



SOLANO COUNTY CIVIL GRAND JURY

2021-2022

ELECTRIC VEHICLE INFRASTRUCTURE IN SOLANO COUNTY

Electric Vehicle Infrastructure in Solano County

Solano County Civil Grand Jury 2021-2022

I. SUMMARY

Emissions from vehicles powered by fossil fuels contribute to global warming. There are federal and state programs that require the adoption of zero-emission vehicles to address this issue. Accordingly, the use of electric vehicles is increasing rapidly in Solano County. Sufficient infrastructure, primarily charging stations, will be needed to support this growth. The current number of public and shared private charging stations in Solano County is not sufficient to meet projected requirements. The Solano County Civil Grand Jury found that local jurisdictions need to act to provide infrastructure to support and streamline a transition to electric vehicles.

II. INTRODUCTION

The 2021-22 Solano County Civil Grand Jury investigated the availability of public and shared private charging stations in Solano County to determine if all measures are being taken to ensure that electric vehicle (EV) infrastructure will be available to support the growing number of plug-in electric vehicles in the County.

Greenhouse gases (GHG), mainly carbon dioxide, methane, and oxides of nitrogen, trap heat in the atmosphere and contribute to global warming. The transportation sector is one of the largest contributors to GHG and, in 2019, accounted for the largest portion of total GHG emissions in the United States. Within that sector passenger cars and light-duty trucks were the largest category.

One method to reduce GHG emissions is the use of zero-emission vehicles (ZEVs) instead of those using fossil fuels. ZEVs include battery electric vehicles, plug-in hybrid electric vehicles, and hydrogen fuel-cell vehicles. More than 98 percent of ZEVs are either battery electric vehicles or plug-in hybrid vehicles (EVs).

Most auto manufacturers offer some form of ZEVs in their product line-ups which are shown in Appendix A. The electric vehicle market share in California has increased over time and is currently greater than 12 percent of all new light-duty vehicle sales (Appendix B). With consumer acceptance growing, access to convenient charging infrastructure is becoming more of a concern to the public. When consumers look to buy a new or used car, they need confirmation that it will be able to take them where they want to go. In fact, one of the biggest barriers to EV adoption is the lack of confidence in America's charging network.

III. METHODOLOGY

Interviewed:

- Solano Transportation Authority personnel
- Vacaville City Officials
- PG&E personnel
- Electric Vehicles Charging Solutions staff

Reviewed Responses to Requests for Information from:

- Solano County
- Cities of Benicia, Vallejo, Fairfield, Vacaville, Suisun City, Rio Vista and Dixon.
- Solano Transportation Authority

Reviewed:

- Federal Executive Order 14037; [Strengthening American Leadership in Clean Cars and Trucks](#); August 5, 2021.
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- California Air Resources Board (CARB); [Governor Newsom’s Zero-Emission by 2035 Executive Order \(N-79-20\)](#); January 19, 2021.
- CARB; [Revised Draft 2020 Mobile Source Strategy](#); 2021.
- [California Assembly Bill \(AB\) 2127 – Electric Vehicle Charging Infrastructure: Assessment](#); September 13, 2018.
- [California AB 1236 – Local Ordinances: Electric Vehicle Charging Stations](#); October 8, 2015.
- [California AB 970 – Planning and Zoning: Electric Vehicle Charging Stations: Permit Application: Approval](#), October 8, 2021.
- Governor’s Office of Business and Economic Development (GO-Biz); [Plug-in Electric Vehicle Charging Station Readiness](#).
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- GO-Biz; [Electric Vehicle Charging Station Permit Streamlining Fact Sheet](#)
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- California Public Utilities Commission (PUC) [Infrastructure](#).
- CARB; [California Greenhouse Gas Emissions for 2000 to 2019](#); July 28, 2021.
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- U.S. Department of Energy; [Alternative Fuels Data Center-California Laws and Incentives.](#)
- U.S. Department of Energy; [Alternative Fuels Data Center – Maps and Data.](#)
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- CEC; [Electric Vehicle Charging Infrastructure Assessment.](#)
- CEC; [Assembly Bill 2127; Electric Vehicle Charging Infrastructure Assessment; Analyzing Charging Needs to Support Zero-Emission Vehicles in 2030](#); Alexander, Matt, Noel Crisostomo, Wendell Krell, Jeffrey Lu, and Raja Ramesh; July 14, 2021.
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- International Council on Clean Transportation; Gordon Bauer, Chih-Wei Hsu, Mike Nicjolas and Nic Lutsey; Charging up America: [Assessing the Growing Need for U.S. Charging Infrastructure through 2030](#); July 2021.
- Solano Transportation Authority (STA); [Solano Transportation Authority 2021 Legislative Platform..](#)
- STA; [Solano Electric Vehicle Transition Program](#); April, 2018.
- STA; [Solano Electric Vehicle Resources.](#)
- Veloz; [EV Market Report.](#)
- Consumer Reports; [Automakers are Adding EVs to their Lineups](#); March 7, 2022.
- Electrek; [Electric Vehicle \(EV\) Charging Standards and How They Differ](#); Scooter Doll October 22, 2021.
- CALeVIP; [Electric Vehicle Charging 101.](#)
- CALeVIP; [Inland Counties Incentive Project](#); Solano County.
- West Coast Green Highway; [West Coast Electric Highway](#); November 16, 2021.
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IV. STATEMENT OF FACTS

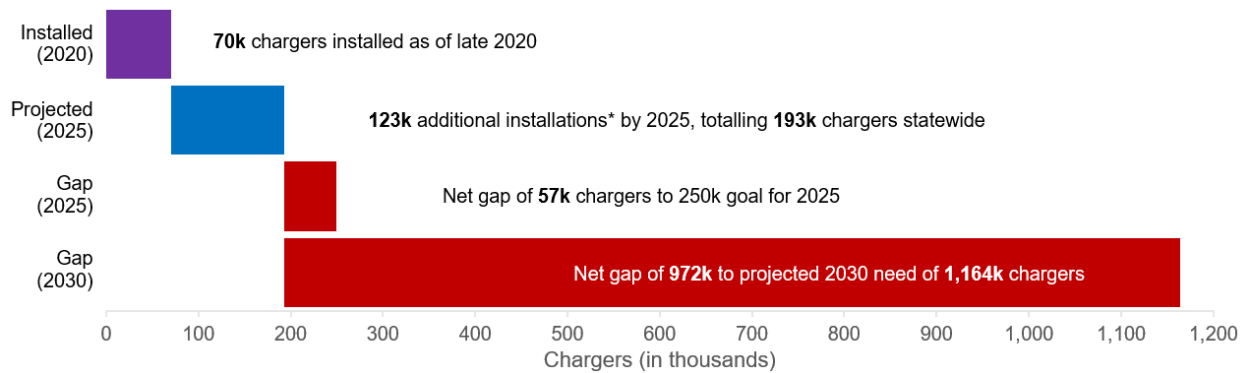
At both federal and state levels, executive orders and legislation exist that require the use of zero emission vehicles (ZEVs):

- President Biden issued an Executive Order on August 5, 2021, setting a goal that 50 percent of all new passenger cars and light trucks sold in 2030 be ZEVs.
- The Infrastructure Investment and Jobs Act was signed into law on November 15, 2021 which includes \$7.5 billion to build out a national network of EV chargers in the United States.
- California Governor Edmund G. Brown Jr. issued Executive Order B-48-18 in 2018 directing California to install 250,000 electric vehicle chargers, including 10,000 direct current (DC) fast chargers, to support 1.5 million ZEVs statewide by 2025.
- Governor Gavin Newsom issued Executive Order N-79-20 on January 19, 2021, which calls for:
 - All in-state sales of new passenger cars and trucks to be zero-emission by 2035.
 - All drayage trucks (tractor-trailers and short beds) operating in the state to be zero-emission by 2035.
 - All medium- and heavy-duty vehicles operating in the state to be zero-emission by 2045, where feasible.
 - All off-road vehicles and equipment to be zero-emission by 2035, where feasible.

In 2018 Governor Brown also established a target of 5 million ZEVs statewide by 2030 to meet a statewide goal of reducing greenhouse gas emissions to 40% below the 1990 level by 2030. Assembly Bill (AB) 2127 codified the 2030 ZEV target and tasked the California Energy Commission (CEC) with preparing biennial assessments of the charging infrastructure needed to meet these goals. Current analysis from the California Air Resources Board (CARB) estimates that 8 million light-duty ZEVs will be needed in 2030 to meet the new goal.

The first biennial Assembly Bill 2127 Electric Vehicle Charging Infrastructure Assessment (Assessment Report) was released in July 2021. The Assessment Report is focused exclusively on plug-in electric vehicles which include battery-electric vehicles and plug-in hybrid electric vehicles. The report identified the number of chargers currently installed and the number planned through state grants, approved utility investments, and settlement agreements. (Figure 1). To meet the 2025 goal of 250,000 public and shared chargers, the state will need about 57,000 more than are already installed or planned. To meet the 2030 goal of 1.2 million public and shared chargers, about 972,000 additional chargers will be required (Figure 1). Note that future biennial AB 2127 Assessment Reports will reassess charging infrastructure needs through 2035 and potentially project longer-term needs through 2045 as envisioned by Executive Order N-79-20.

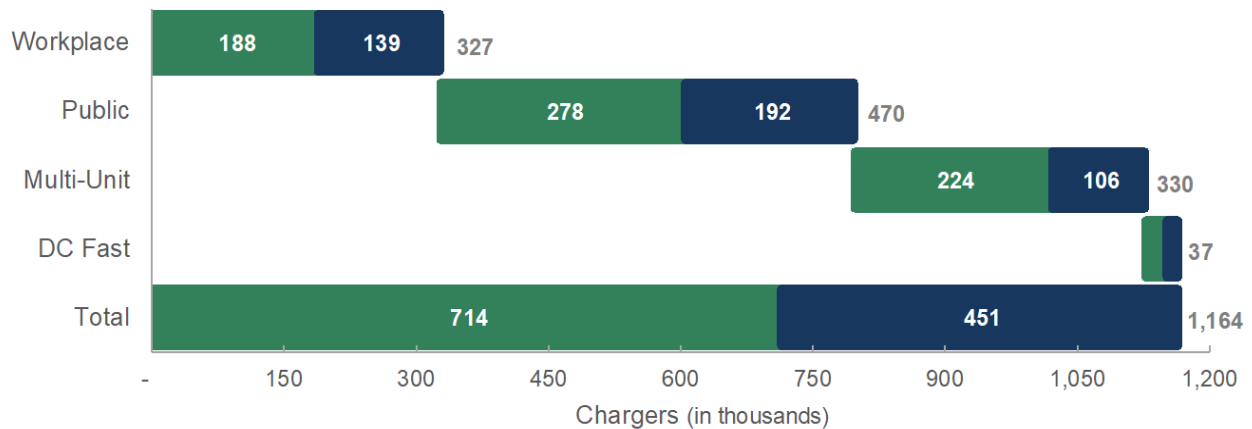
Figure 1: Installed and Projected Charger Counts Compared With Charger Needs for 1.5 Million Light-Duty ZEVs in 2025 and 8 Million Light-Duty ZEVs in 2030



* Based on allocated funding through 2025 as of February 2021
 Source: CEC and National Renewable Energy Laboratory

Figure 2 illustrates the projected breakdown of charger type required and their respective counts. Green bars indicate the charger need for 5 million ZEVs as called for in AB 2127, blue bars represent the additional charger need for 8 million ZEVs, and text labels at the rightmost end of each bar indicate the total charger need for 8 million ZEVs. These numbers do not include chargers located at single-family homes.

Figure 2: Projected 2030 Charger Counts to Support 5 Million and 8 Million Light-Duty Zero-Emission Vehicles



Source: CEC and National Renewable Energy Laboratory

A. Charger Types and Definitions

Chargers are manufactured appliances that safely deliver electricity to charge an EV. As summarized in Table 1, three categories are used to describe light-duty EV chargers: Level 1, Level 2, and DC fast charging. Level 1 and Level 2 chargers deliver alternating current (AC) electricity to the vehicle and use the Society of Automotive Engineering (SAE) J1772 standard connector. While all EVs can use the SAE J1772 connector, not all have a separate charging port

compatible with DC fast charging. Three types of connectors are used for DC fast charging in the North American market: CHAdeMO, Combined Charging System (CCS), and Tesla. The charging inlet of an EV determines the type of DC fast charging connector the vehicle can use.

Table 1. Types of Chargers

Parameter	Level 1	Level 2	DC Fast Charger
Voltage	120 Volts AC	208-240 Volts AC	200 – 1000 Volts DC
Maximum power output in kilowatts (kW)	1.9 kW	19.2 kW	450 kW
Typical added range per hour of charging *	~4 miles at 1.44 kW	~23 miles at 7.2 kW	~90 miles in 30 minutes at 55 kW ~204 miles in 30 minutes at 150 kW

Range estimates based on a 110 MPG-equivalent vehicle

Charger connectors, which determine whether a vehicle can charge when it arrives at a charging station, remain fragmented across all EV sectors. Level 3, or DC fast charging connectors for passenger cars are split among the examples shown above, and lack of connector standardization is even more prevalent among medium- and heavy-duty vehicles. Encouraging greater standardization of charging connectors promotes greater driver convenience, helps alleviate range anxiety, and ensures that chargers installed today are not obsolete in the future.

The following table presents definitions of terminology used in discussing EV charging equipment:

Table 2. Common Charging Terms Definitions

Charger	A manufactured appliance that delivers electricity to charge a EV.
Connector	A physical socket with a specified pin configuration. A charger may have one or multiple connectors.
Charging Station	A charging station is a physical address where one or more chargers are available for use. This is the same usage as for “gas station.” A charging station can be public, shared private, or private.
Public	A public charging station has parking space(s) designated by a property owner or lessee to be available to and accessible by the public for any period.
Shared Private	A shared private charging station has parking space(s) designated by a property owner or residents. Parking spaces are not dedicated to individual drivers or vehicles.
Private	A private charging station has parking space(s) that are privately owned and operated, often dedicated for a specific driver or vehicle (for example, a charger installed in the garage of a single-family home.

Source: California Energy Commission

B. California Status

Data compiled by the CEC show the number of EVs and the number of public and shared private chargers in California in the last two years:

- At the end of 2020 California had 628,473 battery or plug-in hybrid vehicles on the road.
- In 2021, 247,074 battery or plug-in hybrid vehicles were sold in California.
- In 2021, 79,023 public and shared private chargers were available to service these vehicles.

As noted previously, the modeling performed as part of the Assessment Report revealed a shortfall of 972,000 chargers that will be required to support the anticipated growth in electric vehicles in use by 2030, representing a 24 percent shortfall of Level 2 chargers and a 4 percent shortfall of DC fast chargers. Charging infrastructure deployment is lagging vehicle sales, and this gap may stymie progress toward 5 million and 8 million ZEVs by 2030.

The Assessment Report also noted that while most EV drivers today charge at single-family homes, shared and public charging infrastructure will be increasingly critical as EV adoption spreads beyond early adopters. Even with declining vehicle sticker prices, several recent reports emphasize that continued growth in the EV market will depend on driver confidence in charging infrastructure. Drivers who lack reliable charging at home or work will rely on public charging for their mobility needs. Shared and public charging can allow all Californians to enjoy the

benefits of EVs. A 2020 National Renewable Energy Laboratory study found that public charging provided several thousand dollars' worth of tangible value to EV-driving households. The study found that public charging:

- Enables greater inter-regional battery EV travel with public DC fast chargers.
- Provides fuel cost savings to plug-in EV hybrids by enabling drivers to substitute electric miles for what otherwise would have been gasoline miles.
- Substantially decreases the perceived risk of limited range and long recharging time, thereby increasing the likelihood of purchase of a battery EV.
- Increases the public visibility of electric vehicles and creates confidence in their viability and permanence.

As the state continues building infrastructure to support its growing EV population, policy makers and electric vehicle stakeholders must recognize that meeting the diverse electric mobility needs of Californians cannot be achieved through one-size-fits-all solutions.

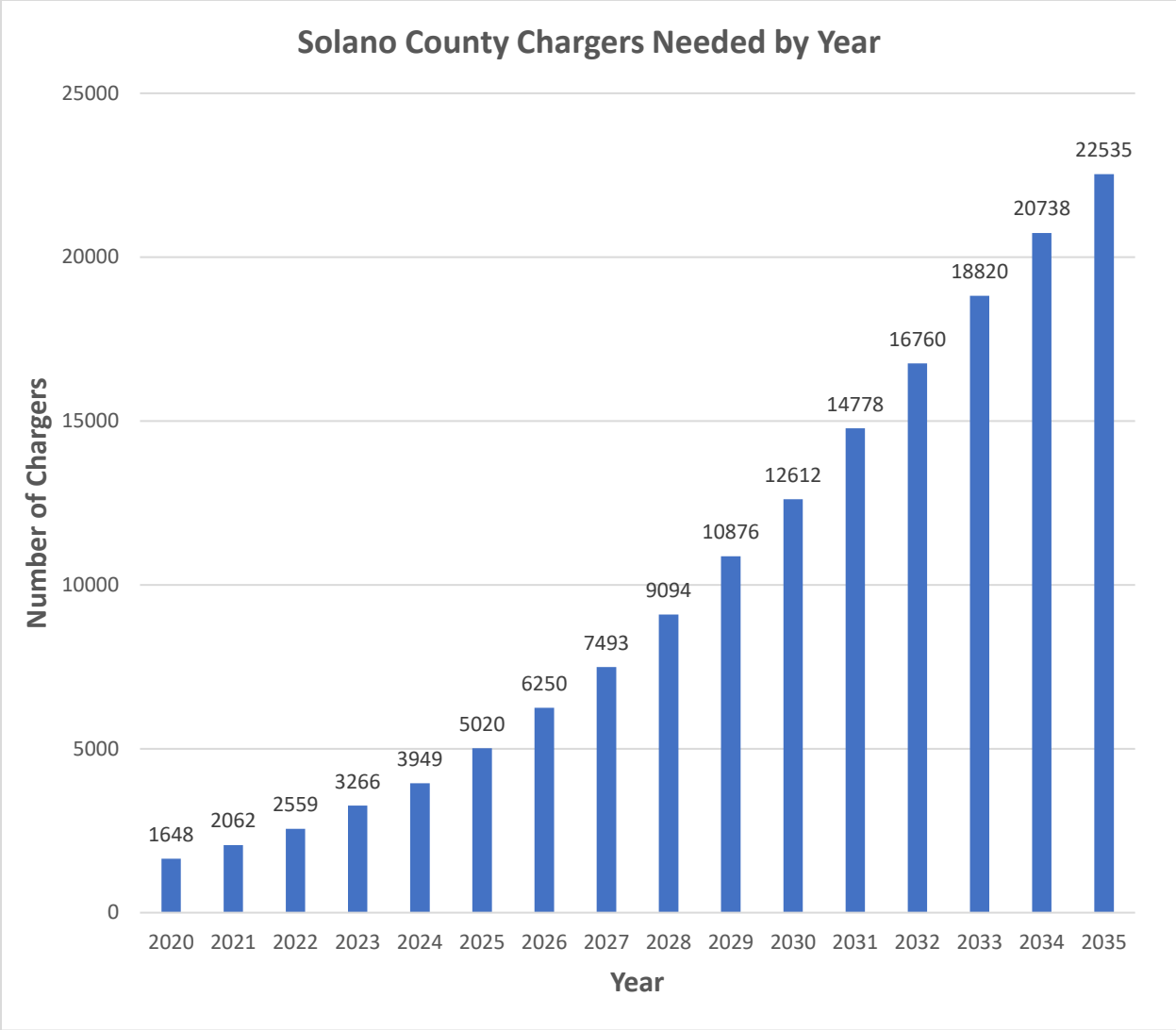
Thoughtful charger deployment is a significant undertaking that demands careful attention to driver behavior, the local built environment, equity, resilience, grid capacity, technical standards, and scalability for an assortment of charging solutions.

Because of the state's ambitious ZEV adoption, climate, and air quality goals, modeling results presented in the Assessment Report focus on the California Air Resources Board (CARB)'s Draft 2020 Mobile Source Strategy planning scenario as the priority for the state. CARB's Draft 2020 Mobile Source Strategy illustrates the trajectory needed to achieve the Executive Order N-79-20 target of 100 percent light-duty ZEV sales by 2035, as well as other key climate and air quality goals.

C. Solano County

The CEC data show that at the end of 2020, Solano County had 5,139 light duty ZEVs on the road, 99.8% of which were EVs. In 2021, the number of EVs increased by 2,074 to a total of 7,213 EVs. The total number of shared public and private chargers in Solano County at the end of 2020 was 471.

The Assessment Report modeling process resulted in projections of infrastructure needed to support nearly 8 million ZEVs by 2030, and is the trajectory needed to achieve the Executive Order N-79-20 target of 100 percent light-duty ZEV sales by 2035. The graph below shows, by year, the projected needs for chargers in Solano County for the years 2020 through 2035. As noted above, the number of public and shared private chargers in Solano County at the end of 2020 was 471. This is significantly fewer than the projected need of 1,648.



Source: CEC and National Renewable Energy Laboratory

1. Solano Transportation Authority

The Solano Transportation Authority’s Board of Directors includes one county supervisor and the mayors of all seven cities in the county. In 2015, the Solano Transportation Authority (STA) received a grant from the California Energy Commission to prepare the [Solano Electric Vehicle \(EV\) Transition Program](#). The goal of the program was to identify and overcome barriers to the deployment of electric vehicles in Solano County. STA contracted with consulting firms, ICF in Sacramento and Fehr & Peers in Walnut Creek, to prepare the report which recommended several solutions to overcome barriers to the adoption and use of EVs. These included:

- public outreach and education,
- establishment of common “trailblazing” signage to point drivers to existing charging stations.
- a streamlined permit process for installing charging stations,

The report also included analysis of potential future charging station locations throughout the county based on predicted vehicle numbers and on the existing charging station network at that time. It was designed to create guidance for the transition to EV usage tailored to Solano County, based on regional conditions. Many maps and charts of charging station locations (as of 2017) and recommended future locations were included as well as clarifications of a variety of steps that could be taken to improve the county's EV readiness. On April 11, 2018, the STA Board adopted the [Solano EV Program Final Report](#).

The 2018 Report is still available on the STA website (STA.ca.gov), and although the link on the STA website is titled "Solano EV Program Final Report" the report itself is labeled as Draft. Interviews with STA staff conducted by the Civil Grand Jury confirmed that it is final. When viewed online, the reader can connect to information via web links to building codes and permitting departments. Some of the links in the Report are no longer valid.

a. Public Outreach and Education Activity

One stated goal of the STA EV Transition Program is to make it easier for those who want to own an electric vehicle to find resources and places to charge. The SolanoEV.org website was created as part of the EV Transition Program with the intention of being a primary resource related to electric vehicles for local governments, installers, site owners, and drivers. This website was created in 2018, but is no longer accessible. STA does not have direct authority to enforce measures in the EV Transition Program. The Civil Grand Jury found that not all cities are using this plan for its intended purpose.

b. Trailblazer Signage Activity

Another goal of the Report was to site potential locations for trailblazer signs. As part of their contract for the report, Fehr & Peers identified 76 potential locations in which to deploy trailblazer signs directing drivers to charging stations in each of Solano County's seven cities. They also provided to STA a document that detailed all sign and mounting specifications required for installation. The plan was to have some trailblazing signs installed before the end of May 2018. As of 2022, there is no evidence of progress on that goal.

c. Streamlining Permit Activity

Recognizing the important role of the permitting and inspection process in the expansion of charging infrastructure in the state, California legislators passed a law in 2015 requiring local governments to streamline the permitting process. AB 1236 required communities with populations greater than 200,000 to adopt ordinances that expedite the permitting process for EV charging stations by September 30, 2016. As the only jurisdiction in Solano County meeting this population minimum, the Solano County Board of Supervisors adopted an ordinance on September 13, 2016, adding section 26 to Chapter 6.3 - Building Standards and Codes of the Solano County Code to provide an expedited permitting process for electric vehicle charging stations. All other jurisdictions were required to adopt an ordinance by September 30, 2017. AB

970 was adopted in 2021 and added specific binding timelines to review periods defined in AB 1236.

The required ordinance must include specific streamlining elements. Local governments must provide a permitting checklist; installation projects that meet all requirements on the checklist must be eligible for expedited review. In addition to developing streamlined procedures, permitting offices must provide the permitting materials on the government's website and must allow for electronic submittal of the application materials online. There are a number of templates for the required ordinance and permitting checklist available online.

Not all Solano County jurisdictions have complied with AB 1236 requirements. A review of The Permitting Olympics webpage sponsored by the Governor's Office of Business and Economic Development shows that only Solano County is completely streamlined. Although not listed on the webpage, Benicia is also fully streamlined. The City of Fairfield has adopted the required ordinance, and has indicated it is in the process of completing a checklist with publication anticipated by the end of May 2022. No other cities have met the requirements of AB 1236.

2. *Grant Writing*

STA has developed a partnership with a vendor, Electric Vehicle Charging Solutions, Inc. to provide turnkey installation of charging stations in the county. One area of expertise mentioned in the Civil Grand Jury's interview with STA personnel which made this company appealing is its grant writing ability. There are a number of grant opportunities and incentives available from utility companies, Air Quality Management Districts, and other agencies. Successful grant writing can be time consuming, and city staff members do not always have sufficient time to undertake this facet of EV charger installations.

V. FINDINGS AND RECOMMENDATIONS

FINDING 1 – There will not be enough electric vehicle charging stations in Solano County to support the State's goals for electric vehicles identified in Executive Order N-79-20.

RECOMMENDATION 1 – Solano Transportation Authority (STA) Board members commit to programs to increase the number of electric vehicle charging stations in their jurisdictions at a rate sufficient to meet Executive Order N-79-20.

FINDING 2 – In 2018, the STA adopted an Electric Vehicle Transition Program (EVTP) and the website (solanoev.org) for Solano County. The website is no longer working which is of no value; the EVTP is no longer current, minimizing its value and applicability.

RECOMMENDATION 2 – STA update the EVTP and its website (solanoev.org) to provide accurate and current information for Solano County residents.

FINDING 3 – In the 2018 EVTP, the STA Board approved a plan to install trailblazing signs to identify locations of electric vehicle charging stations. As of 2022, there is no evidence of progress on that plan.

RECOMMENDATION 3 – STA Board work with jurisdictions and agencies to install signage denoting the location of existing charging stations and to include appropriate signage as a component of future installations.

FINDING 4 – The 2018 STA EVTP was intended to serve as regional guidance for the transition to electric vehicles, but this guidance has not been effectively communicated.

RECOMMENDATION 4A – STA increase staff time available for implementation and oversight of the Electric Vehicle Transition Plan.

RECOMMENDATION 4B – STA add dedicated grant writing staff to bring this function in-house rather than relying on third-party vendors.

FINDING 5 – AB 1236 and AB 970 require all California cities and counties to develop an expedited, streamlined permitting process for electric vehicle charging stations. Not all jurisdictions in Solano County have complied.

RECOMMENDATION 5 – All Solano County jurisdictions comply with streamlined permitting requirements, including adoption of an ordinance and checklist as required by AB 1236 and AB 970.

REQUIRED RESPONSES

Solano County Board of Supervisors (Findings 1 and 3)

Cities (Findings 1,3, and 5):

Vacaville

Vallejo

Suisun City

Rio Vista

Dixon

Fairfield

Solano Transportation Authority Board (All Findings)

COURTESY COPIES

Pacific Gas & Electric Company

Electric Vehicle Charging Solutions, Inc.

APPENDIX A

Automaker Electric Vehicle Plans			
Automaker	Current Models	Planned Models	Sales Goals
American Honda	Civic, CRZ, Insight, Accord, CR-V, Clarity	Prologue in early 2024	All sales to be zero-emissions EVs by 2040; 40% of sales by 2030.
BMW North America, includes Mini and Rolls Royce	i4, iX, Vision, Mini Cooper	EV in 5 Series / 7 Series, X1 SUV. Rolls-Royce EV rumors	Plans for about a dozen new EV to market by 2025
Ford	Mustang Mach-E, Escape, e-Transit, Maverick, EcoSport	EV F-150 Lightning pickup truck	Automaker has split operations between a Model- e division and the internal combustion division. They project that EVs will be half of global sales volume by 2030. Plans to electrify entire portfolio by 2030.
General Motors, includes Buick, Cadillac, Chevrolet, and GMC	EV1, Chevy Volt, Bolt, Bolt EUV,	GMC Hummer EV, Cadillac Lyriq SUV, Celestiq, Chevy Blazer EV, Equinox EV, Silverado EV, GMC Sierra EV	Goal is 20 EV models available in the US by 2025 and an all-electric model lineup by 2035.
Hyundai, includes Genesis	Kona, Ioniq, Ioniq SUV, Genesis GV60	Plans to introduce 17 new models by 2030 - 11 for Hyundai and 6 for Genesis	Committed to be being carbon-neutral by 2045 including a hydrogen electrification strategy.
Jaguar and Land Rover	I-Pace	Land Rover will have first EV by 2024. 6 new EV Land Rovers in 5 years and all - electric Jaguar lineup by 2025.	All models will have electric versions by 2030.
Kia	Niro, Kia EV6,	14 electric models by 2027.	
Mazda	MX-30 SUV, CX-5		
Mercedes-Benz	SmartForTwo city car, EQS 450+, EQS 580.	Plans 10 new EV models in 2022.	All new vehicle platforms will have EV-only starting in 2025: 3 platforms identified for 2025: MB.EAm, AMG-EA, and VAN.EA
Mitsubishi	i-MiEV, Outlander		Plans to expand electric lineup to make up 50% of global sales by 2030.
Nissan North America, includes Infiniti	Leaf EV	Ariya SUV, Infiniti	Plans to launch 23 electrified models by 2030; forecasts 40% of US Sales will be EVs by then. Goal is to be carbon neutral by 2050.

Stellantis, includes Alfa Romeo, Chrysler, Dodge, Fiat, Jeep, Maserati and RAM trucks	Jeep 4xe, Fiat 500e, Peugeot e-2008	All brands committed to offering fully electrified models. Ram plans for a full-size EV truck by 2024.	Aims for all-electric lineup by 2028.
Subaru of America	Crosstrek	Solterra SUV	Will have some form of electrification on all models by 2025.
Tesla	Roadster, Model S, Model X SUV, Model 3, Model Y	Tesla Cybertruck, a Semi Tractor-trailer truck, new generation Roadster	Working on long-range (500+ miles) and tow capacity in new models.
Toyota, includes Lexus	Prius, Mirai, Tundra i-Force, Venza, RAV4, Highlander, Corolla, Camry, Avalon, Sienna,	Toyota bZ4X SUV (bZ is a new brand name "beyond zero") with 6 more bZ models planned by 2025.	Plans to build 3.5 million battery-only EVs per year by 2030. Plans for Lexus to be 100% electric by 2030. Toyota will continue to develop battery-only hybrids as well as electric hybrids.
Volkswagon, includes Audi, Bentley, Bugatti, Lamborghini, and Porsche	VW ID.4, ID.BUZZ van, Audi E-Tron, E-Tron GT, Porsche Taycan EV.	All Bentleys will be plug-ins by 2026.	Will launch 70 pure electric vehicles and 60 hybrids by 2030.
Volvo	X40 Recharge, C40 Recharge	Polestar	Plans to build only pure electric vehicles by 2030.

Source: Consumerreports.org, March 7, 2022



California Electric Vehicle Market Share Increases Over Time



Note: CA sales are 39% of national sales.
Data Source: California Energy Commission (2021)
Retrieved February 2, 2022 from <http://www.energy.ca.gov/zevstats>

Q4 2021 Data Update

APPENDIX B

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