A. INTRODUCTION

Mobile sources are a significant contributor to emissions of criteria pollutants and greenhouse gases (GHG) in California, accounting for well over 80 percent of ozone precursor emissions and approximately 40 percent of statewide GHG emissions. Zero emission vehicles (ZEV) and transport modes using zero emission drivetrains help meet California's goals to improve air quality, protect public health, and reduce GHG emissions by displacing internal combustion engine cars, trucks, and other vehicles.

ZEVs include multiple technology types including plug-in electric vehicles (PEV) and fuel cell electric vehicles (FCEV). PEVs plug in to electric sources to charge, while FCEVs utilize hydrogen fuel. The proposed regulation focuses on electric charging stations, known as electric vehicle supply/service equipment (EVSE), therefor focuses on PEVs rather than FCEVs.

PEVs consist of two distinct technology types: plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEV). PHEVs use both an electric range and an internal combustion engine, so rely on both electric charging and gasoline. These vehicles emit lower levels of GHG and criteria pollutants, but are not fully zero emission at the tailpipe. BEVs have a full electric range, and do not rely on any fuels besides electricity.

PEVs require charging which can occur at home using conventional household plugs or upgraded equipment, at private locations such as in a private parking structure, or in public locations. There are three predominate forms of charging for the public to access, Level 1, Level 2 and direct current fast charging (DCFC). Level 1 charging is slowest, using 110V power similar to that of a typical wall outlet.[1] A vehicle with 100 miles of electric range will take around 20 hours to fully charge. Level 2 charging is faster than Level 1 and a vehicle with 100 miles of electric range will take around five hours to fully charge.[2] DCFC is the fastest charging option,[3] a vehicle with a 100 mile range can obtain a full charge in approximately 30 minutes. New DCFCs capable of charging at even faster rates[4,5] are continuing to reduce charging times.

Electric chargers in public locations are sometimes free of charge and sometimes charge for use. A majority of EVSEs that charge for use are operated by one of several private networks which require membership or payment of a subscription fee. In return, members are provided with services that include reserved times for charging, specific EVSE location data, pre-payment or on-site payment options, and fixed prices for electric charging. These EVSEs are not required to allow non-members to charge, provide typical payment options such as credit card readers, or transparently report prices and fees. Thus many public EVSEs are currently

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[1] CALeVIP, 2018. "Electric Vehicle Charging 101: Level 1" https://calevip.org/electric-vehicle-charging-101

[2] CALeVIP, 2018. "Electric Vehicle Charging 101: Level 2" https://calevip.org/electric-vehicle-charging-101

[3] CALeVIP, 2018. "Electric Vehicle Charging 101: DC Fast Charging" https://calevip.org/electric-vehicle-charging-101

[4] Electrify America, 2018. "Our investment plan: Community DC Fast and Level 2 Charging" Access November 14, 2018. https://www.electrifyamerica.com/our-plan

[5] Electrify America, 2018. "Our investment plan: DC Fast EV Charging Along Highway Corridors" Access November 14, 2018. https://www.electrifyamerica.com/our-plan

d. Disclosure of Charging Price and Fees

EVSEs will be required to disclose charging price and fees before the consumer begins fueling. The proposed regulation does not specify the manner in which customers are notified of pricing at EVSEs. EVSPs have been clear that each site may have different atheistic requirements. Therefore the EVSPs have the ability to choose which signage method would be best for each site. This can range from a software upgrade on EVSEs that have digital screens, a simple metal sign or a weatherproof sticker.

Stakeholder feedback estimates the cost, to EVSPs, of disclosing fees using these methods to range from $0 to $100 per EVSE. To be conservative, staff assumes a cost of $100 for each existing and new EVSE. This is a one-time cost incurred when an existing EVSE is retrofit or replaced, or when a new EVSE is installed and is annualized at a rate of 5 percent over the 10 year useful life of the EVSE. Over the lifetime of the regulation, this $100 cost will be incurred by 26,398 EVSEs in the Low PEV scenario, and 209,587 EVSEs in the High PEV scenario.

e. Labeling

The proposed regulation requires that all EVSEs have the CFR Title 16 Part 309 label. No EVSEs currently have this labeling in place. It is assumed existing EVSEs will have the sticker placed upon upgrade or replacement, and new EVSEs will be installed with the sticker. Through stakeholder feedback the cost of each sticker is estimated to be $45. While a service person is required to place the sticker on the EVSE it can be done at a routine maintenance check. Therefore CARB staff did not include the cost of a technician visit. Each existing EVSE that is retrofit or replaced and each new EVSE is assumed to incur this onetime cost. Over the lifetime of the regulation, this $45 cost will be incurred by 26,398 EVSEs in the Low PEV scenario, and 209,587 EVSEs in the High PEV scenario.

f. Reporting

Currently all EVSPs voluntarily report basic station information to NREL. CARB staff has worked with NREL to develop a standardized reporting sheet that all EVSPs will use. The proposed regulation does not require the EVSPs to change their method of data transfer, only what information they transfer to NREL. EVSPs have indicated that the data necessary for reporting is readily available and will easily transfer to the proposed format. Based on stakeholder feedback, CARB staff estimates the costs of NREL reporting to be $0.

2. Total Costs of the Proposed Regulation

The total direct costs for the proposed regulation are calculated on an annual basis using the incremental costs described in Section C1 and the EVSE inventory assumptions in Table 2. The total direct cost estimated here represents the total cost of the proposed regulation including both costs to businesses and fiscal impacts.[77] Figure 2 breaks down the estimated annual compliance costs of the proposed regulation. The majority of compliance costs are expected to come from the credit card and mobile payment technologies. The installation costs

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[77] Fiscal Impacts are also separately described in detail in Section D.

represent EVSEs that are out of compliance with the credit card and signage requirements. Because these units would not have normally turned over these costs are attributed to the proposed regulation.

The proposed regulation will go into effect January 1, 2020 for DCFC and January 1, 2023 for Level 2 EVSEs. Because the DCFC population count is lower than the Level 2 population count, Level 2 EVSEs represent the bulk of the cost incurred by EVSPs and will occur between 2027 and 2030 as indicated in Table 5 and Figure 2.

Table 5- Annual Costs for the Proposed Regulation (Million 2018$)*

Year	Level 2 Costs				DCFC Costs			IO and PCI Compliance Costs	Grand Total
	Level 2 Installation Costs	CC, Mobile, and Signage One-Time Costs	CC and Mobile Recurring Costs	Total	CC, Mobile, and Signage One-Time Costs	CC and Mobile Recurring Costs	Total		
2020	$0.00	$0.00	$0.00	$0.00	$0.03	$0.13	$0.16	$1.65	$1.81
2021	$0.00	$0.00	$0.00	$0.00	$0.06	$0.20	$0.26	$0.81	$1.07
2022	$0.00	$0.00	$0.00	$0.00	$0.07	$0.21	$0.28	$0.81	$1.09
2023	$7.98	$0.80	$3.20	$11.97	$0.13	$0.22	$0.35	$0.81	$13.13
2024	$8.09	$0.94	$3.77	$12.80	$0.14	$0.23	$0.38	$0.81	$13.98
2025	$8.29	$1.11	$4.41	$13.81	$0.15	$0.24	$0.39	$0.81	$15.01
2026	$8.22	$1.27	$5.08	$14.58	$0.17	$0.25	$0.41	$0.81	$15.80
2027	$8.31	$1.46	$5.84	$15.61	$0.17	$0.25	$0.43	$0.81	$16.84
2028	$3.70	$1.52	$6.09	$11.31	$0.21	$0.25	$0.46	$0.81	$12.58
2029	$3.08	$1.59	$6.35	$11.01	$0.21	$0.26	$0.46	$0.81	$12.28
2030	$2.26	$1.63	$6.52	$10.42	$0.18	$0.25	$0.43	$0.81	$11.66
Total	**$49.93**	**$10.33**	**$41.25**	**$101.51**	**$1.51**	**$2.50**	**$4.02**	**$9.72**	**$115.24**

* Includes both cost to businesses and fiscal impacts. While the total direct costs to not exceed $50 million in any given year, the economic impact exceeds $50 million in all years after 2023, as shown in Section E: Macroeconomic Impacts.

Figure 2 - Annual Costs of the Proposed Regulation (Million 2018$)
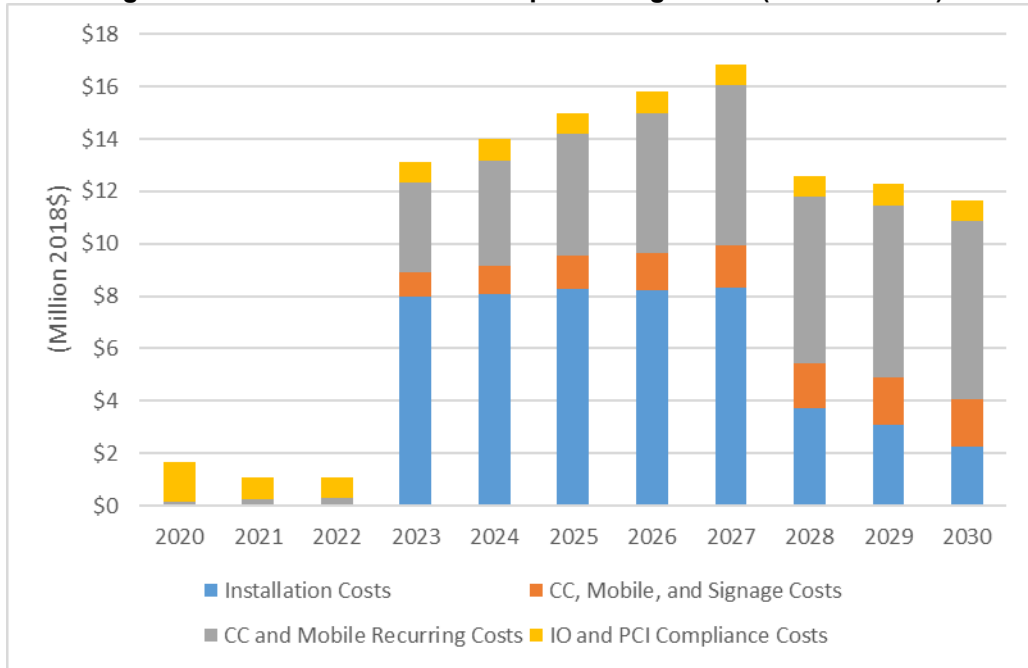
3. Total Costs Sensitivity Scenario

The total compliance costs in the sensitivity scenario are estimated using the incremental costs described in Section C1 and the EVSE inventory projections from Table 3. Figure 3 breaks down the estimated annual costs. Compliance costs in the sensitivity scenario are larger than in the proposed regulation due to the high EVSE population projections. In particular, the Level 2 EVSE population is a critical driver for the total costs, as Level 2 EVSEs are expected to have a high population count compared to DCFCs.

financed, the costs on the regulated community is spread over time, while the benefits to secondary industries are concentrated in the years that services and equipment are needed.

The results of the proposed regulation show a decrease in Output of $119 million in 2030 for the overall California economy, which is small relative baseline, corresponding to a change of less than 0.01 percent (Table 14). At the industry level, changes in Output are all less than 0.1 percent in 2030, except for the Other Electrical Equipment and Component Manufacturing (3359), which sees a decrease in output of about 0.2 percent.

Table 14: Change in California Output Growth by Industry (Proposed Regulation)

|		2020	2022	2024	2026	2028	2030
California Economy	Output (2018M$)	4,423,996	4,655,949	4,890,164	5,134,327	5,401,674	5,690,947
	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	-6	-8	-77	-105	-182	-119
Local Government	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	0	0	-1	-5	-9	-8
Construction (23)	% Change	0.00%	0.00%	0.00%	-0.01%	-0.02%	-0.01%
	Change (2018M$)	-1	-1	-8	-13	-45	-14
Electric power generation, transmission, and distribution (2211)	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	0	0	0	-1	-1	-1
Other Electrical Equipment and Component Manufacturing (3359)	% Change	-0.01%	-0.02%	-0.10%	-0.16%	-0.20%	-0.21%
	Change (2018M$)	0	-1	-6	-10	-13	-14
Other miscellaneous manufacturing (3399)	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	0	0	0	0	0	0
Retail Trade (44-45)	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	-1	-1	-8	-9	-13	-9
Monetary authorities, credit intermediation, and related activities (521, 522)	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	1	1	3	4	3	4
Management, scientific, and technical consulting services (5416)	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	0	0	0	-1	-1	-1
Computer systems design and related services (5415)	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	1	0	0	-1	-1	-1

The results of the sensitivity scenario (Table 15), show industry job impacts that are qualitatively similar to that found in the proposed regulation (Table 14), but of a larger magnitude. A comparison of the annual impacts for both scenarios is illustrate in Figure 5. The results at the industry level show changes of less than 0.1 percent, except for the Other Electrical Equipment and Component Manufacturing industry, which is estimated to have a relatively large decrease in Output of about -0.9 percent. While the trend of impacts on economic output is negative, the year 2023 shows a positive impact due to the increase in demand for construction to replace Level 2 EVSEs that 5 or more years earlier with new fully compliant EVSEs.

Table 15: Change in California Output Growth by Industry (Sensitivity Scenario)

		2020	2022	2024	2026	2028	2030
California Economy	Output (2018M$)	4,423,996	4,655,949	4,890,164	5,134,327	5,401,674	5,690,947
	% Change	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.01%
	Change (2018M$)	-6	-11	-93	-231	-613	-578
Local Government	% Change	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.01%
	Change (2018M$)	0	-1	0	-10	-28	-35
Construction (23)	% Change	0.00%	0.00%	0.01%	-0.01%	-0.07%	-0.04%
	Change (2018M$)	-1	-2	10	-14	-140	-81
Electric power generation, transmission, and distribution (2211)	% Change	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.01%
	Change (2018M$)	0	0	-1	-1	-3	-3
Other Electrical Equipment and Component Manufacturing (3359)	% Change	-0.01%	-0.02%	-0.17%	-0.41%	-0.70%	-0.94%
	Change (2018M$)	-1	-1	-10	-25	-45	-64
Other miscellaneous manufacturing (3399)	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	0	0	0	1	0	0
Retail Trade (44-45)	% Change	0.00%	0.00%	0.00%	-0.01%	-0.02%	-0.01%
	Change (2018M$)	-1	-1	-14	-25	-50	-49
Monetary authorities, credit intermediation, and related activities (521, 522)	% Change	0.00%	0.00%	0.01%	0.02%	0.02%	0.03%
	Change (2018M$)	1	1	10	22	27	38
Management, scientific, and technical consulting services (5416)	% Change	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.01%
	Change (2018M$)	0	0	-1	-1	-3	-3
Computer systems design and related services (5415)	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	1	0	-1	-2	-4	-5

Figure 5: Annual Changes in Economic Output by Scenario
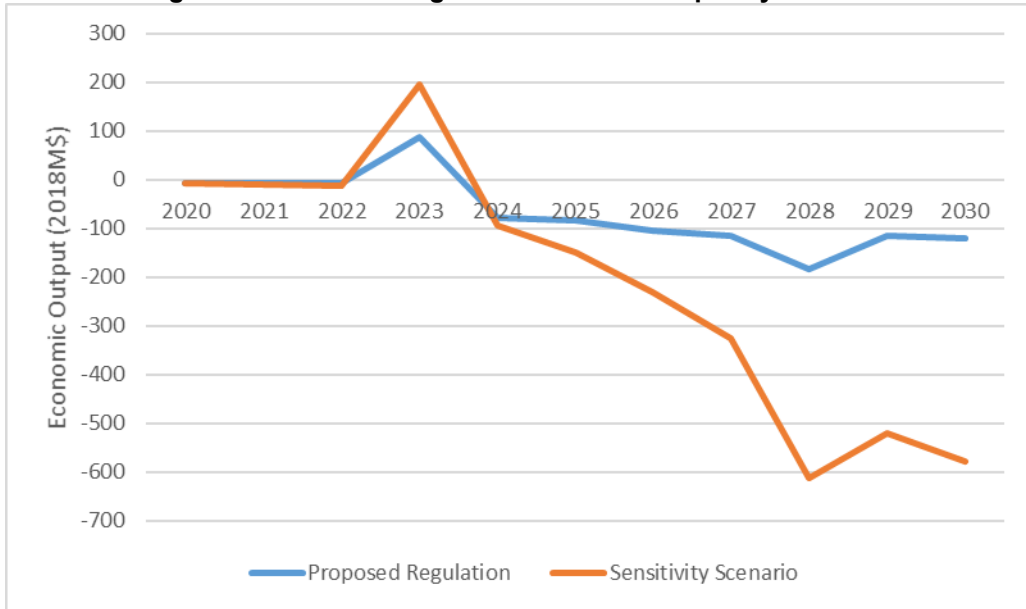
c. Impacts on Investments in California

Private domestic investment consists of purchases of residential and nonresidential structures and of equipment and software by private businesses and nonprofit institutions. It is used as a proxy for impacts on investments in California because it provides an indicator of the future productive capacity of the economy. Table 16 and Table 17 present the gross private domestic investment level in California under the prosed regulation relative for both the proposed regulation and sensitivity scenario.

The relative changes to growth in private investment for the proposed regulation (Table 16) show a decrease of about $19 million in 2030, or about 0.01 percent of baseline private investment. This slight decrease in private investment growth has a similar trend to that of direct compliance cost (Table 5) and economic output (Table 14).

Table 16: Change in Gross Domestic Private Investment Growth (Proposed Regulation)

	2020	2022	2024	2026	2028	2030
Private Investment (2018B$)	349	369	392	419	445	467
% Change	0.00%	0.00%	0.00%	-0.01%	-0.01%	0.00%
Change (2018M$)	-2	-2	-15	-24	-29	-19

The relative changes to growth in private investment for the sensitivity scenario (Table 17), shows a decrease of about $111 million in 2030, which corresponds to about 0.03 percent of baseline private investment. Trends in this result are similar to those in Table 16.

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Table 17: Change in Gross Domestic Private Investment Growth (Sensitivity Scenario)

	2020	**2022**	**2024**	**2026**	**2028**	**2030**
Private Investment (2018B$)	349	369	392	419	445	467
% Change	0.00%	0.00%	-0.01%	-0.01%	-0.03%	-0.02%
Change (2018M$)	-2	-3	-25	-62	-112	-111

d. Impacts on Individuals in California

The proposed regulation will impose no direct costs on individuals in California. However, the compliance costs incurred by affected businesses will cascade through the economy and be passed-through to some extent to individuals.

One measure of this impact is the change in real personal income. Table 18 and Table 19 show the annual change in real personal income across all individuals in California. In 2030, total personal income growth decreases by about $58 million as a result of the proposed regulation or less than -0.01 percent. The change in personal income estimated here can also be divided by the California population to show the average or per capita impact on personal income. The change in personal income growth is estimated to not exceed $1 per person in any year in the time horizon, which is anticipated to be indiscernible. Under the sensitivity analysis, total personal income growth in California is anticipated to decline by about $304 million in 2030 or -0.01 percent. The decrease in per capita personal income is estimated to not exceed $5 in any year in the time horizon. The estimated changes in personal income for both scenarios follow the trends in compliance cost.

Table 18: Change in Personal Income Growth (Proposed Regulation)

	2020	**2022**	**2024**	**2026**	**2028**	**2030**
Personal Income (2018M$)	2,178,467	2,282,979	2,398,669	2,517,943	2,615,524	2,732,912
% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Change (2018M$)	-5	-5	-56	-58	-84	-58
California Population*	40,639,358	41,321,538	41,994,234	42,655,390	43,304,107	43,938,624
Personal Income per capita (2018$)	55,414	57,142	59,023	60,935	62,283	64,069
% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Change (2018$)	0	0	-1	-1	-1	0

*Population forecast differs slightly from the DOF baseline forecast due to demographic changes estimated by the REMI model as a result of the proposed regulation.

Table 19: Change in Personal Income Growth (Sensitivity Scenario)

	2020	2022	2024	2026	2028	2030
Personal Income (2018M$)	2,178,467	2,282,979	2,398,669	2,517,943	2,615,524	2,732,912
% Change	0.00%	0.00%	0.00%	-0.01%	-0.01%	-0.01%
Change (2018M$)	-6	-7	-97	-158	-315	-304
California Population*	40,639,357	41,321,530	41,994,300	42,655,106	43,302,996	43,936,850
Personal Income per capita (2018$)	55,414	57,142	59,023	60,935	62,283	64,069
% Change	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%
Change (2018$)	0	0	-2	-3	-5	-3

*Population forecast differs slightly from the DOF baseline forecast due to demographic changes estimated by the REMI model as a result of the proposed regulation.

e. Impacts on Gross State Product (GSP)

GSP is the market value of all goods and services produced in California and is one of the primary indicators used to gauge the health of an economy. Under the proposed regulation and sensitivity scenario, GSP growth is anticipated to decline slightly as a result of the increased compliance costs.

Table 20: Change in Gross State Product (Proposed Regulation)

	2020	2022	2024	2026	2028	2030
GSP (2018B$)	2,504	2,595	2,711	2,856	3,002	3,144
% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Change (2018M$)	-3	-5	-46	-62	-106	-69

Table 21: Change in Gross State Product (Sensitivity Scenario)

	2020	2022	2024	2026	2028	2030
GSP (2018B$)	2,504	2,595	2,711	2,856	3,002	3,144
% Change	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.01%
Change (2018M$)	-4	-6	-58	-139	-359	-339

f. Creation or Elimination of Businesses

The REMI model cannot directly estimate the creation or elimination of businesses. Changes in jobs and output for the California economy described above can be used to understand some potential impacts. The overall jobs and output impacts of the proposed regulation are very small relative to the total California economy, representing changes of less than 0.01 percent. However, impacts in some specific sectors are larger as described in previous sections.

A certain reduction in output could indicate elimination of businesses. Conversely, increased output within an industry could signal the potential for additional business creation if existing businesses cannot accommodate all future demand. There is no threshold that identifies the

creation or elimination of a business. Based on the modeling of output growth in the sensitivity scenario (Table 15), the construction industry sees increased output in some years but this output is not sustained so will not likely lead to long term business creation. Electric equipment and component manufacturers are anticipated to see the largest slowing in output growth (Table 15), but the magnitude of this change is relatively small, and it is assumed that some compliance costs could be passed on to site hosts if necessary. For these reasons, there are not anticipated to be any eliminations of businesses as a result of the proposed regulation.

g. Incentives for Innovation

The proposed regulation could provide incentives to improve EVSEs and network operations to reduce compliance costs. The proposed regulation does require specific technology to be used and there will be technology innovation from multiple parties to ensure the hardware and software is properly integrated. Due to the proposed regulation there is anticipated to be growth in the monetary authorities, credit intermediation, and related activities industry, which will provide the credit card reader, mobile payment hardware, and PCI compliance. As EVSPs integrate the proposed interoperable billing standard staff expects innovation to streamline operations and reduce costs.

h. Competitive Advantage or Disadvantage

EVSPs that support networked EVSEs (Level 2 and DCFCs) that require fee for service are subject to the same proposed requirements. Businesses that predominately support Level 2 EVSEs will have a higher per EVSE compliance costs compared to those that primarily support DCFCs. The potential price impacts for Level 2 chargers is estimated to be larger than for DCFCs, however the business models for these charger types are often different. DCFCs are charging-focused, providing a draw to drivers due to their fast charging speeds. Level 2 chargers are slower and less desirable for public charging, but can benefit site hosts who install these chargers. Many site hosts provide Level 2 charging for free in order to attract customers, thus charging revenue is not always a primary goal for Level 2 EVSEs. These varied business models may mitigate some of the impacts of differential compliance costs.

EV owners primarily charge their vehicle within the range of their residence, thus there is anticipated to be little competition for charging services across state lines. Compliance costs for California EVSEs are not anticipated to impact competitiveness with out of state businesses.

6. Summary and Agency Interpretation of the Assessment Results

As analyzed here, CARB estimates the proposed regulation is unlikely to have a significant impact on the California economy. Overall, the change in the growth of jobs, State GDP, and output is projected to be less than 0.01 percent of the baseline. There, however, may be a more sizable impact on the primarily affected industry, Other Electrical and Equipment Manufacturing. The results also show that purchases of payment equipment and infrastructure will have a positive impact output and employment growth for secondary industries that provide these services including Monetary Authorities, Credit Intermediation, and related activities industry.

F. ALTERNATIVES

In addition to the proposed regulation, CARB staff also evaluated two alternatives. CARB staff and stakeholders discussed potential alternatives during both forums and workshops. CARB staff combined stakeholder comments into the alternatives analyzed.

1. Alternative 1

Alternative 1 would require EVSEs to meet all of the requirements of the proposed regulation, but allows seven years for EVSEs to come into compliance instead of five. Requirements for DCFC would go into effect in 2020 with all required to be fully compliant seven years later, and requirements for Level 2 EVSEs would go into effect in 2023 with all required to be fully compliant seven years later. This additional time reduces the number of existing EVSEs that are required to comply, because more equipment would reach the natural end of its useful life with three additional years. In addition, compliance costs would be spread over a longer period reducing the annual impact. This would reduce the compliance costs to industry but would also result in more time consumers would not have open access to public EV charging.

a. Costs

The cost analysis for Alternative 1 uses the same assumptions as the proposed regulation described in Section C5. Under Alternative 1 the number of EVSEs required to comply each year would be different than the proposed regulation, changing the distribution of compliance costs. Table 22 and show the number of Level 2 and DCFC EVSEs that would be required to comply under the proposed regulation and Alternative 1. Alternative 1 delays some compliance requirements which spreads costs more evenly over time, but also reduces the benefits by delaying the number of EVSEs that would be accessible and easy to use.

Table 22 - Compliant EVSEs by Year in the Proposed Regulation and Alternative 1

Year	Proposed Regulation		Alternative 1	
	Total Compliant Public Level 2s	Total Compliant DCFC	Total Compliant Public Level 2s	Total Compliant DCFC
2020	0	767	0	406
2021	0	1,154	0	674
2022	0	1,393	0	973
2023	11,796	2,051	4,389	1,394
2024	13,900	2,138	7,170	1,782
2025	16,286	2,217	14,432	2,217
2026	18,762	2,277	16,398	2,277
2027	21,543	2,317	18,630	2,317
2028	22,456	2,339	20,860	2,339
2029	23,415	2,345	23,415	2,345
2030	24,062	2,336	24,062	2,336

Figure 6 shows the annual costs for Alternative 1 and the proposed regulation. Alternative 1 results in $89 million in total compliance costs over 2020 through 2030, which is 23 percent lower than the proposed regulation.

Figure 6: Comparison of Compliance Cost for the Proposed Regulation vs. Alternative 1
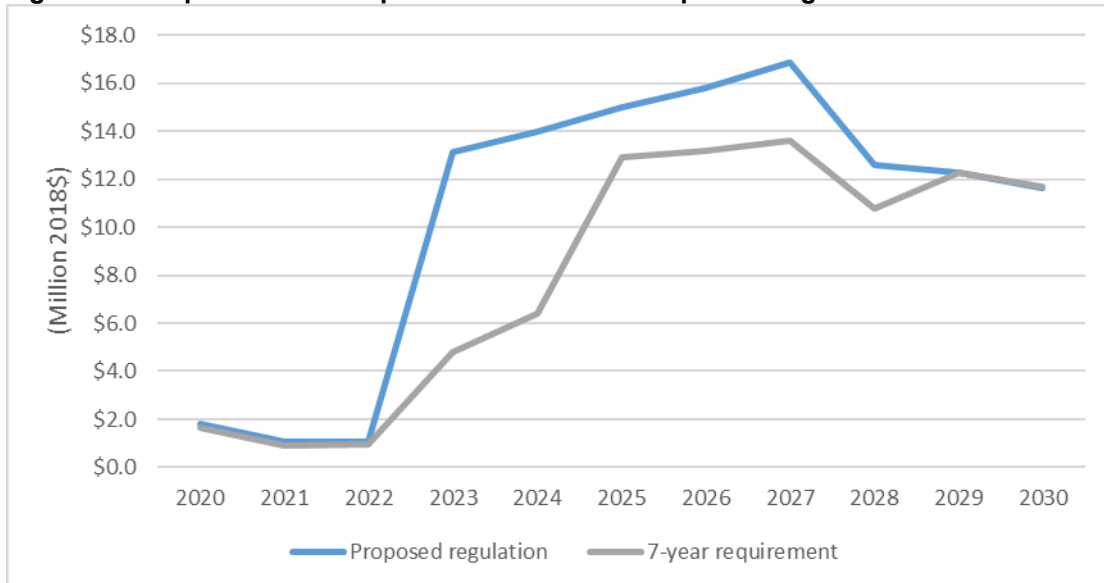
b. Benefits

Alternative 1 results in the same benefits as the proposed regulation, but these benefits are delayed due to the delay in compliance requirements. Benefits include accessibility and ease of use of charging stations, and the resulting emissions benefits from increased eVMT. Though these benefits are not quantified, the relative difference compared to the proposed regulation can be approximated by comparing the cumulative number of compliant chargers over time, as displayed in Table 23. This data shows that Alternative 1 would result in a significant delay in benefits relative to the proposed regulation.

Table 23 - Compliant EVSEs in the Proposed Regulation and Alternative 1

	Proposed Regulation		Alternative 1	
	Level 2	DCFC	Level 2	DCFC
2020	0%	43%	0%	23%
2021	0%	62%	0%	36%
2022	0%	71%	0%	50%
2023	71%	100%	26%	68%
2024	78%	100%	40%	83%
2025	85%	100%	75%	100%
2026	92%	100%	81%	100%
2027	100%	100%	86%	100%
2028	100%	100%	93%	100%
2029	100%	100%	100%	100%
2030	100%	100%	100%	100%

c. Economic Impacts

By allowing for a longer period for EVSEs to comply, Alternative 1 reduces compliance costs incurred between 2020 and 2030. The trend in compliance costs compared to the proposed regulation is displayed in Figure 6. As a result of lower compliance costs, macroeconomic impacts of Alternative 1 are slightly smaller than the proposed regulation (Table 24).

Table 24: Summary of Macroeconomic Impacts of Alternative 1

		2020	2022	2024	2026	2028	2030
GSP	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	-3	-4	-14	-53	-84	-66
Personal Income	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	-5	-4	-20	-54	-67	-57
Employment	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change in Jobs	-28	-34	-100	-406	-668	-444
Output	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	-5	-7	-23	-88	-144	-112
Private Investment	% Change	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%
	Change (2018M$)	-2	-2	-6	-18	-24	-19

d. Reason for Rejecting

Allowing additional time to comply would create more time in which the consumer does not have publicly available open access EVSEs. As the EV market continues to expand, it is vital that EVSEs are ready and easy to use for these consumers. Requiring a simple and uniform way to pay for charging will increase driver confidence of using EVSEs in public. Delay in this standardization could discourage the adoption of electric vehicle technology.

Alternative 1 would result in significantly fewer compliant Level 2 and DCFC EVSE in the early years of implementation (Table 22). In 2023, there would be less than half the number of compliant Level 2 EVSE under Alternative 1. It is important to have as many compliant EVSEs in the ground and operational as possible. The PEV market is changing monthly and adoption rates are steadily increasing in California. It is imperative that drivers have confidence that charging infrastructure is available and easy to use. Having a robust infrastructure will provide driver and regulatory confidence for future ZEV regulation development. Alternative 2 was rejected because it does not provide the maximal benefits which can be achieved through the proposed regulation.

2. Alternative 2

Alternative 2 proposes less time to retrofit or replace EVSEs resulting in public open-access EVSEs faster than the proposed regulation (three years instead of five). The proposed requirements would go into effect for DCFC EVSEs in 2020 with all EVSEs to be fully compliant 3 years from 2020. Level 2 EVSE requirements would go into effect in 2022 with all EVSEs to be fully compliant 3 years from 2022.

a. Costs

The cost analysis for Alternative 2 uses the same assumptions as the proposed regulation described in Section C1. Thus, under Alternative 2 the number of EVSEs required to comply each year, and the distribution of compliance costs are different than for the proposed regulation. Table 25 shows the number of compliant Level 2 and DCFC EVSEs under Alternative 2 compared to the proposed regulation. Alternative 2 concentrates compliance costs in early years, but also hastens the benefits by increasing the number of EVSEs that would be accessible and easy to use.

Table 25 - Compliant EVSEs by Year for the Proposed Regulation and Alternative 2

Year	Proposed Regulation		Alternative 2	
	Total Compliant Public Level 2s	Total Compliant DCFC	Total Compliant Public Level 2s	Total Compliant DCFC
2020	0	767	0	1,188
2021	0	1,154	0	1,869
2022	0	1,393	0	1,958
2023	11,796	2,051	13,650	2,051
2024	13,900	2,138	16,263	2,138
2025	16,286	2,217	19,199	2,217
2026	18,762	2,277	20,358	2,277
2027	21,543	2,317	21,543	2,317
2028	22,456	2,339	22,456	2,339
2029	23,415	2,345	23,415	2,345
2030	24,062	2,336	24,062	2,336

Figure 7 shows the annual costs for Alternative 2 versus the proposed regulation. Alternative 2 results in $125 million in total compliance costs over 2020 through 2030, which is 8.7 percent higher than the proposed regulation.

Figure 7 Comparison of Compliance Cost for the Proposed Regulation vs. Alternative 2
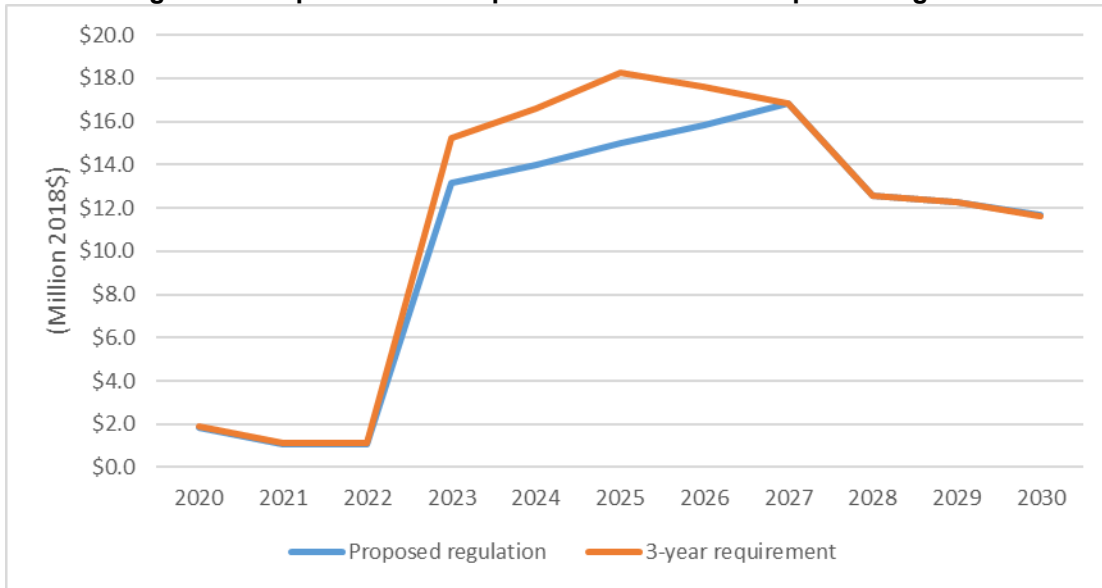
b. Benefits

Alternative 2 results in the same benefits as the proposed regulation, but some benefits accrue earlier. These benefits include accessibility and ease of use of charging stations, and the resulting emissions benefits from increased eVMT. Though these benefits are not quantified, the relative difference compared to the proposed regulation can be approximated by comparing the cumulative number of compliant chargers over time, as displayed in Table 25. This data shows that Alternative 2 would result in approximately 6 percent increase in benefits compared to the proposed regulation.

c. Economic Impacts

By requiring a shorter period of time for EVSEs to comply with the requirements, Alternative 2 increases costs compared to the proposed regulation and shifts these costs to earlier years. As a result the macroeconomic impacts of Alternative 2 are slightly larger than the proposed regulation (Table 26).

Table 26: Summary of Macroeconomic Impacts of Alternative 2

		2020	2022	2024	2026	2028	2030
GSP	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	-3	-5	-51	-81	-109	-71
Personal Income	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	-5	-5	-64	-73	-84	-59
Employment	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change in Jobs	-31	-41	-397	-628	-857	-462
Output	% Change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Change (2018M$)	-6	-9	-84	-137	-187	-121
Private Investment	% Change	0.00%	0.00%	0.00%	-0.01%	-0.01%	0.00%
	Change (2018M$)	-2	-2	-17	-29	-31	-18

d. Reason for Rejecting

Compared to the proposed regulation, Alternative 2 results in an 9percent increase in costs, but only approximately a 6 percent increase in benefits. These differences are small, but indicate that Alternative 2 is likely less cost effective than the proposed regulation.

In addition, Alternative 2 may not be feasible for all regulated parties. There are thousands of EVSE locations and it will take time to coordinate the effort to bring the non-compliant EVSEs into compliance. Implementing the retrofit or replace requirement earlier could place a strain on the hardware supply chain and there is already a shortage of fundamental hardware components for EVSEs. Contracting companies that will help complete these tasks may be in short supply if the compliance deadline is moved up.
Costs for compliance was calculated by EVSE, many sites have single EVSEs the rest of the sites have multiple EVSEs. The sites that have more EVSEs installed could take longer to become compliant depending on sizing and resources. If the EVSPs do not meet the timeline for compliance CARB would need to take enforcement actions.

While the goal is to get open access EVSEs into the market as quick as possible, forcing the EVSEs to be compliant in 3 years may not be feasible. Alternative 2 could lead to non-compliance issues and place strain on enforcement activities. By speeding up the compliance time requirement, consumers will have publicly available open access EVSEs more quickly. Open access more quickly for consumers is vital, but industry needs sufficient time to retrofit or replace existing EVSEs or there will likely be non-compliance requiring enforcement action. Alternative 2 was rejected because it is less cost effective, and the implementation timeline may not be feasible for all regulated parties.

G. MACROECONOMIC APPENDIX

Table G1: REMI Inputs for Proposed Regulation

REMI Policy Variable	REMI Industry	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Production Cost	Retail trade	0	0	0	2.86	2.91	2.98	2.95	2.98	1.33	1.1	0.81
Production Cost	Other electrical equipment and component manufacturing	1.7	1	1.03	9.19	9.94	10.82	11.6	12.54	10.37	10.34	10.08
Production Cost	Electric power generation, transmission, and distribution	0	0	0	0	0.01	0.01	0.01	0.01	0	0	0
Production Cost	Management, scientific, and technical consulting services	0	0	0	0.19	0.2	0.2	0.2	0.2	0.09	0.07	0.05
Exogenous Final Demand	Construction	0	0	0	57.04	0.83	1.41	-0.5	0.62	-32.91	-4.49	-5.81
Exogenous Final Demand	Monetary authorities, credit intermediation, and related activities	1.04	1.06	1.02	8.5	5.33	6.04	6.72	7.51	7.19	7.33	7.38
Exogenous Final Demand	Other miscellaneous manufacturing	0.07	0.06	0.03	1.74	0.33	0.36	0.39	0.41	0.23	0.14	0.1
Exogenous Final Demand	Computer systems design and related services	0.79	0	0	0	0	0	0	0	0	0	0
State and Local Government Spending	Local Government	0	0	0	0.13	0.13	0.14	0.14	0.14	0.06	0.05	0.03
Government Demand	Construction	0	0	0	1.09	0.03	0.04	0.01	0.03	-0.56	-0.07	-0.1

REMI input values are rounded to the nearest $10,000.

Table G2: REMI Inputs for Sensitivity Scenario

REMI Policy Variable	REMI Industry	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Production Cost	Retail trade	0	0	0	5.73	7.02	8.23	9.28	10.33	5.81	4.33	2.9
Production Cost	Other electrical equipment and component manufacturing	1.87	1.35	1.57	11.11	23	28.07	39.27	50.49	51.8	57.58	63.34
Production Cost	Electric power generation, transmission, and distribution	0	0	0	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01
Production Cost	Management, scientific, and technical consulting services	0	0	0	0.39	0.47	0.56	0.63	0.7	0.39	0.29	0.2
Exogenous Final Demand	Construction	0	0	0	114.06	25.74	24.1	20.9	20.86	-89.92	-29.4	-28.5
Exogenous Final Demand	Monetary authorities, credit intermediation, and related activities	1.35	1.49	1.6	3.68	15.33	17.31	32.06	39.72	44.79	50.67	56.98
Exogenous Final Demand	Other miscellaneous manufacturing	0.23	0.22	0.19	0.77	1.71	1.49	4.58	4.57	4.44	4.02	4.02
Exogenous Final Demand	Computer systems design and related services	0.79	0	0	0	0	0	0	0	0	0	0
State and Local Government Spending	Local Government	0	0	0	0.26	0.31	0.37	0.42	0.46	0.26	0.2	0.13
Government Demand	Construction	0	0	0	1.97	0.53	0.5	0.59	0.59	-1.37	-0.32	-0.3

REMI input values are rounded to the nearest $10,000.

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Table G3: REMI Inputs for Alternative 1

REMI Policy Variable	REMI Industry	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Production Cost	Retail trade	0	0	0	0.8	1.03	2.46	2.29	2.17	0.88	1.1	0.81
Production Cost	Other electrical equipment and component manufacturing	1.55	0.83	0.91	3.63	4.89	9.44	9.84	10.39	9.19	10.34	10.1
Production Cost	Electric power generation, transmission, and distribution	0	0	0	0	0	0	0	0	0	0	0
Production Cost	Management, scientific, and technical consulting services	0	0	0	0.05	0.07	0.17	0.15	0.15	0.06	0.07	0.05
Exogenous Final Demand	Construction	0	0	0	15.88	4.59	28.51	-3.33	-2.43	-25.59	4.38	-5.81
Exogenous Final Demand	Monetary authorities, credit intermediation, and related activities	0.78	0.89	0.96	3.78	3.89	7.6	5.95	6.58	7.24	7.9	7.38
Exogenous Final Demand	Other miscellaneous manufacturing	0.02	0.04	0.04	0.65	0.43	1.14	0.32	0.33	0.42	0.36	0.1
Exogenous Final Demand	Computer systems design and related services	0.79	0	0	0	0	0	0	0	0	0	0
State and Local Government Spending	Local Government	0	0	0	0.03	0.05	0.11	0.11	0.09	0.04	0.05	0.03
Government Demand	Construction	0	0	0	0.31	0.1	0.55	-0.04	-0.02	-0.42	0.1	-0.1

REMI input values are rounded to the nearest $10,000.

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Table G4: REMI Inputs for Alternative 2

REMI Policy Variable	REMI Industry	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Production Cost	Retail trade	0	0	0	3.38	3.56	3.79	3.4	2.98	1.33	1.1	0.81
Production Cost	Other electrical equipment and component manufacturing	1.79	1.06	1.08	10.56	11.69	12.98	12.78	12.54	10.37	10.34	10.05
Production Cost	Electric power generation, transmission, and distribution	0	0	0	0.01	0.01	0.01	0.01	0.01	0	0	0
Production Cost	Management, scientific, and technical consulting services	0	0	0	0.23	0.24	0.26	0.23	0.2	0.09	0.07	0.05
Exogenous Final Demand	Construction	0	0	0	67.35	3.66	4.46	-7.82	-8.25	-32.91	-4.49	-5.81
Exogenous Final Demand	Monetary authorities, credit intermediation, and related activities	1.26	1.26	0.99	9.35	6.1	6.97	6.65	6.95	7.19	7.33	7.38
Exogenous Final Demand	Other miscellaneous manufacturing	0.13	0.13	0.02	1.88	0.39	0.44	0.2	0.19	0.23	0.14	0.1
Exogenous Final Demand	Computer systems design and related services	0.79	0	0	0	0	0	0	0	0	0	0
State and Local Government Spending	Local Government	0	0	0	0.15	0.16	0.17	0.15	0.14	0.06	0.05	0.03
Government Demand	Construction	0	0	0	1.28	0.09	0.1	-0.13	-0.13	-0.56	-0.07	-0.1

REMI input values are rounded to the nearest $10,000.

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