvantaged communities in San Joaquin County:

- CalEnviroScreen (CES): A tool developed and maintained by California's Office of Environmental Health Hazard Assessment (OEHHA) on behalf of the California Environmental Protection Agency (CalEPA), providing the public with a transparent assessment of pollution burdens and environmental and health vulnerabilities across California. It provides a relative (not absolute) quantification of pollution exposure and its impacts, as well as data on health and socioeconomic status, at a census-tract level. The tool is now (since October 2021) available in Version 4.0.
- Justice40: The Justice40 Initiative was created by the Biden Administration to help deliver benefits of federal investments in climate and clean energy to disadvantaged communities. As part of the initiative, the Climate and Economic Justice Screening Tool (CEJST) was released, which aims to identify DACs who are underserved and overburdened by pollution. Like CES, the tool uses census tracts as the geographic granularity. The Justice40 framework provides a state-independent look at the spatial distribution of marginalized and disadvantaged communities.
- Overlay of CalEnviroScreen and Justice40: The overlay of areas identified by the two utilized tools as disadvantaged communities allows for a more comprehensive understanding of the spatial distribution of DACs. In doing so, we can minimize the likelihood of dismissing an area identified as disadvantaged by either of the two tools and can thus capture the study area's DACs to a better extent.

As shown in **Figure 11 and Tables 7 and 8** nearly half of San Joaquin County falls into one or more of these DACs. However, simply installing more EVSE within these communities won't address the changing needs of disadvantaged drivers. While mapping DACs and existing charger locations provides important context for planning by identifying disparities, care should also be taken to meet this population where they are by installing chargers in locations frequented by these drivers.

TABLE 7: EXISTING EVSE WITHIN DISADVANTAGED COMMUNITIES IN SAN JOAQUIN COUNTY (PER CALENVIROSCREEN, HIGHEST % IS MOST VULNERABLE)

JURISDICTION	75-80%	80-85%	85-90%	90-95%	95-100%	TOTAL DAC	% OF TOTAL EVSE
STOCKTON	58	1	21	13	33	126	75%
LODI	-	-	14	-	-	14	30%
MANTECA	-	-	22	16	-	38	100%
TRACY	29	-	-	-	-	29	83%
RIPON	-	-	-	-	-	-	0%
LATHROP	-	2	-	1	5	8	100%
UNINCORPORATED SAN JOAQUIN COUNTY	14	5	-	-	-	19	66%
TOTAL SAN JOAQUIN COUNTY	101	8	57	30	38	234	70%

Sources: Alternative Fuels Data Center, PlugShare, CalEnviroScreen

TABLE 8: EXISTING EVSE WITHIN DISADVANTAGED COMMUNITIES IN SAN JOAQUIN COUNTY (PER JUSTICE40 AND CES)

JURISDICTION	CES 75%+	JUSTICE 40	BOTH	NEITHER	TOTAL
STOCKTON	126	94	92	41	126
LODI	14	14	14	33	14
MANTECA	38	18	18	-	38
TRACY	29	2	-	4	29
RIPON	-	-	-	6	-
LATHROP	8	-	-	-	8
UNINCORPORATED SAN JOAQUIN COUNTY	19	-	-	10	19
TOTAL SAN JOAQUIN COUNTY	234	128	124	94	234

Sources: Alternative Fuels Data Center, PlugShare, CalEnviroScreen and Justice 40

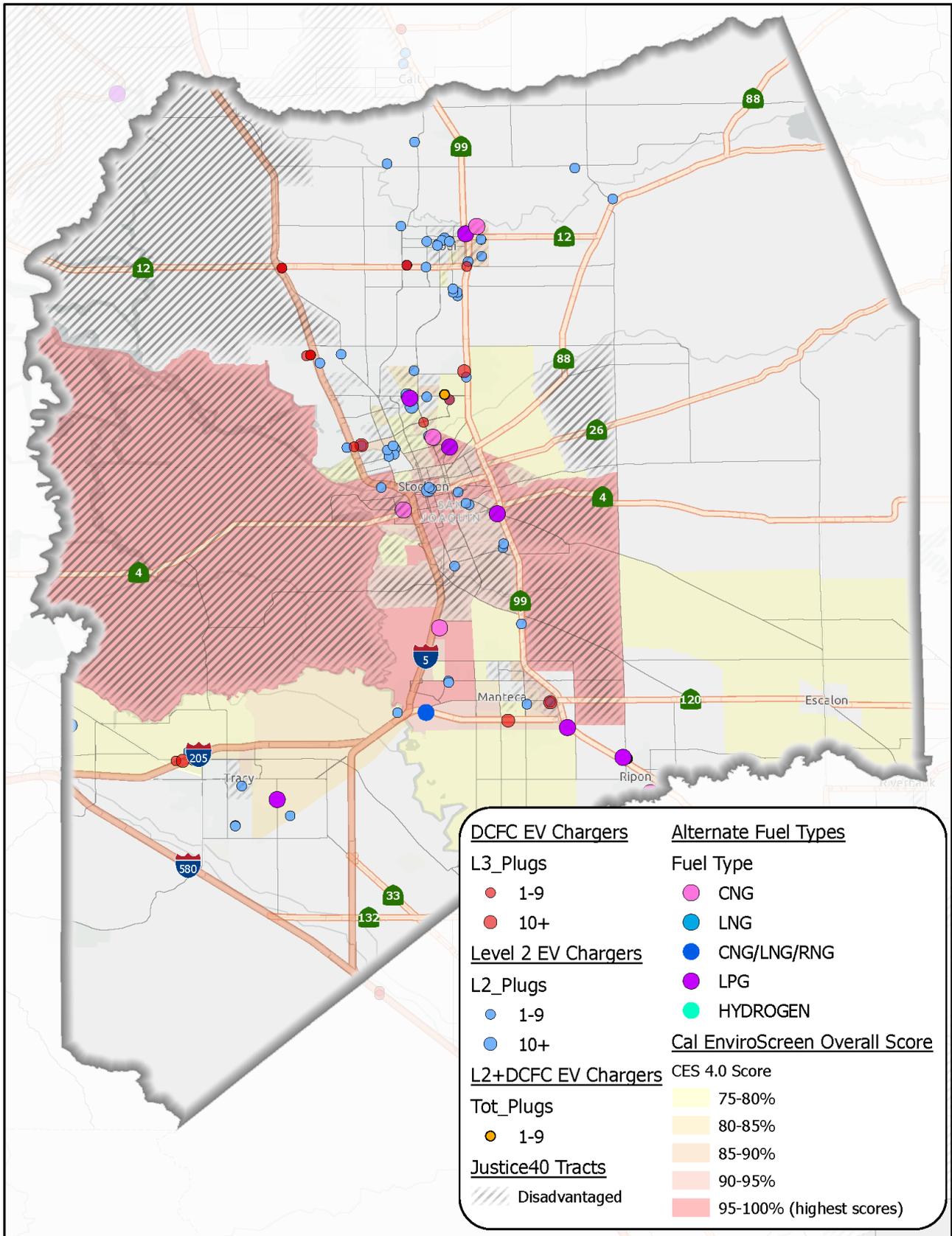


FIGURE 11: EXISTING ALTERNATIVE FUEL STATION LOCATIONS WITH JUSTICE40 AND CALENVIROSCREEN OVERLAY

Sources: Alternative Fuels Data Center, PlugShare, CalEnviroScreen and Justice 40

EXISTING EV CHARGING IN PROXIMITY TO MULTIFAMILY HOUSING

An important demographic to consider regarding access to EV charging, are those who live in multifamily housing. Currently, more than 80% of electric vehicle (EV) charging occurs at home¹⁰, meaning the lack of residential charging represents a *significant* barrier to EV adoption and leaves multifamily residents behind in the clean transportation transition. Some multifamily properties provide EV charging as an amenity to their tenants; however, this is still not standard practice. Not all residents of multi-family properties even have access to on-site parking, and when they do, they typically cannot modify the space to install EV charging even if they have the financial means. Owners and managers of multifamily properties serving families and individuals with limited income often also face considerable financial barriers to installing charging themselves. Older buildings also often require expensive electrical upgrades adding to the cost of installation.

Due to these challenges in providing charging at every multifamily property; providing nearby public charging can help promote equitable access, especially for historically marginalized communities as identified in **Figure 12 and 13 and Tables 9 and 10**.

As illustrated by these figures and tables, Lodi, Stockton and Manteca in particular stand out as having the highest concentration of multifamily households and population. In Stockton, multifamily housing accounts for 23% of the households and 17% of the population. In Lodi, multifamily housing accounts for 29% of households and 26% of the population and 20% in Manteca, multifamily housing accounts for 20% of households and 18% of the population. Countywide, multifamily housing accounts for 21% of total households and 16% of total population.

More than half of the multifamily households in Stockton are in disadvantaged communities as per both CalEnviroScreen and Justice40. About 80% of the multifamily households in Lodi fall in either a CalEnviroScreen or Justice40 disadvantaged community, and about one-third are in both. In Manteca about a quarter of the multifamily households are in both CalEnviroScreen and Justice40 identified disadvantaged communities. Countywide, over 50% of households and population fall within either CalEnviroScreen or Justice40 identified disadvantaged communities, while just under 40% of households fall within areas identified as both CalEnviroScreen and Justice40 identified disadvantaged communities.

¹⁰ J.D. Power (2021) U.S. Electric Vehicle Experience (EVX) Home Charging Study
<https://www.jdpower.com/business/press-releases/2021-us-electric-vehicle-experience-evx-home-charging-study>

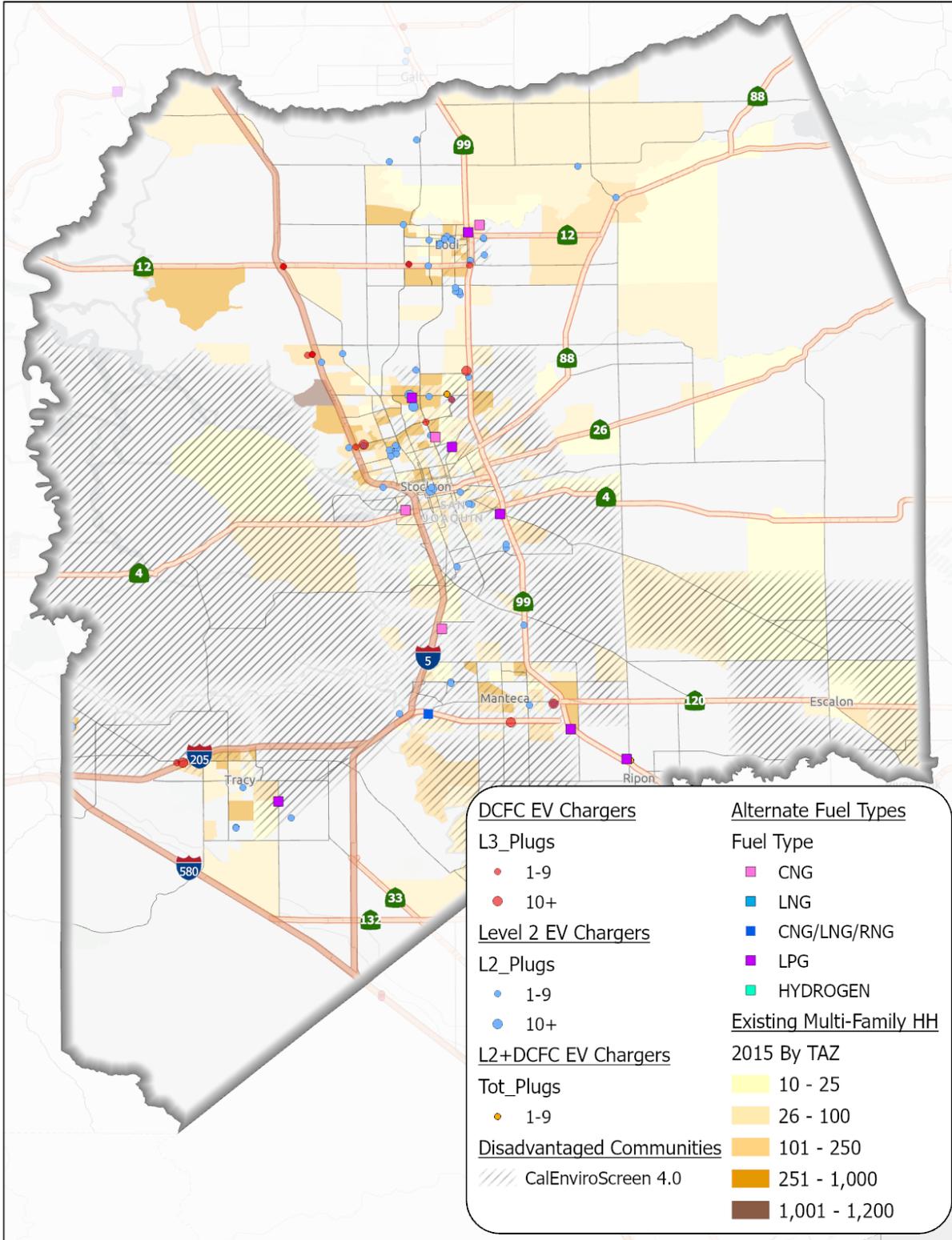


FIGURE 12: EXISTING ALTERNATIVE FUEL STATION LOCATIONS WITH MULTIFAMILY HOUSING AND CALENVIROSCREEN 4.0 OVERLAYS

Sources: Alternative Fuels Data Center, PlugShare, CalEnviroScreen, San Joaquin Valley Model Improvement Plan, Phase 2 (VMIP2)

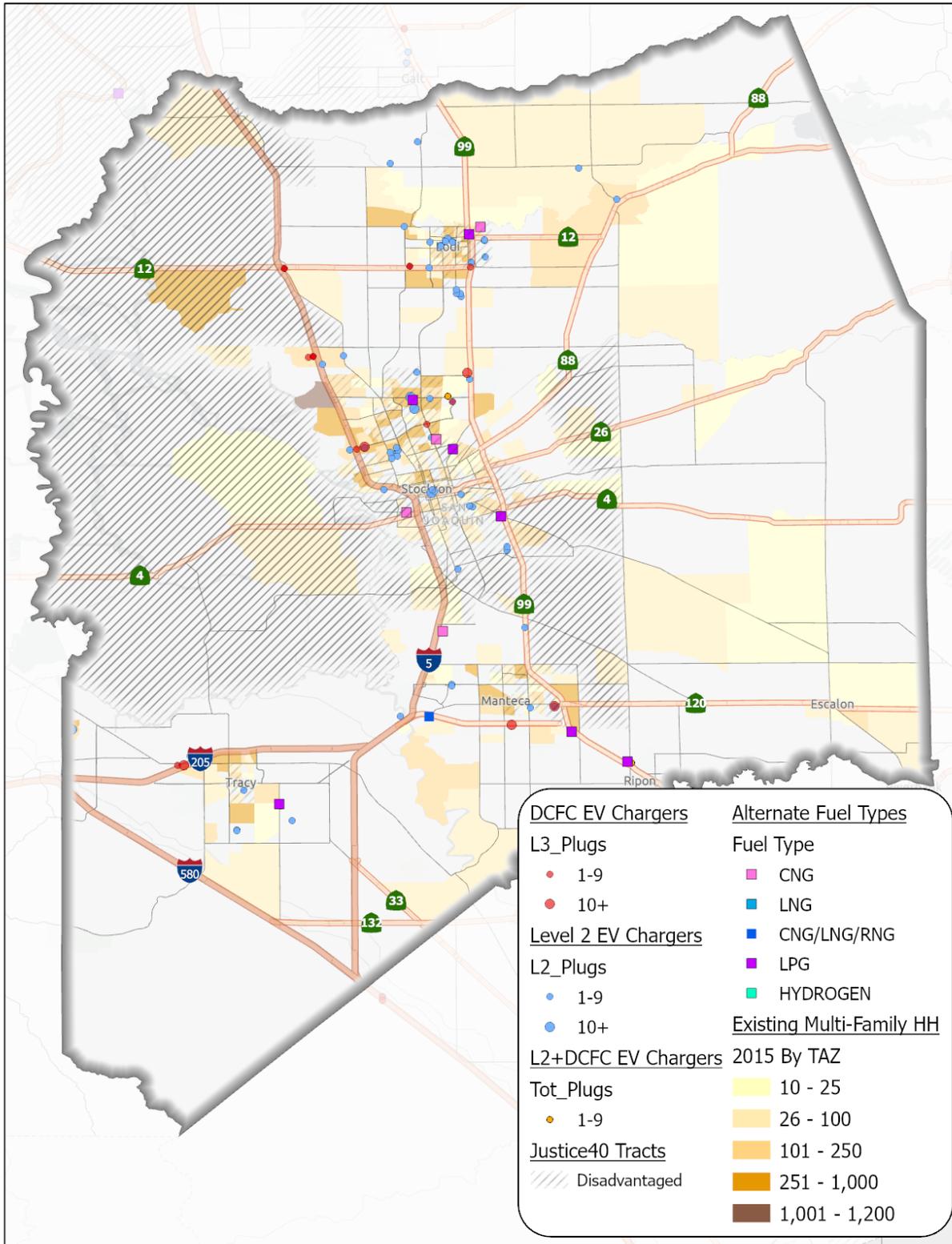


FIGURE 13: EXISTING ALTERNATIVE FUEL STATION LOCATIONS WITH MULTIFAMILY HOUSING AND JUSTICE40 OVERLAYS

Sources: Alternative Fuels Data Center, PlugShare, Justice40, San Joaquin Valley Model Improvement Plan, Phase 2 (VMIP2)

TABLE 9: EXISTING MULTI-UNIT DWELLINGS (MUD) WITHIN DISADVANTAGED COMMUNITIES IN SAN JOAQUIN COUNTY (PER CALENVIROSCREEN AND JUSTICE40)

CITY	Multi-Unit Households				
	MUD HH	% of Total HH	CES 4.0	Justice 40	CES 4.0 +J40
Stockton	24,851	23%	16,217	18,432	13,779
Lodi	6,570	29%	1,977	3,441	1,977
Manteca	4,740	20%	3,246	1,744	1,520
Tracy	3,908	16%	1,840	0	0
Lathrop	351	6%	351	0	0
Escalon	260	11%	0	0	0
Unincorporated	4,130	14%	1,416	785	250
TOTAL SAN JOAQUIN COUNTY	44,811	21%	25,046	24,403	17,525
Percent of Total			56%	54%	39%

TABLE 10: EXISTING MULTI-UNIT POPULATION WITHIN DISADVANTAGED COMMUNITIES IN SAN JOAQUIN COUNTY (PER CALENVIROSCREEN AND JUSTICE40)

CITY	Multi-Unit Population				
	MUD Pop	% of Total Pop	CES 4.0	Justice 40	CES 4.0 +J40
Stockton	46,862	17%	29,760	34,125	24,832
Lodi	14,450	26%	4,347	7,569	4,347
Manteca	11,998	18%	8,207	4,397	3,826
Tracy	9,917	14%	4,669	0	0
Lathrop	890	6%	890	0	0
Escalon	573	9%	0	0	0
Unincorporated	9,175	12%	3,405	1,728	550
TOTAL SAN JOAQUIN COUNTY	93,866	16%	51,279	47,818	33,555
Percent of Total			55%	51%	36%

FUNDING OPPORTUNITIES

The electromobility space is rapidly growing as are related funding opportunities. Covered expenses include the purchase or lease of EVs, the purchase and installation of charging infrastructure, and expenses for FCEVs and their refueling infrastructure. Several dozen funding opportunities exist federally as well as in each state, with eligible applicants ranging from private customers, state and local government agencies, tribal governments, school districts, transit agencies, utilities, fleet owners and operators, to vehicle dealers and charging infrastructure vendors. Funding programs are typically fixed term and have limited allocated funds. However, the range of funding options has vastly expanded over the past couple of years and especially few months. Information on specific programs can change quickly and we encourage the San Joaquin Council of Governments to monitor and identify funding sources timely and carefully.

There are numerous other funding opportunities related to electric vehicles and their charging infrastructure not mentioned below. The provided list serves as an overview of the most relevant programs with substantial funding resources.

As opportunities can change frequently, additional resources can be found here:

- Alternative Fuels Data Center Overview of Federal and State Laws and Incentives: <https://afdc.energy.gov/laws>
- California Governor’s Office of Business and Economic Development (GO-Biz) ZEV Funding Resources library: <https://business.ca.gov/industries/zero-emission-vehicles/zev-funding-resources/>
- PlugStar searchable database by ZIP code: <https://plugstar.com/tools/incentives>
- DSIRE (database of clean energy programs): <https://programs.dsireusa.org/system/program>

In the following, we list the most relevant funding opportunities at the federal, state, and local level.

FEDERAL PROGRAMS

List of programs:

- National Electric Vehicle Infrastructure (NEVI) Program ([web link](#))
- Federal tax credit ([web link](#))
- USDOT Grants for Buses and Bus Facilities Competitive Program ([web link](#))
- EPA Clean School Bus Program ([web link](#))
- Volkswagen settlement funds ([web link](#))

CALIFORNIA STATE PROGRAMS

The following incentive programs and projects are specific to California, administered and/or funded by state agencies, such as the California Air Resources Board (CARB)¹¹ or the California Energy Commission (CEC)¹². Some of the funding made available in California-specific programs comes from

¹¹ CARB: <https://ww2.arb.ca.gov/>

¹² CEC: <https://www.energy.ca.gov/>

revenue continually generated in the state’s greenhouse gas emissions cap-and-trade program¹³ or the Low Carbon Fuel Standard (LCFS)¹⁴.

List of programs:

- Clean Vehicle Rebate Project (CVRP) ([web link](#))
- Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) ([web link](#))
- Clean Off-Road Equipment (CORE) Voucher Incentive Project ([web link](#))
- Clean Fuel Reward ([web link](#))
- California Electric Vehicle Infrastructure Project (CALeVIP) ([web link](#))
 - Go to the San Joaquin Valley-specific project branch
 - CALeVIP 2.0 launching with the Golden State Priority Project (GSPP), for DCFC in disadvantaged or low-income communities, application window opens January 2023
- Energy Infrastructure Incentives for Zero-Emission (EnergIIZE) Commercial Vehicles ([web link](#))
- Clean Vehicle Assistance Program (CVAP) (funds currently exhausted) ([web link](#))
- Clean Cars 4 All (CC4A) ([web link](#))
- Low Carbon Fuel Standard (LCFS) ([web link](#))

Upcoming state funding:

In November 2021, the California Energy Commission (CEC) released the 2021-2023 Investment Plan Update that increased the budget of the Clean Transportation Program by six times¹⁵. The Clean Transportation Program has been investing in a broad portfolio of alternative fuel transportation projects throughout the state. As part of that program, over two years, the CEC will distribute nearly \$1.4 billion funding as follows:

- \$314 million for light-duty electric vehicle charging infrastructure (will fund a new program administered by Center for Sustainable Energy and CALSTART)
- \$690 million for medium- and heavy-duty ZEV infrastructure (battery-electric and hydrogen) (will fund EnergIIZE)
- \$77 million for hydrogen refueling infrastructure
- \$25 million for zero-and near-zero-carbon fuel production and supply
- \$244 million for ZEV manufacturing
- \$15 million for workforce training and development¹⁶

¹³ Cap-and-trade program: <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program>

¹⁴ LCFS: <https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard> \

¹⁵ CEC’s 2021-2023 Investment Plan Update: <https://www.energy.ca.gov/publications/2021/2021-2023-investment-plan-update-clean-transportation-program>

¹⁶ CEC’s Clean Transportation Plan: <https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program>

The California Air Resources Board (CARB) offers the Clean Mobility Options¹⁷ program that provides funding for two types of projects, Clean Mobility Projects and Community Transportation Needs Assessments. The funding window has not been announced.

As part of California’s 2022-2023 budget, Governor Newsom proposed \$1.5 billion of funding for a competitive grant program for school districts to replace nonelectric school buses with electric buses¹⁸ and construct charging stations (“Green School Bus Grants”). Grant awards would be at least \$500,000 each and be prioritized in areas with a high concentration of low-income students and English learners and smaller and more rural school districts. It is estimated that the program could help replace 3,000 older buses with electric buses.

LOCAL AND REGIONAL PROGRAMS

Pacific Gas and Electric (PG&E) programs

The California Public Utilities Commission (CPUC) authorizes programs run by investor-owned utilities such as Pacific Gas and Electric (PG&E).

List of programs:

- EV Fast Charge Program ([web link](#))
- EV Charge program ([web link](#))
- EV Fleet program ([web link](#))

San Joaquin Valley Air Pollution Control District

A few different programs supporting EV adoption and the installation of charging infrastructure are offered by the San Joaquin Valley Air Pollution Control District.

- Charge Up! Electric Vehicle Charger Incentive Program ([web link](#))
- Zero-Emission School Bus Replacement Incentive Program ([web link](#))
- Zero-Emission School Bus Infrastructure Program ([web link](#))
- Public Benefit Grant Program ([web link](#))

PRIVATE FINANCING

There is an emerging opportunity to obtain the full amount of capital needed to fund electric fleet vehicles and charging infrastructure, charging only a usage fee to the user. Such outside capital will allow the fleet operator and/or EVSE host to avoid the high up-front capital expenditure and still realize the lower Total Cost of Operating for EVs. Although private EVSE operators have existed for a while, it may make better sense from a financial and risk perspective to partner with a company that finances the chargers, the vehicles and all future maintenance, upgrades, and expansions. The outside capital generally would consist of a combination of equity and debt and will be tailored to the

¹⁷ CARB’s Clean Mobility Options program: <https://cleanmobilityoptions.org/>

¹⁸ Green School Bus Grants: <https://lao.ca.gov/Publications/Report/4525>

project. Private financing groups like 7Gen¹⁹ and investment groups like Sustainability Partners²⁰ have established some of the most creative and beneficial structures to ensure the highest excellence and efficiency for public sector customers.

REGULATIONS

A number of regulations both at the state and the federal level have the express goal of accelerating the transition to clean transportation fuels. These regulations can not only provide insights as to how fast the transition may occur, but also what type of vehicles will need to be served by new EVSE networks. Some regulations target the EVSE itself and dictate certain operating procedures which should be noted during the planning process.

2020 ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE) REGULATION (2021-2031)

EVSE used for commercial purposes, are subject to regulation adopted by the Department of Measurement Standards. The regulation requires that all charging stations that accept payment must:

- Be capable of indicating the start and stop time, the total quantity of energy delivered, the unit price, and the total price for the quantity of energy delivered during each discrete phase corresponding to one of the multiple unit prices.
- EVSE units used to charge electric vehicles shall be indicated and recorded in megajoules (MJ) or kilowatt-hours (kWh) and decimal subdivisions thereof.
- In the event of a power loss, the information needed to complete any transaction (i.e., delivery is complete, and payment is settled) in progress at the time of the power loss (such as the quantity and unit price, or sales price) shall be determinable by an alternative method.

The enforcement schedule is as follows:

- **January 1, 2021.** All new commercial AC EVSE installed on or after January 1, 2021 will be fully subject to the regulation.
- **January 1, 2023.** All new commercial DCFC EVSE installed on or after January 1, 2023 will be fully subject to the regulation.
- **January 1, 2031.** All commercial AC EVSE installed prior to January 1, 2021 may continue in operation, as is, but must comply with the regulation by January 1, 2031.
- **January 1, 2033.** All commercial DCFC EVSE installed prior to January 1, 2023 may continue in operation, as is, but must comply with the regulation by January 1, 2033.²¹

¹⁹ <https://www.7gen.com/>

²⁰ <https://www.sustainability.partners/>

²¹ California Air Resources Board-https://www.cdfr.ca.gov/dms/pdfs/CA_EVSE_Regulation_Reference_Document.pdf

ASSEMBLY BILL 841 ELECTRIC VEHICLE INFRASTRUCTURE TRAINING PROGRAM AND ENERGY EFFICIENCY PROGRAMS (2022+)

Assembly Bill 841 requires that that 25% of installation crew members of any State-funded electric vehicle charging infrastructure be certified under the Electric Vehicle Infrastructure Training Program (EVITP). The training program is administered by Powering Michigan's Future on behalf of the National Electrical Contractors Association. The course is available to California State Certified Electricians and is 18 hours of instructor-led training. NECA has been developing a self-paced course, but it isn't launched yet. After completing the course, the trainee must take a 90-minute in-person test that is currently offered twice a year in the San Francisco Bay Area and twice a year in Los Angeles.

To enroll, a contractor must complete an online form, wait for verification of their contractor's license, pay a \$275 fee, and then are told when the class and test are available. Training is not offered for electrician apprentices, site designers, or job estimators. NECA will not license the content or make it available to other training organizations²². <https://evitp.org/>

State and Local Building Codes (2022+)

California's 2022 Building Energy Efficiency Standards apply to newly constructed buildings, additions, and alterations. The 2022 Energy Code encourages efficient electric heat pumps, establishes electric-ready requirements for new homes, expands solar photovoltaic and battery storage standards. <https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2022-building-energy-efficiency>

Many local jurisdictions have passed or are passing reach codes that surpass the state standards; no San Joaquin jurisdiction has an adopted reach code for all electric construction. <https://localenergycodes.com/content/map>

State building codes are updated tri-annually, and the 2025 Building Energy Efficiency Standards are in a "pre-rulemaking" phase of research and public participation. Current consensus is that the next code cycle will require all-electric construction for single-family homes and low-rise multifamily (three stories or fewer.)

INNOVATIVE CLEAN TRANSIT (2023)

Innovative Clean Transit regulations requires transit agencies to demonstrate how they will achieve a full transition to zero-emission buses (ZEBs). Large transit agencies submitted their Rollout Plans in 2020, and small transit agencies must submit by July 1, 2023. **Table 11** shows the roll out plan by year.²³

²² Electric Vehicle Infrastructure Training Program- https://www.cdfa.ca.gov/dms/pdfs/CA_EVSE_Regulation_Reference_Document.pdf

²³ California Air Resources Board: https://ww2.arb.ca.gov/sites/default/files/2019-10/ictfro-Clean-Final_0.pdf

TABLE 11: PERCENTAGE OF BUS PURCHASES THAT MUST BE ZEBs BY YEAR

YEAR	LARGE AGENCY	SMALL AGENCY
2023	25%	
2024	25%	
2025	25%	
2026	50%	25%
2027	50%	25%
2028	50%	25%
2029	100%	100%

Source: California Air Resources Board (CARB)

ADVANCED CLEAN FLEET (ACF) REGULATION (2024-2027)

The Advanced Clean Fleet Regulation is a pending CARB regulation that will require all public fleets, all port and rail drayage operators, and private fleets with 50 or more vehicles or \$50 million in annual revenue to make 50% of their class 2b-8 vehicles added to their fleets zero emission vehicles starting January 1, 2024. If adopted with the language in the draft regulation, it will apply to vehicles with a GVWR of 8,501 pounds and more such as pickup trucks, large vans, SUVs and larger.²⁴ **Table 12** provides a summary at a glance of the proposed requirements and dates they will go into effect.

TABLE 12: SUMMARY OF ACF REGULATION

PROPOSED REQUIREMENT	DATES
50% of Class 2b-8 vehicles added to fleet must be ZEV	2024 through 2026
100% of Class 2b-8 vehicles added to fleet must be ZEV	2027 and onward

Source: California Air Resources Board

ADVANCED CLEAN TRUCK (ACT) REGULATION (2024-2035)

This existing California Air Resources Board (CARB) regulation requires that manufacturers sell zero emission vehicles as an increasing percentage of annual California sales from 2024-2035. It applies to vehicles with a gross vehicle weight rating (GVWR) of 8,501 pounds and more, such as pickup trucks, large vans, SUVs and larger with the sales percentage requirements based on vehicle

²⁴ California Air Resources Board: https://ww2.arb.ca.gov/sites/default/files/2022-04/220504acfdraftstatelocal_ADA.pdf

classes²⁵. **Figure 14** shows the percentage of vehicles by class that manufacturers are required to sell.

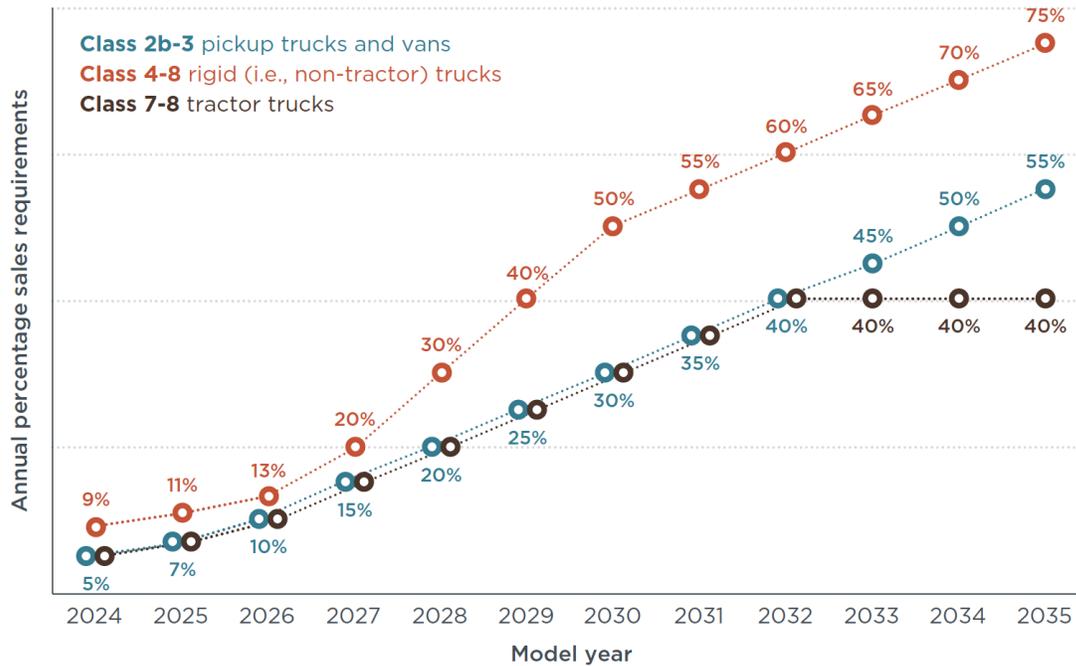


FIGURE 14: ACT REGULATION

Source: The ICCT

ADVANCED CLEAN CARS (ACC) II REGULATION (2026-2035)

This regulation is a proposed update to the State’s passenger vehicle emission standards and zero-emission vehicle (ZEV) requirements. The ACC II regulations propose to scale down emissions from light-duty passenger cars, pickup trucks, and sport utility vehicles (SUVs), starting with the 2026 model year, and require that manufacturers sell an increasing number of zero emission vehicles; up to 100 percent by the 2035 model year. This proposed change will put Governor Newsom’s Executive Order [N-79-20](#) into regulation.

PENDING FEDERAL ACTIONS

At the Federal level, there are a number of new actions/regulations that will have an impact on EV adoption and EVSE infrastructure:

- U.S. Department of Transportation’s Federal Highway Administration proposed minimum standards and requirements for projects funded under the National Electric Vehicle Infrastructure (NEVI) Formula Program and is accepting comments through August 22, 2022. The proposed rule includes:
 - Requirement that installers be EVITP certified

²⁵ California Air Resources Board: <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks/about>

- Use of the open-source communication protocol, OCPP, so that charging infrastructure that can communicate and operate on the same software platforms from one state to another. The FHWA proposes interoperability requirements for charger-to-EV communication to ensure that chargers are capable of the communication necessary to perform smart charge management and Plug and Charge.
- Consistency in signage and traffic control devices
- Networking and communication so that charging stations report locations, pricing, real-time availability, and accessibility to mapping applications, and can interact with grid management.
- National adoption of California’s EVSE regulation.
- Early movement to make charging stations compliant with ADA regulations, which could include connectors and screens at a different height and ability to receive verbal instructions for use (“talking screens.”)
- Federal vehicle standards to reduce emissions from heavy-duty trucks due to be finalized in December 2022
- Inflation Reduction Act:
 - The Inflation Reduction Act was passed by Congress and signed into law by President Biden in August 2022, including substantial funding for climate change mitigation-related efforts.²⁶ The act would extend the federal tax credit of \$7,500 for newly purchased all-electric vehicles and eliminate the phasing out of this tax credit after manufacturers have reached 200,000 EV sales.
 - Through the IRS, a federal tax credit of \$7,500 for all new BEVs is available to all private EV buyers. The tax credit also includes PHEVs with a credit amount that is dependent on the battery capacity of the respective purchased vehicle. In case of vehicle leases, the tax credit goes to the vehicle manufacturer or leasing company, who can pass on the lower costs to the lessee.²⁷ The Inflation Reduction Act as signed into law in August 2022 will extend the federal tax credit until 2032 and eliminate the phasing out of this tax credit after manufacturers have reached 200,000 EV sales (starting January 1, 2023), which had been designated before. The bill expands the tax credit eligibility to used EV purchases too, at \$4,000 per vehicle. However, the bill also poses restrictions on the vehicle and battery supply chains (in a move aiming to reduce reliance on China), which will likely exclude many vehicle models in the coming few years from being eligible for this tax credit.²⁸

²⁶ [Whitehouse.org-By the Numbers: The Inflation Reduction Act](https://www.whitehouse.gov/2022/08/16/by-the-numbers-the-inflation-reduction-act/)

²⁷ [IRS.gov-Plug-In Electric Drive Vehicle Credit \(IRC 30D\)](https://www.irs.gov/2022/08/16/plug-in-electric-drive-vehicle-credit-irc-30d/)

²⁸ [Alternative Fuels Data Center-Inflation Reduction Act of 2022](https://www.afdc.energy.gov/2022/08/16/inflation-reduction-act-of-2022/)