



ELECTRIC VEHICLE SUPPLY EQUIPMENT STANDARDS TECHNOLOGY REVIEW

FEBRUARY 2022

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EXECUTIVE SUMMARY

Zero-emission transportation is critical to achieving the State's air quality and climate goals, and the State has taken many steps to establish the policies and investments necessary to support this historic transition. To support the adoption and use of ZEVs, the Board adopted the Electric Vehicle Supply Equipment (EVSE) Standards Regulation in 2019, pursuant to Senate Bill 454 (Corbett, Chapter 418, Statutes of 2013), to reduce barriers to accessing public charging stations.

The EVSE Standards Regulation establishes minimum requirements for payment methods an EVSE must allow, facilitates roaming agreements between electric vehicle service providers (EVSPs), creates a more complete database of location and pricing information for consumer use, and ensures clarity in the cost of a charging session. The Regulation is concerned not just with today's electric vehicle drivers, who have first adopted new technologies, but the full cohort of Californians who will use these systems now and in the future.

To continue assessing barriers drivers may face and understand whether the requirements of the Regulation, particularly the requirement that EVSE must accept both EMV chip payment cards and contactless, "tap" cards, CARB staff conducted a Technology Review. The Technology Review included an evaluation of the availability and use of different payment methods and a survey of drivers' experiences accessing public charging stations. This report presents the findings and recommendations from that work.

The available data indicate that drivers continue to experience a number of barriers to accessing public charging, with inoperable stations and payment issues being the most frequently cited challenges. Furthermore, while credit card companies are deploying new, contactless credit card technologies, available information from the credit industry indicates that tap-enabled cards are not yet widely available and that EMV chip-enabled cards will continue to be the foundation for payment transactions until tap becomes more broadly deployed. Furthermore, while tap technologies have the potential to offer advantages to under- and unbanked drivers, the survey data collected as part of this effort suggest that lower-income drivers may have less access to tap-enabled cards and tap-enabled smartphones than higher-income drivers at this time.

Though there is more to learn, based on these findings, this report concludes that immediate changes to the EVSE Standards Regulation are not warranted at this time. Nevertheless, payment technologies are evolving and therefore the availability and use of different payment methods, including by drivers with varying levels of income and access to traditional banking, requires ongoing monitoring so that staff may recommend changes at the appropriate time in the future.

Staff recommends continuing to evaluate barriers for all users at public charging stations, with regular updates to the Board highlighting the progress of industry. The lack of readily available information for the public on station uptime or downtime is particularly concerning. Unless a PEV driver is a member of multiple networks, there is no known way to determine ahead of time if a station a driver wants to access is operational. To address that issue, staff recommends working with other State agencies to explore the development of metrics to measure and report station reliability. Lastly, staff recommends exploring a more in-depth research study or pilot project to evaluate how people, particularly low-income residents pay for public EV charging and other services related to transportation.

Moving forward, staff will hold a workshop to discuss these findings and recommendations on February 15. Staff will consider comments and present an informational update to the Board in April.

INTRODUCTION

California is committed to growing the zero-emission vehicle (ZEV) market with the goal of achieving 100 percent sales of new ZEVs and plug-in hybrid electric vehicles by 2035 pursuant to Governor Newsom's Executive Order N-79-20. ZEVs are critical to meeting federal health-based air quality standards and the State's climate change goals. As the State accelerates the transition to zero-emission transportation, it has become increasingly urgent to expand the availability of, and access to, electric vehicle (EV) chargers.

To serve aspects of these goals, the Legislature enacted the Electric Vehicle Charging Stations Open Access Act, Senate Bill (SB) 454 (Corbett, Chapter 418, Statutes of 2013), which establishes open access principles for charging infrastructure. In response, after considerable study and public process, CARB adopted the Electric Vehicle Supply Equipment (EVSE) Standards Regulation in 2019 to establish requirements that electric vehicle service providers (EVSPs) must meet, including minimum requirements for payment methods they must allow, with the goal of enabling drivers to confidently and reliably access public charging infrastructure. In implementing the Regulation, CARB continues to evaluate barriers to access and the extent to which the Regulation is adequately addressing those barriers.

As part of that effort, and consistent with Board direction, staff conducted a Technology Review, including surveys of drivers' experiences accessing public charging stations and evaluated the availability and use of different payment methods to understand whether the requirements of the Regulation remain appropriate. This report presents preliminary findings from that work for public review and comment.

BACKGROUND

The intent of the Electric Vehicle Charging Stations Open Access Act is “to promote (1) a positive driving experience by assisting in the widespread deployment of electric vehicles, (2) not limit the ability of a property owner or lessee of publicly available parking spaces, as defined in Section 44268, to restrict use of or access to those parking spaces to its customers, and (3) facilitate expanded EV driver access to electric vehicle charging stations in public places.” Among other provisions, the law prohibits electric vehicle service providers (EVSPs) from requiring a person to obtain a membership or pay a subscription fee in order to use the station. An electric vehicle charging station that requires payment of a fee must “allow a person desiring to use the station to pay via credit card or mobile technology, or both.” Appendix A includes a copy of the statute.

The Open Access Act intends to ensure broad access to EVSE but also responded to a particular charging access problem: EVSPs requiring membership in order for a driver to charge an EV using that EVSP’s network. Membership means that a driver must have a credit card on file with the EVSP and pay for a charging session using the EVSP-issued radio frequency identification (RFID) card or the EVSP app on their smartphone. Early adopters needed to have multiple memberships to sufficiently meet their public charging needs. This complex system was a significant barrier to the transition from gas stations to chargers.

In response to the Open Access Act, the EVSE Standards Regulation sought to ensure that electric vehicle charging becomes as easy as, or easier than, fueling an internal combustion engine vehicle – meaning an end not just to membership requirements, but also the creation of affirmative public requirements in regulation, including a requirement that a network offer multiple ways to pay for vehicle charging. Electric vehicle charging payment systems must be easy, recognizable, reliable, and available to the mass market. The Regulation is concerned not just with today’s electric vehicle drivers, who have first adopted new technologies, but the full cohort of Californians who will use these systems now and in the future. Drivers will vary in their comfort with and access to new technologies, income, and other factors that may affect zero emission vehicle (ZEV) adoption and charging experience. All drivers need to have confidence that they will be able to use a charging station, including knowing prior to the session what the prices are and how they can pay for the session.

To that end, the EVSE Standards Regulation establishes minimum requirements for payment methods an EVSE must allow, facilitates roaming agreements between electric vehicle service providers (EVSPs), creates a more complete database of location and pricing information for consumer use, and ensures clarity in the cost of a charging session. With respect to payment methods, the Regulation requires all new

EVSE to be equipped with a reader that accepts Euro MasterCard Visa (EMV) chip-enabled cards and a device, most commonly a near-field communications (NFC) device, that accepts mobile payments. This requirement was in effect starting January 1, 2022 for public direct current fast chargers (DCFC) and will be in effect starting July 1, 2023 for public Level 2 chargers. To read all regulatory requirements, please refer to Appendix B for a copy of the Regulation.

In developing the Regulation, staff had extensive engagement with stakeholders, including the regulated parties. Staff held a forum in December 2017 to discuss requirements as stipulated by the Open Access Act and held two more public workshops in 2018 to receive feedback on proposed regulatory requirements. Staff presented the proposed regulation on June 27, 2019 at the Board Hearing, and the Board adopted the rule that day pending a minor 15-day change notice.¹ The final regulation order and the Final Statement of Reasons are posted on CARB's rulemaking activity website.² The regulation became effective July 1, 2020.

CARB staff's analysis for the 2019 rulemaking included an economic impact estimating a cumulative cost to EVSE operators of \$115 million over 10 years for the whole regulation, not just its payment technology component. Staff cost estimates were based on hardware units accommodating both EMV chip and contactless payments, and staff contacted EVSPs for data on specific costs to install and maintain credit card payment systems. Upfront costs for EMV chip readers were estimated at \$371 per unit on average, a cost which could occur at each EVSE, or could be shared at a common kiosk for a parking facility.³ Ongoing annual operating and maintenance costs were estimated to be \$270 per unit per year. For context, in 2019, staff estimated the cost of replacing a public Level 2 EVSE unit to be \$6000.⁴ Staff have not seen any evidence that this cost is reducing the number of EVSE units installed in California.

Furthermore, staff anticipate that EVSPs will pass this cost onto users of the chargers. While this could increase fuel costs for EV drivers, staff anticipate the drivers will still save substantially on fuel compared to conventional vehicles. In a more recent cost analysis for the Advanced Clean Cars II rulemaking, CARB staff estimate that EV drivers will save thousands of dollars over a ten-year period of ownership. Further, recent announcements of Federal and State public investment in EV charging infrastructure will mitigate installation costs for many EVSE units.

¹ [Proposed EVSE Standards June 2019 Board Hearing Presentation](#)

² [EVSE Standards Rulemaking Log](#)

³ Preliminary new cost information indicates the hardware installation cost may be lower than staff estimated in 2019, and that ongoing networking fees may be lower.

⁴ U.S. DOE 2015, U.S. Department of Energy, Costs Associated With Non-Residential Electric Vehicle Supply Equipment, November 2015, http://www.afdc.energy.gov/uploads/publication/evse_cost_report_2015.pdf The cost does not account for any electrical or concrete work on these sites, because the regulation does not require any site upgrades.

The rulemaking analysis also found that EMV chip cards are as secure as contactless cards because they both use the same security standards for transactions. Every chip and contactless transaction uses a one-time use cryptographic code that prevents counterfeit fraud. Whether a customer is using a tap-to-pay card or inserting your EMV chip card, the sensitive information sent is encrypted. A unique, one-time-use code is created for the transaction instead of sending a customer's name, billing address, CVV code, or zip code. This is called "tokenization." So, even if a thief intercepted a contactless or chip transaction, they could not use that to replicate a card.

Following the rulemaking process in 2019, and in response to Board direction to keep current on evolving technologies and needs, CARB staff committed to conducting a Technology Review, consistent with ongoing evaluations other CARB regulatory programs commonly undertake. As discussed further in the Methods section, the Technology Review analyzed reports on how people bank, assessed hardware availability on EVSE, and surveyed industry stakeholders and drivers to understand their experiences accessing charging. This review was not intended to, and does not, propose specific changes in regulatory requirements, but rather to provide an assessment of access to public charging infrastructure, including the availability and use of different payment technologies, and to provide a continuing forum for all stakeholders to keep abreast of the state of payment technology and charging needs. In this way, the Review may inform potential future regulatory proposals along with non-regulatory approaches to increase access and support the ongoing EVSE roll-out.

QUESTIONS ANSWERED BY THE TECHNOLOGY REVIEW

The overarching objective of the EVSE Standards Regulation is to remove barriers to charging by making public charging available to the broadest possible market, reliable, and easy and simple to do. Thus, the Technology Review sought to understand the barriers drivers currently encounter when they need to use public charging. Issues staff focused on included: What barriers do drivers experience when they attempt to access charging? What are the circumstances under which a driver must call customer service when initiating a charging session? How frequently are charging stations down?

Moreover, in response to concerns by some EVSPs about the Regulation's requirement that EVSE must be equipped with a Euro Mastercard Visa (EMV) chip reader, along with staff's recognition that payment technologies are evolving, and drivers may have access to different forms of payment, the Technology Review specifically analyzed the market status of different payment methods. These issues included: To what extent have credit card companies deployed EMV chip and tap⁵-enabled cards? What is the availability and use of EMV chip and tap payment methods

by consumers? What are charging stations' up and down time and does that affect the needs of drivers?

In undertaking this work, staff also sought to understand more deeply the needs of under- and unbanked drivers and what payment methods assist in providing access to these groups.

METHODS

In October 2020, staff conducted a public webinar to propose topics for the Technology Review and requested feedback from stakeholders. Throughout 2021, staff continued to engage with industry and conduct independent research of the topics, including reviewing public data on existing payment systems installed on EVSE in California. To better understand national banking trends and how individuals use banking institutions, staff reviewed the Federal Deposit Insurance Corporation (FDIC) report "How America Banks: Household Use of Banking and Financial Services 2019 FDIC Survey"⁶. Staff also reviewed public records of payment issuers' quarterly earnings call for credit card companies and other studies on the smartphone market.⁷ After the October 2021 Board Hearing, the Board directed staff to address additional topics related for the technology review.

To address these new questions, staff conducted surveys of drivers in California, EVSPs, and credit card companies. With respect to the driver survey, the goal of the survey was to better understand what barriers, if any, drivers are experiencing at a public charging station, what payment technology they have in their possession, and how often they use those payment options for public charging. A copy of the survey can be found in Appendix C. The survey was distributed via Facebook and Twitter by CARB staff, and a large number of partner organizations including Plug-In-America, the California Energy Commission, Veloz, Chargeway, Forth, Bay Area Air Quality Management District, Sacramento Metropolitan Air Quality Management District, El Dorado County Air Quality Management District, Silicon Valley Leadership Group, the Center for Sustainable Energy, and the California Governor's Office of Business and Economic Development. The survey was also deployed via email from Veloz and the Clean Cars 4 All incentive program. Because this survey was deployed via partner organizations that serve or interact with current plug-in electric (PEV) drivers, or drivers who are interested in getting an EV in the near future, the respondents tended to be PEV drivers and are thus not representative of the general California population today. For example, only about 2 percent of cars on the road in California are zero-emission, while 87 percent of respondents to the survey were PEV drivers in California. PEV

⁶ [FDIC How America Banks, 2019](#)

⁷ Pew Research Center, [Mobile Fact Sheet](#), 2021.

drivers may be unique in some important characteristics, such as their willingness to adopt new technologies.

At the close of the survey, 1,290 drivers had responded. There were two broad categories of drivers who responded to the survey: “national drivers” (any drivers living in another state) and “California drivers,” referring to anyone living in California. Most responses (1175, or 91 percent) came from California. The respondents were separated into 3 subcategories: PEV drivers who use public charging stations (761 drivers, or 65 percent), PEV drivers who do not use public charging (259 drivers, or 22 percent) and non-PEV drivers (155 drivers, or 13 percent). There were 483 California respondents who have a household income of less than \$50,000, which is 41 percent of California respondents.

The second survey was for major credit card companies and was deployed to Visa, MasterCard and Discover. This survey focused on the current market penetration of contactless tap-enabled cards and EMV chip cards, and the timeline to full deployment of tap technology in credit, debit, and pre-paid cards. A copy of this survey is included in Appendix D. Visa and Mastercard responded to the survey with publicly available documentation but did not provide direct answers to the survey questions. As a result, CARB data on this critical question remain limited.

Finally, staff conducted a survey of the major EVSPs operating in California, including Blink, Charge Point, Electrify America, EnelX, EV Connect, EVgo, Flo, Greenlots, Rivian, Telsa and Volta. It is important to note that Tesla and Rivian have private networks that only service the vehicles they manufacture and are not considered open for public charging. While these companies are not subject to the EVSE Standards Regulation at this time, these companies were included in the survey because they have engaged with staff on regulatory development and may open their networks to the public in the future.

The EVSP survey asked the companies what payment hardware they deploy on their charging stations in California, the status of roaming agreements, the up/down time of the charging stations, redundancy of payment hardware in case one or more fails, proportions of users that use the EMV chip versus tap, what fees are associated with transactions of the different payment methods, what percentage of users had to contact customer service, and response time when a station becomes inoperable. A copy of this survey is included in Appendix E. Eight⁸ of the eleven EVSPs responded to the survey questions with varying levels of completeness. Three⁹ of the eleven EVSPs did not respond to the survey at all.

⁸ EVgo, ChargePoint, EnelX, FLO, Greenlots, Rivian, Tesla and Volta responded to the survey.

⁹ Electrify America, Blink and EVConnect did not respond to the survey.

FINDINGS

Finding #1: Inoperable stations and payment issues are barriers for drivers.

The survey asked PEV drivers what, if any, barriers they experienced when using a public charging station. Respondents were able to select all answers that applied to them with an option to write in their own answers. Given the range of responses, staff grouped similar responses into categories to help identify the most prominent themes. Table 1 lists the barriers drivers reported experiencing at public charging stations organized with the most common barriers at the top.

The most common barrier was some version of “membership requirements,” indicating that membership requirements are a critical issue to address to ensure broad-based access. This category included responses such as not having a membership or not wanting to create a membership. This is a problem the EVSE Regulation seeks to resolve; it will be important to monitor this issue as implementation continues.

Table 1: Barriers Drivers Experience at Public Charging Stations

Barriers to Using Public Charging	Number of Drivers
Membership requirements	575
Charging station operability issues	439
Too Expensive	224
Payment Issues	209
Too complicated	164
Finding Charging Stations	121
Lack of Charging Station Availability	39
Declined to State	35
Cell Service/Wi-Fi Availability	2

The survey also asked PEV drivers if they had contacted customer service and if so why. This question was presented to drivers as a multiple-choice option, asking them to select all answers that applied to them. Forty percent of California PEV respondents indicated they had. Drivers were also able to insert their own response in a “other” box option.

Table 2 breaks down the survey responses in this category. The top three reasons why PEV drivers contacted customer service stem from the charging station not working (70 percent of the driver responses to this question). The fourth, fifth, seventh, and eighth reasons why drivers had to contact customer service related to a payment issue. These issues represented 20 percent of responses to this question.

Table 2: Why PEV Drivers Contacted Customer Service

Reasons for Contacting Customer Service	Number of Drivers
1. Charging station unit not working	261
2. Vehicle connector on charging station was broken	105
3. Charging station shut off during charging session	69
4. No way to pay with my credit card on charging station	66
5. Not a member of the network	45
6. Insufficient cell service to download mobile app	35
7. Billing and Payment Issues	10
8. Technical Issues	5
9. Membership Issues	6
10. Cell Service	1
11. Assistance with Charging Station	7
12. General Assistance	3
13. File a complaint	1
14. Miscellaneous Statement	1
15. Declined to state	2
Total	617

Results from the survey indicate that drivers are experiencing non-operable charging stations and payment or membership issues as the main reasons they must contact customer service when at a public station. It is important to note that results from the EVSP survey, though incomplete, tell a somewhat different story. The EVSP survey asked the percentage of the company’s public charging stations that were inoperable over the course of a 7-day period. Four out of 11 service providers responded to this question, and they responded that they have a national uptime of 95-98 percent. The data from the two surveys suggest there may be a disconnect between what drivers are experiencing and what the EVSPs are reporting, and more work is needed to understand this issue.

Finding #2: Membership requirements may be a perceived barrier for drivers.

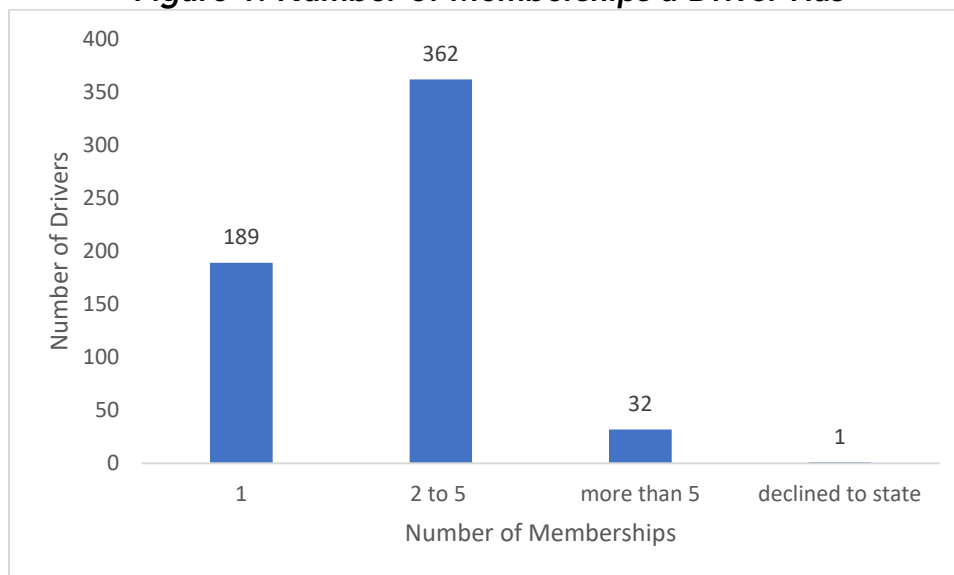
In addition to the finding above that membership is a barrier to public charging, the driver survey asked respondents why they created a membership account with network providers, followed by questions asking how many memberships they held. Seventy-six percent of California PEV drivers who use public charging responded that they created at least one membership. Table 3 presents the reasons respondents reported for establishing them. Two-thirds of these drivers (385 respondents) indicated that creating a charging membership was the only way to access the charging station.

Table 3: Primary Reason Drivers Created a Membership with a Charging Network

Primary Reasons for Creating a Charging Network Membership	Number of Drivers
It was the only way to access the charging station	388
I was driving out of my home area and needed to prep for public charging	117
My vehicle came with free charging	24
No on-site credit card payment available	19
Membership Advantages	25
Other Reasons	6
Miscellaneous Comments	1
Declined to State	4

California PEV drivers were also asked how many memberships they had. Figure 1 shows that most PEV drivers have 2-5 memberships (62 percent of the responses to this question). One of the purposes of open access is to ensure that membership with a network provider is a choice, not a requirement, to use a public charging station. This is a key objective in the Open Access Act. More work is needed to understand the extent to which membership may be a real or perceived barrier.

Figure 1: Number of Memberships a Driver Has



Finding # 3: Multiple payment methods exist on chargers today, but most EVSPs rely on contactless tap methods of payments.

The survey sent to network providers asked them to list the payment options they currently offer on their public charging stations. Table 4 shows the payment hardware available on Level 2 and direct current fast charging (DCFC) stations from the network

providers that responded to the survey (eight of the eleven providers surveyed responded to this question). While there are multiple payment options available, the network providers have predominantly relied upon the contactless tap technology, which depends on a singular hardware option, an NFC reader. Only three of the providers that responded currently have EMV chip hardware¹⁰, four of the providers have NFC readers that can be used for non-membership mobile payments, and none of the network providers accept cash. Two providers indicate the EMV chip hardware is available only on DCFC and in limited locations for Level 2. Note these survey responses are not an indication of non-compliance with the Regulation; the current implementation requirements dictate new EVSE units need to have the EMV chip hardware with requirements for DCFC starting January 1, 2022 and requirements for Level starting July 1, 2023.

Table 4: Payment systems availability across EVSPs in California

Payment Hardware	Charge-Point	EnelX	Flo	Green-lots	EVgo	Rivian	Tesla	Volta
1-800	X	X	X	X	X	-	X	-
EMV chip	-	X	-	X*	X*	-	-	-
NFC card **	X	X	X	-	X*	-	-	-
NFC mobile phone (mobile wallet)	X	X	X	-	X*	-	-	-
EVSP mobile app	X	X	-	X	X	X*	X	X*
EVSP RFID Card	X	X	X	X*	X	-	-	-
Cash	-	-	-	-	-	-	-	-
Mag swipe	-	X	-	X*	X*	-	-	-
Plug-N-Charge	X	-	-	X*	-	-	-	-
Other	Wex / Voyager	QR Code	-	-	-	-	-	-

*These payment options are in limited use or are only on direct current fast chargers.

** For example, tap-enabled credit card technology.

Finding #4: Tap-enabled cards represent a small segment of cards in use today in the United States, but deployment and use is accelerating. Lower-income respondents to CARB’s PEV driver survey are somewhat less likely to have tap-enabled cards; CARB lacks detailed data on the broader distribution of these cards among Californians generally.

California drivers and credit card companies were surveyed about the deployment of tap cards. Visa conveyed in its fourth quarter earnings call from 2021 that they have 400 million tap cards deployed nationally, which accounts for roughly 15 percent of

¹⁰ This represents roughly 900 ports in California. There are roughly 29,191 ports operational in California as of January 2022.

the Visa card market in the country. Mastercard is estimating the U.S. market is roughly 24 months away from having 25 percent of cards issued being tap-enabled.¹¹ At the end of 2020, there were nearly 11 billion EMV chip cards in global circulation, and over 85 percent of all card-present transactions globally used EMV chip technology.¹² Credit card-issuing companies and EMVCo¹³ have indicated that EMV chip cards will continue to be the foundation for payment processing while tap is rolled out.

Drivers were asked multiple questions related to what type of payment technologies they have available and use, and three quarters of the survey respondents answered these questions. Eighty-three percent of California drivers who responded to these questions possess some type of payment cards. Table 5 shows which card payment technologies respondents possess for three different categories of respondents: total respondents, respondents who earn less than \$50,000 per year, respondents who earn more than \$50,000 per year. As the survey results show, 70 percent¹⁴ of all respondents have access to a tap-enabled card, but there is a small disparity in access to tap cards across income groups. Seventy-nine percent of respondents with incomes greater than \$50,000 report having a tap card, while only 57 percent of respondents with incomes less than \$50,000 do. It is important to note that lower-income respondents were also more likely to have no payment card at all.

¹¹ Contactless for Merchants, Mastercard, 2021.

¹²EMVCo, 2021. [EMV Chip Cards: Enabling Global Commerce, 2021.](#)

¹³ EMVCo is a company that manages and evolves EMV specifications and supporting testing programs that enable card-based payment products to work together seamlessly and securely worldwide.

¹⁴ To calculate 70 percent of all respondents having tap across income groups, one needs to add the only tap group to the tap and EMV group. This calculation can be repeated for the income categories, as indicated by the highlighted boxes.

Table 5: Drivers by Income and the Card Technology They Report Having

Card Type	Drivers with income ABOVE \$50,000		Drivers with income BELOW \$50,000		Total Drivers	
	Number of Drivers	Percentage of Drivers	Number of Drivers	Percentage of Drivers	Number of Drivers	Percentage of Drivers
Tap and EMV	351	52.62%	173	35.82%	535	45.68%
Only tap	181	27.14%	100	20.70%	284	24.25%
Only EMV	64	9.60%	71	14.70%	137	11.69%
Do not own any cards	56	8.40%	116	24.02%	174	14.85%
Unsure of card type they have	19	2.25%	23	4.76%	45	3.5%
Totals	671	100%	483	100%	1175	100%

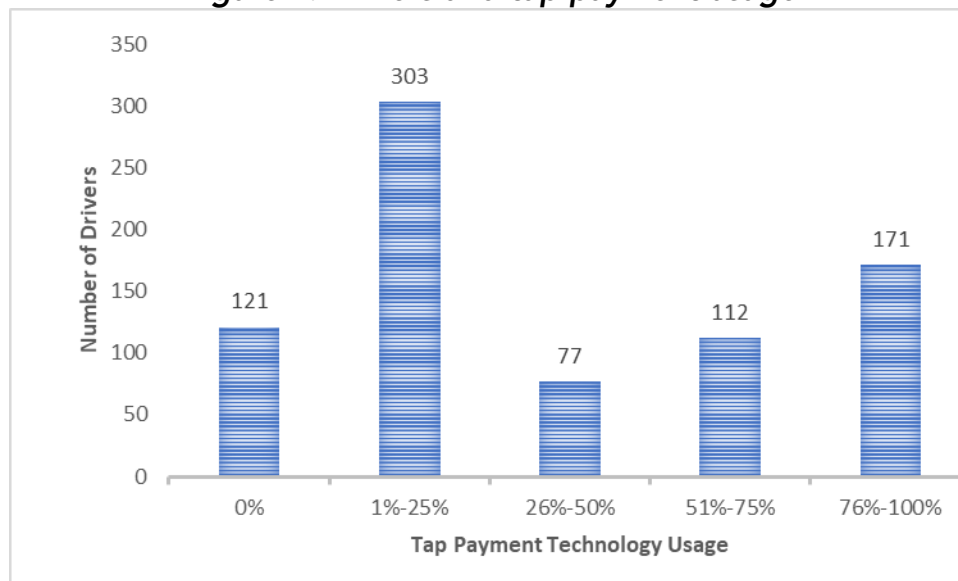
The survey data, as noted above, are illustrative, but have gaps. As they reflect only those PEV drivers who took the time to complete the survey, the data may be reflecting those who are most engaged with PEV technology generally, even among early adopters, and the data do not reflect the general penetration of payment methods outside of this engaged early adopter group. That disparities in access appear even among this engaged, technology-friendly group suggests the possibility of broader disparities in access and awareness amongst Californians generally (including Californians who lack access to credit). Lower-income Californians, in particular, are less likely to have PEVs at this point, and may also be less likely to have the most recent payment technologies if they have access to credit or banking at all. Further work would be needed to explore these issues, and is important to consider as PEVs move from an early technology into general use.

Information from the credit card companies suggests that consumers do not have broad access to tap-enabled cards at this time nor will they within the next two years. Because credit card companies did not provide detailed roll-out plans in response to the survey, exact access timing and reach could not be determined. This finding is somewhat at odds with data from the driver survey, which shows much higher penetration of tap-enabled cards. This discrepancy underscores the fact that survey respondents were not representative of the general population. Indeed, as mentioned in the Methods, the majority of respondents owned PEVs (87 percent), while there only about 2 percent of vehicles on the road in California are ZEVs.

The driver survey also asked if drivers with tap-enabled cards use that functionality in their regular purchasing behavior. Figure 2 shows the tap payment technology usage

rates for drivers. Out of the 819 drivers who own tap-enabled cards, 15 percent of respondents indicate they never use tap payment technology, 37 percent of respondents indicated that they only use tap payment technology 1 percent to 25 percent of the time, indicating that nearly half of drivers do not prefer to use tap cards for their regular purchasing habits.

Figure 2: Drivers and tap payment usage



As the data above show, many drivers who responded to the survey have access to tap¹⁵, but also that drivers are not using it as one would expect if the technology has completely penetrated the market. There could be several reasons why a person does not use their tap card. For example, they may know how to use it or be comfortable trying it; they may not shop at merchants that have that hardware installed; or they simply prefer to use the swipe or EMV chip functions of the payment cards.

Finding #5: Tap has the potential to expand payment options for under and unbanked drivers, but barriers remain.

Under and unbanked individuals do not use or have access to traditional banking methods. This means the individuals do not have access to tap payment cards issued by these institutions. According to a report issued by the Federal Deposit Insurance Corporation (FDIC), 20 percent of unbanked households stated they “don’t have enough money to meet minimum balance requirements” as the most cited main reason for not having an account.¹⁶ This group of drivers may need to rely on non-traditional banking methods because they have little to no balance requirements or

¹⁵ The driver survey distribution focused on EV followers and enthusiasts who are likely early adopters of technology and not necessarily representative of the general California population.

¹⁶ FDIC, 2019. [“How America Banks: Household Use of Banking and Financial Services”](#)

fees associated with having an account.¹⁷ Non-traditional banking methods include peer-to-peer mobile applications such as Venmo, PayPal and the CashApp. These apps enable users who are hesitant to share residential address, driver's license, and personal identifiable information, or do not have it, a way to digitize their cash. However, all of these peer-to-peer payment companies heavily rely on smartphones that require internet connectivity that depends on a cellular network or Wi-Fi.

These mobile applications rely on the user having a smartphone. In the driver survey conducted as part of this Technology Review, nearly all of the respondents answered that they do have a smartphone (1,156 or 90 percent), and 923 (or 80 percent) of these drivers' smartphones enable contactless payments.¹⁸ While there is broad availability of smartphones that enable contactless payments *in general*, the survey results suggest that drivers with lower incomes may have less access to these technologies than those with higher incomes. Table 6 presents the number of respondents who own a smartphone with contactless payment capability by household income. Thirty percent of respondents to the driver survey who have a household income of less than \$50,000 annually do not have access to smartphones with contactless payment ability. This disparity appears even among early-adopting PEV drivers; once again, because of the nature of the survey's focus on these drivers, the presence of a disparity even among this group may suggest broader gaps among Californians generally. Not having a smartphone with contactless payment is a barrier to charging in public, and more work is needed to understand potential other advantages or barriers that might exist relative to use of a smartphone for lower-income households, such as whether the use of these apps requires a data plan or Wi-Fi access, and the extent to which lower-income drivers have data plans and/or charging stations provide free Wi-Fi.

¹⁷ Walk-Morris, 2021. "[Will apps like PayPal and Venmo make financial inequality worse?](#)"

¹⁸ The driver survey did not cover the usage of smartphone contactless payments.

Table 6: Drivers that Own a Smartphone with and without Contactless Payment, by Household Income

Smartphone Type	Drivers with income ABOVE \$50,000		Drivers with income BELOW \$50,000		Total Drivers	
	Number of Drivers	Percentage of Drivers	Number of Drivers	Percentage of Drivers	Number of Drivers	Percentage of Drivers
Smartphone WITH contactless payment	585	87.2%	322	66.7%	923	78.7%
Smartphone WITHOUT contactless payment	79	11.8%	142	29.4%	226	19.2%
Has a smartphone does not know if it has contactless payment	5	.7%	2	.4%	7	.6%
Does not own a smartphone	2	.3%	17	3.5%	19	1.5%
Totals	671	100%	483	100%	1175	100%

Furthermore, as the payment industry is evolving, the peer-to-peer payment companies are starting to issue cards associated with their accounts. Cards that are issued come with EMV chip, tap, and magnetic swipe capabilities. This approach also gives users a card that they can use to pay for goods and services.¹⁹ Payment cards that are issued from peer-to-peer companies are backed by major card issuers like Visa, Mastercard and Discover. Giving the user the ability to use the card at any merchant that accepts those payments.

In short, tap payment technology can expand payment options for under and unbanked drivers because tap is available through both traditional and non-traditional banking methods, and it will be important for the EVSE Standards Regulation to continue requiring that EVSE be equipped to accept mobile payments.

¹⁹ CashApp, 2022. "[Order Cash Card.](#)"

CONCLUSIONS AND RECOMMENDATIONS

As stated earlier, the overarching objective of the EVSE Standards Regulation is to remove barriers to charging by making public charging available to the broadest possible market, reliable, and easy and simple to use. This Technology Review sought to answer several questions, including the barriers that drivers face in accessing charging stations and the availability and use of tap versus chip-enabled cards.

As described in the Findings section, in surveying drivers, the network providers, and credit card companies, as well as reviewing public information on charger access and credit card technology, staff found inoperable stations and payment issues continue to be barriers for drivers. Specifically, membership requirements are reported as a barrier for many drivers and more work is needed to understand if that is a real or perceived barrier in light of the Open Access Act prohibiting membership as a condition to charge. Furthermore, although multiple payment methods exist on chargers today, network providers center on contactless payments. Tap-enabled cards for contactless payment systems represent a small but growing segment of cards in use today in the United States. Tap is useful for under and un-banked drivers but barriers remain, and contactless payments alone are not sufficient for lower-income drivers who may not have a tap-enabled smartphone.

Based on these findings, staff offer the following recommendations.

1. Revisit the EMV chip requirement in the EVSE Standards Regulation only when tap technologies are more broadly available in California. Based on staff's findings, access to tap technology is not yet widespread, either through tap-enabled cards or tap-enabled smartphones. Only about 15 percent of Visa credit cards in consumer hands are tap-enabled today and MasterCard has announced it expects about 25 percent market penetration within the next two years. A higher fraction of PEV drivers have tap-enabled cards (70 percent), but 42 percent of the tap-enabled PEV drivers never or seldom use that card technology, there is less access to these cards by lower-income drivers relative to higher-income drivers, and survey respondents are not representative of Californians as a whole. The EVSE Standards Regulation must be designed in a way that provides access for the drivers of tomorrow, who will be more diverse in terms of their access to and comfort with new technologies.
2. Conduct ongoing monitoring of public charging market trends. The second recommendation is to develop a public website to convey key network metrics and progress (an "EVSE access dashboard"). This dashboard could contain data from the service providers regarding the status of roaming agreements, network up and down time statistics, payment hardware supported by network

providers including the number of EVSE that support the various payment methods, and finally the usage patterns of the payment hardware.

3. Explore conducting a research study or pilot project to evaluate how people, particularly low-income residents, pay for transportation services, including public EV charging.
4. Continue evaluating barriers to charging for all users with periodic updates to the Board, including but not limited to the following topics:
 - a. The extent to which membership is a real or perceived barrier in accessing public chargers. A contactless payment system for tap-enabled credit cards, coupled with a phone number for the EVSP, are forms of payment that do not require a membership. However, a service call is cumbersome and relies on cell service that may or may not exist in all areas where there is charging. It is also possible that the driver was not aware they could pay by calling customer service. Staff recommends future research to understand why and how drivers consider membership a barrier.
 - b. Market status of credit card companies' issuance of tap-enabled cards, including an annual assessment.
 - c. How drivers are using tap for purchases, including use of tap-enabled cards, RFID cards issued by EVSPs, and smartphones. As part of this, understand barriers and opportunities to using smartphones to pay for goods and services, including extent to which drivers have tap-enabled phones, and have data plans or depend on Wi-Fi, the latter of which is not available at many charging stations. Low-income drivers and drivers who are under- or unbanked would be a central focus of this work.
 - d. Barriers that exist to charging for under and unbanked current and future drivers of PEVs.
5. Develop metrics and a process for tracking station up/down time. The driver survey data suggest that charging station down time is a barrier to public charging. Unless a driver is a member of multiple networks, there is no reliable way to determine ahead of time if a station a driver wants to visit is operational. Staff recommend working with industry to develop metrics that communicate a charging network's reliability and a way to communicate whether stations are operational. This recommendation would involve working with both industry and drivers to determine the best way to transmit up-to-date up/down time information to drivers so they can have confidence in the public charging infrastructure.

NEXT STEPS

This report is available for 21-day public review and comments. Comments are due to CARB by 5:00 pm on February 28, 2022 on [informal comment submittal form](#). Comments submitted can be viewed on the [workshop comments log webpage](#).

Additionally, staff will be holding a public workshop in mid-February 2022. This will be an opportunity for staff to summarize the findings and recommendations of this Technology Review, and to hear public comments. Staff will consider public comments in revising the findings and recommendations and present an informational update to the Board in April 2022.

Appendix A – Statute Providing Authority

Senate Bill 454 (Statutes of 2013, Corbett, HSC Div 26, Part 5, Chapter 8.7)

SECTION 1.

The Legislature finds and declares all of the following:

- (a) California is the nation’s largest market for cars and light-duty trucks.
- (b) The transportation sector is the biggest contributor to California’s greenhouse gas emissions and accounts for approximately 40 percent of these emissions.
- (c) California should encourage the development and success of zero-emission vehicles to protect the environment, stimulate economic growth, and improve the quality of life in the state.
- (d) California should encourage and support the development of infrastructure for open and accessible public charging stations.
- (e) In order to reach the goal of 1.5 million electric drive vehicles in California by 2025, electric vehicle (EV) consumers need confidence that they can access a robust network of publicly available EV charging stations. Any EV driver should be able to access any publicly available EV charging station, regardless of the system provider.
- (f) EV consumers and drivers need to be able to find the stations and know how much they cost.
- (g) It is the intent of the Legislature to (1) promote a positive driving experience by assisting in the widespread deployment of electric vehicles, (2) not limit the ability of a property owner or lessee of publicly available parking spaces, as defined in Section 44268, to restrict use of or access to those parking spaces to its customers, and (3) facilitate expanded EV driver access to electric vehicle charging stations in public places.

SEC. 2.

Chapter 8.7 (commencing with Section 44268) is added to Part 5 of Division 26 of the Health and Safety Code, to read:

CHAPTER 8.7. Electric Vehicle Charging Stations Open Access Act 44268.

As used in this chapter, the following terms have the following meanings:

- (a) “Battery” means an electrochemical energy storage system powered directly by electrical current.
- (b) “Electric vehicle” means a vehicle that uses a plug-in battery to provide all or part of the motive power of the vehicle, including battery electric, plug-in hybrid electric, or plug-in fuel cell vehicle.
- (c) “Electric vehicle charging station” means one or more publicly available parking spaces served by electric vehicle service equipment.
- (d) “Electric vehicle service equipment” means an electric component assembly or cluster of component assemblies designed specifically to charge batteries within electric vehicles by permitting the transfer of electric energy to a battery or other storage device in an electric vehicle.

(e) “Interoperability billing standards” means the ability for a member of one electric charging station billing network to use another billing network.

(f) “Network roaming” means the act of a member of one electric vehicle charging station billing network using a charging station that is outside of the member’s billing network with his or her billing network account information.

(g) “Publicly available parking space” means a parking space that has been designated by a property owner or lessee to be available to, and accessible by, the public and may include on-street parking spaces and parking spaces in surface lots or parking garages. “Publicly available parking space” shall not include a parking space that is part of, or associated with, a private residence, a parking space that is reserved for the exclusive use of an individual driver or vehicle or for a group of drivers or vehicles, such as employees, tenants, visitors, residents of a common interest development, or residents of an adjacent building, or a parking space provided by a producer of electric vehicles as a service. Nothing in this article limits the ability of an owner or lessee of a publicly available parking space whose primary business is other than electric vehicle charging from restricting use of the parking space, such as limiting use to customers and visitors of the business.

44268.2.

(a) (1) Persons desiring to use an electric vehicle charging station that requires payment of a fee shall not be required to pay a subscription fee in order to use the station, and shall not be required to obtain membership in any club, association, or organization as a condition of using the station. The total actual charges for the use of an electric vehicle charging station, including any additional network roaming charges for nonmembers, shall be disclosed to the public at the point of sale. An electric vehicle charging station that requires payment of a fee shall allow a person desiring to use the station to pay via credit card or mobile technology, or both.

(2) Notwithstanding paragraph (1), an electric vehicle charging station may offer services on a subscription- or membership-only basis provided those electric vehicle charging stations allow nonsubscribers or nonmembers the ability to use the electric vehicle charging station through the payment options detailed in paragraph (1).

(b) The service provider of electric vehicle service equipment at an electric vehicle charging station or its designee shall disclose to the National Renewable Energy Laboratory the electric vehicle charging station’s geographic location, a schedule of fees , accepted methods of payment, and the amount of network roaming charges for nonmembers, if any.

(c) Electric vehicle charging stations shall be labeled in accordance with Part 309 of Title 16 of the Code of Federal Regulations, and, where commercially reasonable and feasible, may be clearly marked with appropriate directional signage in the parking area or facility where they are located.

(d) If no interoperability billing standards have been adopted by a national standards organization by January 1, 2015, the state board may adopt interoperability billing standards for network roaming payment methods for electric vehicle charging stations. If the state board adopts interoperability billing standards, all electric vehicle charging stations that require payment shall meet those standards within one year. Any standards adopted by the state board shall consider other governmental or industry-developed interoperability billing standards and may adopt interoperability billing standards promulgated by an outside authoritative body.

Appendix B – Final Regulation

FINAL REGULATION ORDER

Adopt new sections 2360, 2360.1, 2360.2, 2360.3, 2360.4 and 2360.5 in new Chapter 8.3 of Division 3, Title 13, California Code of Regulations, to read as follows:

Chapter 8.3. Electric Vehicle Supply Equipment Standards

§ 2360. Applicability.

(a) This chapter applies to all Electric Vehicle Service Providers (EVSPs) operating one or more publicly available Level 2 or Direct Current Fast Charger (DCFC) Electric Vehicle Supply Equipment (EVSE) installed in California. If an EVSP also operates EVSE that are not publicly available, the requirements of this chapter apply only to that EVSP's publicly available Level 2 or DCFC EVSE installed in California.

(b) For the purposes of this chapter, the following definitions shall apply:

"Charging session" means an event starting when a user or a vehicle initiates a refueling event and stops when a user or a vehicle ends a refueling event.

"Clearly marked" means a sign, sticker, plaque or any other visible marker that is readable and indicates if the EVSE is available for private or public use.

"Common interest development" means a residential community apartment project, a residential condominium project, a residential planned development, or a residential stock cooperative.

"Direct Current Fast Charger (DCFC or DCFC EVSE)" means an EVSE capable of supplying direct current (DC) electricity to a vehicle fitted with the appropriate connection to support refueling the vehicle's energy storage battery.

"Electric Vehicle Service Provider (EVSP)" means the entity responsible for operating one or more networked or non-networked EVSE. Operating includes, but is not limited to, sending commands or messages to a networked EVSE; receiving commands or messages from a networked EVSE; or providing billing, maintenance, reservations, or other services to a non-networked or networked EVSE. An EVSP may designate another entity to act as the EVSP for purposes of this chapter.

"Electric Vehicle Supply Equipment (EVSE)" means the unit controlling the power supply to one or more vehicles during a charging session.

"Installed" means the date the EVSE is first available for use by the public for a charging session.

"Kiosk" means a standalone physical unit that allows users to pay for and start a charging session at one or more EVSE located at the same site as the kiosk.

"Level 2 Electric Vehicle Supply Equipment (Level 2 EVSE)" means an EVSE capable of supplying 208 to 240 Volt alternating current (AC), single phase electricity to a vehicle fitted

with an on-board charger that can accept and convert that AC electricity into DC electricity to refuel the vehicle's energy storage battery.

"Mobile payment device" means hardware that enables a driver to complete a payment from a mobile phone via contactless payment.

"Networked Electric Vehicle Supply Equipment (Networked EVSE)" means an EVSE capable of receiving and sending commands or messages remotely from an EVSP.

"Non-networked Electric Vehicle Supply Equipment (Non-networked EVSE)" means an EVSE incapable of receiving and sending commands or messages remotely from an EVSP.

"Payment Card Industry Data Security Standard Level 1 (PCI-DSS Level 1)" means payment card information data security standards consistent with "Payment Card Industry (PCI) Data Security Standard - Requirements and Security Assessment Procedures" published by PCI Security Standards Council (Version 3.2.1, May 2018), which is incorporated by reference herein.

"Publicly available Electric Vehicle Supply Equipment (publicly available EVSE, publicly available DCFC EVSE, or publicly available Level 2 EVSE)" means an EVSE and associated parking space or spaces designated by a property owner or lessee to be available to, and accessible by, the public for any period of time. An EVSE designated by a lessee or a property owner to be available only to customers or visitors of the business is a publicly available EVSE for purposes of this chapter. EVSE and associated parking spaces located in parking garages or gated facilities are considered publicly available for purposes of this chapter if any member of the public can obtain vehicular access to the facility for free or through payment of a fee. If an EVSE and associated parking space is made available to the public for only limited time periods, that EVSE and associated parking space is considered a publicly available EVSE during those limited time periods only, and must comply with this chapter during those limited time periods.

A publicly available EVSE does not include:

- (i) A workplace EVSE and its associated parking space if it is clearly marked and operated as available exclusively to employees or contracted drivers. For the purposes of this chapter, "contracted drivers" includes participating drivers, as that term is defined in Public Utilities Code section 5431, regardless of the physical accessibility of the EVSE to the public;
- (ii) An EVSE and associated parking spaces reserved exclusively to residents, tenants, visitors, or employees of a private residence or common interest development; or a residential building adjacent to a private residence; or
- (iii) An EVSE provided by a manufacturer of electric vehicles for the exclusive use by vehicles it manufactures.

"Radio-Frequency Identification (RFID) card" means a card that communicates with a reader through radio-frequency electromagnetic fields and is capable of transmitting payment information.

“Replaced” means that the EVSE has been substantially modified or substituted with another unit, as indicated by a change in the serial number, EVSE ID or the model name of the EVSE.

“Service provider application” means a mobile phone downloadable software package that connects users to an EVSP and enables users to begin, end, and pay for charging sessions.

“Station ID” means the physical site, typically identified by a street address, at which one or more EVSE are located.

NOTE: Authority cited: Sections 39600, 39601 and 44268.2, Health and Safety Code.

Reference: Sections 44268 and 44268.2, Health and Safety Code.

§ 2360.1. Requirements for Labeling Electric Vehicle Supply Equipment.

(a) Applicability. The requirements of this section apply to all EVSPs operating one or more publicly available Level 2 or DCFC EVSE installed in California.

(b) DCFC EVSE labeling deadline. By January 1, 2022, the EVSP shall install and maintain, for each publicly available DCFC EVSE that is operated by the EVSP, a label that complies with 16 CFR Part 309, Subpart B – Requirements for Alternative Fuels, Subject group 31 § 309.17 a(3) (as amended April 23, 2013).

(c) Level 2 EVSE labeling deadline. By July 1, 2023, the EVSP shall install and maintain, for each publicly available Level 2 EVSE that is operated by the EVSP, a label that complies with 16 CFR Part 309, Subpart B – Requirements for Alternative Fuels, Subject group 31 § 309.17 a(3) (as amended April 23, 2013).

(d) At a minimum, if the EVSE requires payment for use, the EVSP shall disclose to the user the following information at the point of sale, if applicable:

(1) A fee for use of the parking space.

(2) A nonmember plug-in fee from the EVSP.

(3) Price to refuel in U.S. dollars per kilowatt-hour or megajoule.

(4) Any potential changes in the price to refuel, in U.S. dollars per kilowatt-hour or megajoule, due to variable pricing. This may be specified as a range of prices, in U.S. dollars per kilowatt-hour or megajoule.

(5) Any other fees charged for a refueling session.

NOTE: Authority cited: Sections 39600, 39601 and 44268.2, Health and Safety Code.

Reference: Sections 44268 and 44268.2, Health and Safety Code.

§ 2360.2. Payment Method Requirements for Electric Vehicle Supply Equipment.

(a) Applicability. The requirements of this section apply to publicly available EVSE installed in California that require payment.

(b) The EVSP shall ensure that each EVSE subject to this section that it operates complies with the requirements of this section.

(c) Compliance deadlines.

(1) DCFC EVSE compliance deadline. A DCFC EVSE installed on or after January 1, 2022, shall comply with the requirements of this section. A DCFC EVSE installed prior to January 1, 2022, shall comply with the requirements of this section when the EVSE is replaced but in no case later than July 1, 2033.

(2) Level 2 EVSE compliance deadline. A Level 2 EVSE installed on or after July 1, 2023, shall comply with the requirements of this section. A Level 2 EVSE installed prior to July 1, 2023, shall comply with the requirements of this section when the EVSE is replaced but in no case later than July 1, 2033.

(d) All EVSE subject to this section shall have a credit card reader device physically located on either the EVSE unit or a kiosk used to service that EVSE. The credit card reader device shall comply with all of the following requirements:

(1) The credit card reader device shall accept, at a minimum, the Euro MasterCard Visa (EMV) chip and, at a minimum, one of the following credit card types: Visa, MasterCard, or American Express.

(2) The credit card reader device shall be non-locking and shall always permit customers to remove their credit card without damage to the card, including during a fault situation or power failure.

(3) The credit card reader device shall comply with PCI – DSS Level 1.

(e) All EVSE subject to this section shall have a mobile payment device physically located on the EVSE or kiosk used to service that EVSE.

(f) The EVSP shall provide and display a toll-free number on each EVSE or kiosk used to service that EVSE that provides the user with the option to initiate a charging session and submit payment at any time that the EVSE is operational and publicly available.

(g) The EVSP shall not require a subscription or membership in order to initiate a charging session for an EVSE subject to this section.

NOTE: Authority cited: Sections 39600, 39601 and 44268.2, Health and Safety Code.

Reference: Sections 44268 and 44268.2, Health and Safety Code.

§ 2360.3. Facilitating Roaming Agreements.

(a) Applicability. This section applies to ESVPs operating one or more networked EVSE installed in California.

(b) No later than July 1, 2021, the EVSP shall meet, at a minimum, and maintain the "California Open Charge Point Interface Interim Test Procedures for Networked Electric Vehicle Supply Equipment for Level 2 and Direct Current Fast Charge Classes," adopted April 15, 2020, and incorporated by reference herein, for each applicable EVSE. This does not preclude the additional use of other communication protocols.

NOTE: Authority cited: Sections 39600, 39601 and 44268.2, Health and Safety Code.

Reference: Sections 44268 and 44268.2, Health and Safety Code.

§ 2360.4. Reporting for Electric Vehicle Service Providers.

(a) Applicability. The requirements of this section apply to all EVSPs operating or intending to operate one or more publicly available Level 2 or DCFC EVSE installed in California.

(b) Initial reporting deadline for existing EVSPs. No later than August 15, 2020, the EVSP shall collect and submit the following information to the Executive Officer:

(1) Initial EVSP contact information as specified in subsection (g).

(2) An EVSE model certification, as specified in subsection (h), for each EVSE model operated in California.

(3) EVSE inventory as specified in subsection (i). For this initial inventory report, the EVSP may omit information that it has not collected in the past if that information could not be reasonably obtained within the past 45 days.

(c) Initial reporting deadline for new EVSPs. If an EVSP intends to operate one or more publicly available Level 2 or DCFC EVSE installed in California on or after July 1, 2020, then that EVSP shall collect and submit the following information to the Executive Officer at least 45 days before installation of any EVSE in California:

(1) Initial contact information as specified in subsection (g).

(2) An EVSE model certification, as specified in subsection (h), for each EVSE model that the EVSP intends to install in California within the next 45 days.

(d) Reporting deadline for new EVSE models. If an EVSP intends to operate a new, unique EVSE model in California on or after July 1, 2020, then that EVSP shall collect and submit initial contact information to the Executive Officer as specified in subsection (g) at least 45 days prior to installation of that EVSE model in California.

(e) Annual reporting deadline for all EVSPs. On or before March 1 of each year, the designated contact for the EVSP shall collect and submit to the Executive Officer annual EVSE inventory information for the prior calendar year, as specified in subsection (i). If the EVSP operates one or more EVSE that require payment for use, the designated contact for the EVSP shall also collect and submit to the Executive Officer annual EVSE payment information for the prior

calendar year, as specified in subsection (j). The first annual report is due March 1, 2022. For example, an EVSP must submit information no later than March 1, 2022, for EVSE that it operated between January 1, 2021, and December 31, 2021.

(f) Information updates. Any EVSP reporting under this subsection shall update its initial contact information and EVSE model certification within 45 days of any changes to that information.

(g) Initial EVSP contact information. The initial EVSP contact information reported by the EVSP shall include all of the following information:

- (1) EVSP company name.
- (2) Website for EVSP.
- (3) Name of designated contact person.
- (4) Email of designated contact person.
- (5) Phone number of designated contact person.
- (6) Mailing address of designated contact person.

(h) EVSE model certification. The EVSE model certification reported by the EVSP shall include all of the following information, for each EVSE model:

- (1) Manufacturer name and model number.
- (2) Type of EVSE (Level 2 or DCFC EVSE).
- (3) Nominal voltage, current supported (amps), power supported (kilowatts).
- (4) Number of ports.
- (5) Number of connectors and connector standard.
- (6) Type of payment devices installed.
- (7) Manufacturer website.
- (8) EVSP toll-free number or numbers displayed on the EVSE model.
- (9) EVSE model photos: front, back, payment hardware, fee display (if display is multiple pages, include photos of complete information).
- (10) Kiosk model photos: front, back, payment hardware, fee display (if display is multiple pages, include photos of complete information), if applicable.

(i) Annual EVSE inventory. The annual EVSE inventory report filed by the EVSP shall include all of the following information, broken down per publicly available EVSE operated by the EVSP in California:

- (1) New EVSE installations in California in the reporting period:
 - (A) Station ID.

- (B) Station Name.
 - (C) EVSE ID or serial number.
 - (D) Station Address.
 - (E) Geographic coordinates of the station (e.g., Latitude: 50.770774, Longitude: -126.104965).
 - (F) Model of EVSE.
- (2) Listing of retired, decommissioned, or removed EVSE in California during the reporting period:
- (A) Station ID.
 - (B) Station Name.
 - (C) EVSE ID or serial number.
 - (D) Station Address.
 - (E) Geographic coordinates of the station (e.g., Latitude: 50.770774, Longitude: -126.104965).
 - (F) Model of EVSE.
- (j) Annual EVSE payment information for EVSE installed in California that require payment. The annual EVSE payment report filed by the EVSP shall include all of the following information, reported in statewide aggregated numbers:
- (1) Total number of charging sessions started with a credit card.
 - (2) Total number of charging sessions started with a mobile payment.
 - (3) Total number of charging sessions started with a toll-free number.
 - (4) Total number of charging sessions started with a membership RFID card.
 - (5) Total number of charging sessions started with a service provider application.
 - (6) Total number of charging sessions with other methods of payment, including sessions that did not require payment.
- (k) Reporting to the National Renewable Energy Laboratory (NREL) Alternative Fuels Data Center (AFDC):
- (1) No later than six months after July 1, 2020, and thereafter at least once per month if there are any changes, each EVSP shall report to NREL in accordance with this subsection.
 - (2) For any EVSE decommissioned since the last report, the EVSP shall report the date the EVSE was decommissioned. For any EVSE no longer operated by the EVSP since the last report, the EVSP shall report the date the EVSP ceased operating the EVSE.
 - (3) The EVSP shall ensure that its data reported to NREL matches corresponding data reported to the Executive Officer in its annual EVSE inventory and usage information report.

(4) The data reported by the EVSP shall include all of the following, broken down per publicly available EVSE operated by the EVSP in California:

(A) Station ID.

(B) Station Name.

(C) Phone number to call if a user has problems at the station.

(D) Access type (e.g., private, private – government only, private – residential, public, public – limited hours, public – call-ahead, public – card key at all times, public – credit card at all times (no membership requirement)).

(E) Access Days/Times – hours of public operation for the station.

(F) Station Type – Primary customer the station is intended to serve (e.g., multi-unit dwelling, workplace, fleet, transportation network company, public).

(G) Payment Methods – list of payment methods accepted at the station.

(H) Payment Actions – list of how a user pays with their payment method at the station.

(I) Geographic coordinates of the station (e.g., Latitude: 50.770774, Longitude: -126.104965).

(J) Network – the EVSP (EVSP) of the station.

(K) Pricing information (e.g., \$/kWh (kilowatt-hour), \$/MJ (megajoule), demand response, variable, non-member fee, parking fee).

(L) Open Date – date station was first in service.

(M) Address – Country, State, Postal Code, City, Street Address, Directions.

(N) EVSE ID – a unique identifier for the EVSE within the network provided by the EVSP.

(O) Geographic coordinates of the EVSE (e.g., Latitude: 50.770774, Longitude: -126.104965).

(P) Manufacturer of EVSE.

(Q) Model of EVSE.

(R) Serial Number of EVSE.

(S) Power Sharing capabilities of EVSE - if this EVSE has multiple ports does it distribute power among all ports in use.

(T) Port ID – a unique identifier for each port, unique within the context of the EVSP servicing the EVSE.

(U) Level – classification of the port which indicates the rate of the battery refuel (e.g., AC Level 2 (3.3kW – 22kW), DC Fast (23kW+)).

(V) Connectors – connector types available at the EVSE to connect to the vehicle (e.g., SAE J1772, J1772 Combo, CHAdeMO).

(l) Confidential business information. If the EVSP believes any information required to be reported under this section is confidential business information, the EVSP shall prominently label the specific information considered to be confidential, and shall include an explanation for why the EVSP believes the identified information is confidential. All documents (including spreadsheets and other items not in a standard document format) designated as containing confidential business information also must prominently display the phrase

“Contains Confidential Business Information” above the main document title and in a running header. All information reported and not identified as confidential business information is subject to public disclosure pursuant to California Code of Regulations, title 17, sections 91000 through 91022, and the California Public Records Act (Gov. Code, § 6250 et seq.). The Board may also disclose information claimed by the applicant to be confidential as required by law.

(m) The EVSP shall submit the initial EVSP contact information, EVSE model certification, annual EVSE inventory and usage information, as well as any subsequent updates to that information, electronically via email to EVSE@arb.ca.gov, unless the Executive Officer has approved in writing another format.

NOTE: Authority cited: Sections 39600, 39601 and 44268.2, Health and Safety Code.

Reference: Sections 44268 and 44268.2, Health and Safety Code.

§ 2360.5. Civil Penalty Schedule.

(a) An EVSP cited for any violation of section 2360.1 is subject to a \$300 penalty if the EVSP submits a demonstration of correction and pays the assessed penalty within 45 days of personal or certified mail receipt of the citation.

(b) An EVSP cited for any violation of section 2360.2 is subject to a \$600 penalty if the EVSP submits a demonstration of correction and pays the assessed penalty within 45 days of personal or certified mail receipt of the citation.

(c) An EVSP cited for any violation of section 2360.4 is subject to a \$600 penalty if the EVSP submits a demonstration of correction and pays the assessed penalty within 45 days of personal or certified mail receipt of the citation.

(d) An EVSP cited for any violation of section 2360.3 is subject to a \$1,000 penalty if the EVSP submits a demonstration of correction and pays the assessed penalty within 45 days of personal or certified mail receipt of the citation.

(e) If an EVSP cited for any violation of this chapter fails to correct the cited violation within 45 days of personal or certified mail receipt of the citation, that EVSP is subject to an additional penalty of \$1,000 per 45-day period that elapses before the cited violation is corrected, up to a maximum of \$37,500.

(f) The penalties in this section apply per EVSE or per kiosk, as applicable.

(g) The Executive Officer shall annually adjust all penalties specified in this section for inflation based on the California Consumer Price Index, beginning July 1, 2021.

NOTE: Authority cited: Sections 39600, 39601 and 44268.2, Health and Safety Code.

Reference: Sections 43016, 44268 and 44268.2, Health and Safety Code.

Appendix C – Survey for Drivers

Background: The California Air Resources Board (CARB) is seeking information from current and potential users of EV chargers or electric vehicle supply equipment (EVSE), regarding methods of payment at EVSE and convenience in the use of the public infrastructure. CARB established requirements in 2019 for publicly available chargers in the state to ensure new EVSE with at least two forms of payment a credit card “chip” reader and mobile payment “tap” technology. This regulation was established in response to a state law passed directing CARB to do so.

CARB staff has committed to conducting a Technology Review of the current credit card technology choices in the U.S. market. The goal of this technology review is to continue ensuring that all users of the system have access to charging services – an ever more important goal as vehicle electrification continues. One of the issues involved is reviewing how to address the “chip” reader requirements over time as “tap” options expand in credit, debit, and mobile payment systems. But we of course need to think broadly: The current requirements that are in effect were established with a principle that multiple, widely available, payment options are important to maximize access to EVSE by the wide range of EV drivers California is targeting. Indeed, we know that some Californians – including those without ready access to banks or credit – may benefit from further support, and are therefore looking closely at a range of potential needs. Before CARB can consider if any changes are needed to the existing regulation, staff need data and information about the market availability of credit card technology choices and how frequently they are used. Specifically, CARB needs to learn how frequently “chip” payment systems are used so staff can determine if the requirement for that system is still needed to ensure access to chargers.

Robust answers to the questions below will help CARB staff complete the Technology Review. We request that you complete any of the questions that apply to you by Monday Dec 10, 2021.

1. Do you drive a plug-in electric vehicle (PEV, not a hybrid) (i.e. my vehicle has an electrical plug for charging)?
 - a. Yes
 - b. No
2. What is the brand of vehicle do you drive?
3. If you have driven a PEV, have you ever had to charge in public?
 - a. Yes
 - b. No
 - c. If YES: How often do you charge in public?
 - i. Once a week
 - ii. At least twice a week
 - iii. Once a month
 - iv. Every few months
 - v. Have only used a public charger once or a couple times

4. When you received your vehicle did it come with any charging network memberships?
 - a. Yes
 - b. No
 - c. If yes: What is the name of the charging network membership? (Select all that apply)
 - i. Blink
 - ii. ChargePoint
 - iii. Electrify America
 - iv. EVgo
 - v. Flo
 - vi. Greenlots
 - vii. SemaConnect
 - viii. Tesla
 - ix. Other
 - d. Was 'free charging' included in the memberships?
 - i. Yes
 - ii. No
 - e. If so, how long was charging free?
5. Have you created a membership by establishing an account with an charging network in order to access a public charging station? (Membership means establishing a username/email with a password to access an charging network)
 - a. Yes
 - b. No
 - c. If yes, how many accounts do you have?
 - i. 1
 - ii. 2 to 5
 - iii. More than 5
6. What was the primary reason why you created a membership with a charging network?
 - a. It was the only way to access the charging station
 - b. My vehicle came with free charging
 - c. I was driving out of my home area and needed to prep for public charging
 - d. I couldn't get ahold of someone from the 1-800 number
 - e. No on-site credit card payment available
 - f. other
7. If you created a membership for a charging network, were you required to input payment card information?
 - a. Yes
 - b. No
8. Have you ever had to contact customer service to initiate a charging event?
 - a. Yes
 - b. no
9. Why did you have to contact customer service?
 - a. Charger is not working
 - b. Not a member of the network
 - c. No way to pay with card on charger
 - d. Insufficient cell service to download mobile app

- e. Connector was broken
 - f. Charger shut off during charging session
 - g. Other [Fill in the blank]
10. What barriers to charging in public have you experienced? (Select all that apply)
- a. Didn't want to sign up for another account
 - b. The charging stations are always down
 - c. Issues with the station accepting my payment
 - d. Too complicated
 - e. Too expensive
 - f. Don't know where the nearest charger is/how to find the nearest charger
 - g. Other: [fill in]
11. Do you have any tap-enabled (show symbol) payment cards?
- a. If so, how many?
 - i. 1
 - ii. 2-5
 - iii. More than 5
12. When you use a credit card (for any type of transaction), roughly what percentage of the time do you pay by tap, as opposed to swipe or inserting your chip card?
13. Do you have any non-tap enabled payment cards?
- a. If so how many?
 - i. 1
 - ii. 2-5
 - iii. >5
14. Do you have a smartphone?
- a. Yes
 - i. Does this smartphone enable contactless payments?
 - b. No
15. What is your yearly household income?
- a. Less than \$20,000
 - b. \$20,000 to \$34,999
 - c. \$35,000 to \$49,999
 - d. \$50,000 to \$74,999
 - e. \$75,000 to \$99,999
 - f. \$100,000 to \$149,999
 - g. \$150,000 or more
16. What type of housing do you live in?
- a. Single-family home (rented)
 - b. Single-family home (owned)
 - c. Multi-dwelling (apartment complex)
 - d. other (please specify)
17. What State do you live in?

Appendix D – Survey for Credit and Banking Organizations

Background: The California Air Resources Board (CARB) is seeking information from experts of payment card deployment regarding the state of tap and EMV chip technology deployment for users. In response to legislation to ensure open access for all, CARB established requirements in 2019 for publicly available chargers in the state to ensure new EVSE with at least two forms of payment a credit card “chip” reader and mobile payment “tap” technology.

CARB staff has committed to conducting a Technology Review of the current credit card technology choices in the U.S. market. The goal of this technology review is to continue ensuring that all users of the system have access to charging services – an ever more important goal as vehicle electrification continues. One of the issues involved is reviewing how to address the “chip” reader requirements over time as “tap” options expand in credit, debit, and mobile payment systems. But we of course need to think broadly: The current requirements that are in effect were established with a principle that multiple, widely available, payment options are important to maximize access to EVSE by the wide range of EV drivers California is targeting. Indeed, we know that some Californians – including those without ready access to banks or credit – may benefit from further support, and are therefore looking closely at a range of potential needs. Before CARB can consider if any changes are needed to the existing regulation, staff need data and information about the market availability of credit card technology choices and how frequently they are used.

Robust answers to the questions below will help CARB staff complete the Technology Review. We request that you complete any of the questions that apply to you by Monday Dec 10, 2021.

1. What is the percentage of valid cards in California that are credit, debit, pre-paid cards and cards issued from peer-to-peer apps (Venmo, CashApp, Zelle, etc)?
2. Are there differences related to card technology between a pre-paid card (i.e., gift card purchase) and a pre-loaded card (i.e., that some employers issue as a pay check)?
3. How many cards are currently valid in California that are EMV only?
4. How many cards are currently valid in California that are EMV and tap?
5. What is the date you expect 100% of customers have in hand a tap enabled debit card?
6. What is the date you expect 100% of customers have in hand a tap enabled credit card?
7. What is the date you expect 100% of customers have in hand to tap enabled pre-paid cards?
8. What, if any, barriers exist to deploying tap more quickly?
9. How many total cards are issued in California annually? (please break down into credit, debit, pre-paid and peer-to-peer categories)
10. Describe, if any, the differences in the payment tokenization process between EMV chip and tap hardware and card, or any other differences in security risk between the payment technologies.

Appendix E – Survey for EVSPs

Background: The California Air Resources Board (CARB) is seeking information from the electric vehicle supply equipment (EVSE) industry and EVSE users regarding how drivers pay for a charging session and how often the EVSE is not operable for drivers to access. In response to legislation to ensure open access for all, CARB established requirements in 2019 for publicly available chargers in the state to ensure new EVSE is installed with at least two forms of payment; a credit card “chip” reader and mobile payment “tap” technology.

CARB staff has committed to conducting a Technology Review of the current credit card technology choices in the U.S. market. The goal of this technology review is to continue ensuring that all users of the system have access to charging services – an ever more important goal as vehicle electrification continues. One of the issues involved is reviewing how to address the “chip” reader requirements over time as “tap” options expand in credit, debit, and mobile payment systems. But we of course need to think broadly: The current requirements that are in effect were established with a principle that multiple, widely available, payment options are important to maximize access to EVSE by the wide range of EV drivers California is targeting. Indeed, we know that some Californians – including those without ready access to banks or credit – may benefit from further support, and are therefore looking closely at a range of potential needs. Before CARB can consider if any changes are needed to the existing regulation, staff need data and information about the market availability of credit card technology choices and how frequently they are used.

Robust answers to the questions below will help CARB staff complete the Technology Review. We request that you complete any of the questions that apply to you by Monday Dec 10, 2021.

1. What methods of payment do you offer for un-banked drivers?
2. What is the status of the announced roaming agreements with other EVSPs? Are there any fees passed to the driver that is associated with the roaming agreement? If so, what are they and how are they assessed? (Status can be defined in the following categories: announced, in-process, and implemented. All categories must have dates of anticipated full implementation)
3. What payment mechanisms do you offer at your Level 2 EVSE?
 - a. 1-800
 - b. EMV chip
 - c. “NFC” options
 - i. NFC credit card
 - ii. NFC of mobile phone (apple/google pay)
 - iii. EVSP RFID card
 - d. EVSP Mobile app (remote start from phone)
 - e. Cash
 - f. Mag swipe of credit card
 - g. Plug-N-Charge
 - h. [fill in any other]

4. What payment mechanisms do you offer at your DCFC EVSE?
 - a. 1-800
 - b. EMV chip
 - c. "NFC" options
 - i. NFC credit card
 - ii. NFC of mobile phone (apple/google pay)
 - iii. EVSP RFID card
 - d. EVSP Mobile app (remote start from phone)
 - e. Cash
 - f. Mag Swipe of credit card
 - g. Plug-N-Charge
 - h. [fill in any other]
5. If one of those payment mechanisms is inoperable, are the other mechanisms still available, or does the whole unit not work?
6. At EVSE that has both an EMV chip and NFC payment option, what proportion of users select to use the EMV chip vs. the NFC option?
7. At EVSE that has a credit card option (EMV chip and/or NFC) and can be started remotely through the network app, what portion of users select to use the credit card option versus the mobile app?
8. What fees are associated with individual transactions for the different payment methods you offer at your EVSE? (i.e., what is the cost of a credit card transaction)
 - a. Visa
 - b. MasterCard
 - c. AMEX
 - d. [fill in any other]
9. Since January 1, 2020, what percentage of your customers have had to contact customer service in order to initiate a charging event? What are the top three reasons why customers had to contact customer service?
10. What percentage of your public stations were inoperable over the course of a 7-day period?
11. What is the average response time to repair an inoperable charging station?