State of California

AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR RULEMAKING

PROPOSED 2015 MODIFICATIONS TO THE ZERO EMISSION VEHICLE REGULATION

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EXECUTIVE SUMMARY

California is the nation's largest market for cars and light-duty trucks with over 25 million registered vehicles. Each day those vehicles drive approximately 800 million miles and consume 29 million gallons of gasoline. In the process, they are responsible for producing 26 percent of statewide greenhouse gas emissions (GHG). As a measure of the severity of the air quality in California, both the South Coast Air Basin and the San Joaquin Valley Air Basin are classified by the United States Environmental Protection Agency as "extreme" ozone non-attainment areas.

Automakers have made extensive progress in controlling emissions from conventional internal combustion engines. However, the California Air Resources Board (ARB or the Board) has determined that only by reducing vehicle criteria pollutant and greenhouse gas emissions to near zero can California achieve its long term air quality and climate change goals. For example, planning scenarios indicate that zero emission vehicles (ZEV) will need account for nearly 100 percent of new vehicle sales by 2050 to achieve California's goal of reducing statewide GHG emissions to 80 percent below 1990 levels by 2050.[1]

In order to meet these challenges, ARB adopted the ZEV Regulation in 1990. It was, and still is, an ambitious program to promote the transition of California's light-duty fleet through the gradual introduction of ZEVs. The ZEV Regulation helps facilitate this transition by driving down the cost and accelerating the development of the cleanest new vehicles. Since its inception, the ZEV Regulation has been adjusted eight times in order to reflect the pace of ZEV development, the emergence of new ZEV technologies, and to provide clarifying language.

The ZEV Regulation sets production requirements for clean vehicle technology based on manufacturers' California sales volumes. Manufacturers meet these requirements by generating credits through the sale of ZEVs to California drivers. ZEVs qualifying for regulatory compliance are awarded credits based on zero emission range on a specific driving cycle and fast refueling capability. The fast refueling provisions within the ZEV Regulation award additional credits to vehicles capable of replacing 95 percent of a vehicle's range at a rate analogous to traditional gasoline or diesel-fueled vehicles.

In May 2014, additional amendments to the ZEV Regulation's fast refueling provisions were finalized that ensure fast refueling credits are awarded for actual fast refueling events. The fast refueling provisions allow manufacturers of battery electric vehicles (BEV) to earn additional ZEV credits for battery swap.[2] A manufacturer may apply the first 25 battery swap events performed on any individual vehicle toward the total number

[1] ARB, 2012a. California Air Resources Board. June 27, 2012. Vision for Clean Air: A Framework for Air Quality and Climate Planning, 4. http://www.arb.ca.gov/planning/vision/docs/vision_for_clean_air_public_review_draft.pdf

[2] Battery swap is a process by which a vehicle's depleted battery pack is replaced with a full battery pack, resulting in an accumulation of vehicle range and utility. The terms battery swap, battery exchange and fast swap may be used interchangeably throughout all documents associated with this rulemaking.

of battery swap capable vehicles within the vehicle fleet, although the swap events must occur during the first year after the vehicle's placement into service.

In October 2014, staff returned to the Board to make additional changes to the ZEV Regulation, including minor changes to the fast refueling provisions. Board member comments received at the conclusion of the staff presentation highlighted concerns that any credits awarded under the current fast refueling provisions for fast refueling events should be representative of the fleets' use of rapid range extending fast refueling. As a result, the Board directed staff to review the fast refueling provisions, and return with a new regulatory proposal to ensure that any additional ZEV credits awarded to vehicles qualifying as a fast-refueling ZEV Type are awarded on a one-to-one basis. This would require every vehicle that qualifies to earn additional ZEV credits as a fast refueling ZEV Type to demonstrate actual usage of fast refueling.

This proposed amendment was developed to help meet the goals of the ZEV Regulation's fast refueling credit provisions. Staff's proposal seeks to address the Board's concerns by amending the fast refueling provisions within the ZEV Regulation to permit one vehicle to earn additional ZEV credits for only one fast refueling event, rather than the 25 events currently allowed. The proposed amendment would be effective for model year (MY) 2017 vehicles.[3]

[3] The amendment is proposed only for MY 2017 because MY 2015 and MY 2016 vehicles are already on the road in California.

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Table of Acronyms

ACC .....Advanced Clean Car
ACC EA…… Environmental analysis prepared as part of ACC's December 2011 Staff Report: Initial Statement of Reasons (ISOR)
AER……....All Electric Range
ARB .....California Air Resources Board or The Board
BAU……....Business as usual
BEV .....Battery Electric Vehicle
CEQA .....California Environmental Quality Act
DOF…… California Department of Finance
EA.....Environmental Assessment
EIA……...Economic Impact Assessment
FCEV .....Fuel Cell Electric Vehicle
GHG .....Greenhouse Gas
ISOR .....Initial Statement of Reasons
LDT.....Light-duty Trucks loaded vehicle weight up to 8500 pounds
LEV I .....First generation Low Emission Vehicle program, adopted in a 1990-1991 rulemaking, and generally applicable in the 1994-2003 model years
LEV II .....Second generation Low Emission Vehicle program, adopted in a 1998 -1999 rulemaking, and generally applicable in the 2004 and subsequent model years
LEV III.....Third generation Low Emission Vehicle program (criteria pollutant and greenhouse gas emission fleet standards), adopted in 2012, and generally applicable to 2015 and subsequent model years for Criteria Pollutants, and applicable to 2017 and subsequent model years for Greenhouse Gases
MY……...Model Year
NOx .....Oxides of Nitrogen
PC.....Passenger Car
PZEV .....Partial Zero Emission Allowance Vehicle, typically, a conventional gasoline, diesel, or natural gas vehicle that meets the most stringent standards for smog-forming emissions
SAE……Society of Automotive Engineers
SEC……United States Securities and Exchange Commission
SRIA……Standardized Regulatory Impact Assessment
Type III .....ZEV, range of 100 or more miles plus fast refueling, or 200 miles
Type IV .....ZEV, range of 200 or more miles plus fast refueling
Type V .....ZEV, range of 300 or more miles plus fast refueling
TZEV .....Transitional Zero Emission Vehicle, typically a plug-in hybrid electric vehicle
U.S. EPA.....United States Environmental Protection Agency
ZEV .....Zero Emission Vehicle

I. Introduction and Background

A. Background on ZEV Regulation

In 1990, the California Air Resources Board (ARB or the Board) adopted an ambitious program to dramatically reduce the environmental impact of light-duty vehicles through the gradual introduction of zero emission vehicles (ZEV) into the California fleet as part of the Low Emission Vehicle (LEV I) regulation. Since its inception, the ZEV Regulation, which affects passenger cars (PC) and light-duty trucks (LDT), has been adjusted eight times to reflect the pace of ZEV development, the emergence of new ZEV technologies, and the need to provide clarifying language. Throughout these adjustments the fundamental goal of the program, the commercialization of ZEV technologies, has not changed.

California's commitment to the ZEV program reflects the recognition that ZEV technology is indispensable to achieving the State's public health protection goals, including criteria pollutant and long-term climate change emission reductions. California is the nation's largest market for cars and light-duty trucks with approximately 25 million registered vehicles. Each day those vehicles drive approximately 800 million miles and consume more than 29 million gallons of gasoline.[1] They are also responsible for 26 percent of statewide greenhouse gas emissions (GHG). [2]

Over 90 percent of Californians breathe unhealthy air at varying times of the year. According to the 2014 8-hour Ozone State Implementation Plan, the regional light duty fleet accounts for 14 percent of the oxides of nitrogen, or NOx, emissions in the South Coast Air Basin.[3] Health-based state and federal air quality standards for criteria pollutants continue to be exceeded in regions throughout California. As a measure of the severity of the air quality problems in California, both the South Coast Air Basin and the San Joaquin Valley Air Basin are classified by the United States Environmental Protection Agency (U.S. EPA) as "extreme" ozone non-attainment areas.[4]

In 2005, then Governor Arnold Schwarzenegger issued an executive order establishing the goal of reducing GHG emissions in the state of California to 80 percent below 1990 levels by 2050.[5] Despite advancements made by vehicle manufacturers, conventional

[1] ARB, 2015a. California Air Resources Board. May 12, 2015. EMFAC2014 Volume III – Technical Documentation, 134-137. http://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf

[2] ARB, 2015b. California Air Resources Board. April 24, 2015. California Greenhouse Gas Inventory 2000-2013. http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_2000-13_20150831.pdf

[3] ARB, 2014a. California Air Resources Board. May 23, 2014. Staff Report: 8-Hour Ozone State Implementation Plan Emission Inventory Submittal. http://www.arb.ca.gov/planning/sip/2012iv/o38hrnaa_report.pdf

[4] U.S. EPA, 2015. United States Environmental Protection Agency. January 30, 2015. The Green Book Nonattainment Areas for Criteria Pollutants, 8-Hr Ozone (2008) Nonattainment Areas. http://www.epa.gov/airquality/greenbook/hntc.html. Accessed September 7, 2015.

[5] Executive Order S-3-05. State of California Executive Order signed by Governor Arnold Schwarzenegger. June 1, 2005. http://gov.ca.gov/news.php?id=1861.

internal combustion engine emission control technologies, and the liquid fuels used in the engines, are limited in their ability to reduce GHG emissions. In response, Governor Jerry Brown issued an executive order in 2012 creating a series of benchmarks to support commercialization of zero-emission technologies and set a goal of reaching 1.5 million ZEVs on California's roads by 2025.[6] Recently, Governor Brown issued an executive order strengthening emission reduction goals with an intermediate target of reaching 40 percent below the 1990 GHG emission levels by 2030.[7]

The ZEV Regulation is an important tool for meeting California's GHG reduction goals by facilitating the transition to a fleet of zero emission and lower-emitting vehicles. By creating an increasingly stringent production requirement that manufacturers must meet through the introduction of ZEV and transitional-ZEV technology, the regulation helps to drive down the cost and accelerate the development of the cleanest new vehicles. Staff's proposed changes to the ZEV Regulation will help ensure a strong ZEV Regulation remains in place in California and all Section 177 states, while allowing appropriate compliance flexibility where needed.

B. Fast Refueling Provision

The ZEV Regulation sets production requirements for clean vehicle technology based on manufacturers' California sales volumes. Manufacturers must meet these requirements by generating credits through the sale of ZEVs to California drivers. Battery Electric Vehicles (BEV) and Fuel Cell Electric Vehicles (FCEV) are awarded credits based on zero emission range and fast refueling capability. Fast refueling vehicles are those capable of replacing 95 percent of a vehicle's range in under 15 minutes. The purpose of the fast refueling provisions is to recognize the additional consumer value of refueling at a rate analogous to traditional gasoline or diesel-fueled vehicles.

In October 2013, staff proposed to exclude battery swap from qualifying under the fast refueling provisions of the ZEV Regulation.[8,9] After considering input from stakeholders, the Board directed staff to amend the regulation to ensure any additional ZEV credits awarded under the fast refueling provisions are awarded for demonstration of actual fast refueling events (e.g., actual battery swap events). The amended regulation includes documentation and application requirements for qualifying fast refueling events. Under that amended regulation, up to 25 fast refueling events may be documented for an

[6] Executive Order B-16-2012. State of California Executive Order signed by Governor Edmund G. (Jerry) Brown Jr. March 23, 2012. http://gov.ca.gov/news.php?id=17472.

[7] Executive Order B-30-15. State of California Executive Order signed by Governor Edmund G. (Jerry) Brown Jr. April 29, 2015. http://gov.ca.gov/news.php?id=18938.

[8] Battery swap is a process by which a vehicle replaces the depleted high voltage (or traction) battery pack, with a fully charged battery pack. The term battery swap may be used interchangeably with battery exchange and fast swap throughout this all documents associated with this rulemaking.

[9] ARB, 2013. 2013 Minor Modifications to the Zero Emission Vehicle Regulation, California Air Resources Board, September 4, 2013. (http://www.arb.ca.gov/regact/2013/zev2013/zev2013isor.pdf)

individual vehicle and additional fast refueling credit values assigned to up to 25 vehicles. However, the number of fast refueling vehicles for which a manufacturer requests credits cannot exceed the total number of fast refueling eligible vehicles in that manufacturer's fleet.

The fuel system and refueling infrastructure of FCEVs is inherently capable of fast refueling the vehicle during every refueling event; therefore, FCEVs are exempt from documentation requirements. Additionally, this emerging technology requires the development of an entirely new hydrogen refueling infrastructure before commercialization of FCEVs. In contrast, the documentation requirements are necessary for battery swap capable BEVs because these vehicles are capable of refueling through the use of existing private and publically available infrastructure at varying rates of refueling. This difference in documentation requirements between the two technologies is necessary to ensure that battery swap capable BEVs are actually performing battery swap events.

At the October 2014 Board meeting, Board members expressed concern that allowing manufacturers of battery swap capable BEVs to apply up to 25 battery swap events from an individual vehicle toward the total number of qualifying fast refueling events for that manufacturer would not be representative of the overall fleet's use of fast refueling as a means of range extension.[10] The Board requested staff return with a proposal for additional modifications to the fast refueling provisions within the ZEV Regulation to require every vehicle earning additional credits as a fast refueling ZEV type to demonstrate real world usage of fast refueling.

C. Public Process for ZEV Regulation Development

ARB staff developed the proposed amendment through a public process. Beginning in March 2015, a notice of publication of the Standard Regulatory Impact Assessment (SRIA) was distributed to the public as a means of engaging stakeholders and obtaining input on the potential economic impacts of the proposed amendment. In May 2015, ARB staff released notice of a public workshop on June 5, 2015 to discuss the proposed amendment. The stakeholders present at the workshop included representatives from manufacturers, Section 177 states, and environmental non-governmental organizations. The workshop was held at ARB offices in Sacramento and broadcast via webcast. The announcements and materials for this workshop were posted on ARB's website and distributed through a list serve that included over 14,500 recipients.

The materials presented at the workshop are available on ARB's ZEV program website at http://arb.ca.gov/msprog/zevprog/2015zevreg/2015zevreg.htm

[10] ARB. 2014b. California Air Resources Board. Page 187, Transcript of Board member comments, October 23, 2014. Diamond Bar, CA. (http://www.arb.ca.gov/board/mt/2014/mt102314.pdf)

II. Statement of Reasons

Staff's proposal would modify one aspect of the fast refueling provision. Specifically, for model year (MY) 2017, the proposal would limit the additional ZEV credits an individual vehicle can earn under the fast refueling provisions to a single fast refueling event, rather than the 25 events currently allowed.

The proposed modifications, as discussed below, seek to address the Board's direction as provided at the October 2014 hearings.

III. Summary of Proposed Action

ZEVs qualifying for regulatory compliance are awarded credits based on zero emission range on a specific driving cycle and fast refueling capability and use. Type III ZEVs achieve 100 miles or more of electric range and are capable of replacing 95 miles of a standard driving cycle range within 10 minutes.[11] Type IV and V ZEVs achieve at least 200 and 300 miles, respectively, of electric range, and are capable of replacing 190 and 285 miles, respectively, of a standard driving cycle within 15 minutes.[12] Table 1 below provides a summary of ZEV types earning fast refueling credit through MY 2017.

Table 1: Credit Level by ZEV Type

	Definition	MY 2012-2014 Credit Level	MY 2015-2017 Credit Level
Type III ZEV	100+ mile range and fast refueling capable or 200 mile range	4	4
Type IV ZEV	200+ mile range and fast refueling capable	5	5*
Type V ZEV	300+ mile range and fast refueling capable	7	9*

***** For MY 2015 and subsequent vehicles fast refueling "capable" means the ZEVs refueling system has been demonstrated as actually having replaced the requisite number of miles, based on actual fast refueling events.

Before the amendments that went into effect in July 2014, some BEVs received ZEV credits for fast refueling based on their capability to battery swap. However, it had not been demonstrated that any battery swap events had occurred on the vehicles earning credits. Accordingly, ARB amended the ZEV Regulation in May 2014 to require actual fast refueling events (e.g., actual battery swap events) for such credits. These amendments require manufacturers to submit documentation to substantiate that any

[11] The definition for "capable" (also referred to in regulatory text as "capability" or "capability to accumulate") was clarified as a part of the amendments codified in 2014 [1962.1(d)(5)(B)]. For MY 2009 through 2014, capability means that the ZEVs refueling system has been demonstrated as having the potential, with appropriate infrastructure, to accumulate the requisite mileage. For MY 2015 and subsequent, capability means that the ZEV's refueling system has been demonstrated as actually accumulating the requisite miles, and is based on actual fast refueling events.

[12] Mileage requirements are based on UDDS drive cycle.

credits awarded under the fast refueling provisions are based on actual fast refueling events. In addition to requiring specific documentation for fast refueling events, these modifications established that one vehicle may apply up to 25 fast refueling events toward earning additional ZEV credits, not to exceed the total number of vehicles in the vehicle fleet, and that fast refueling events must be within the first year of placement.

FCEVs are exempt from any reporting requirements because these vehicles, and any supporting hydrogen infrastructure, are inherently capable of fast refueling at all times. Additionally, this emerging vehicle technology requires the development of an entirely new refueling infrastructure before commercialization of FCEVs. By contrast, the documentation requirements are necessary for battery swap capable BEVs because these vehicles are capable of refueling through the use of existing private and publically available charging infrastructure at varying rates of refueling. This difference in documentation requirements between the two technologies is necessary to ensure that battery swap capable BEVs are actually performing battery swap events.

At the October 2014 Board meeting, Board members expressed concern that under the current fast refueling provisions a portion of a manufacturer's battery swap capable BEV fleet could earn ZEV credits for the entire fleet. The Board directed staff to return with a proposal for changes to these provisions within the ZEV Regulation. The currently proposed modification would amend the ZEV Regulation to permit one vehicle to earn additional ZEV credits under the fast refueling provisions for only one fast refueling event, rather than the 25 events currently allowed. The proposed amendment would be effective only for MY 2017 vehicles.[13]

The goal of the ZEV Regulation's fast refueling provisions are to encourage ZEV manufacturers to offer fast refueling capabilities such that ZEV drivers can obtain a similar level of utility as conventional gasoline or diesel-powered vehicle users. The additional ZEV credits awarded through the fast refueling provisions are intended to reward manufacturers for providing the necessary technology to enable ZEV fueling with electricity or hydrogen at approximately the equivalent speed of conventional petroleum fuels. The proposed amendments would ensure that BEVs and FCEVs are treated more equitably by granting additional ZEV credits under the fast refueling provisions for any vehicle that uses fast refueling infrastructure.

The proposed amendment does not change the issuance of fast refueling credits for Fuel Cell Electric Vehicles (FCEV). Staff's proposed amendment leaves intact any regulatory requirements for FCEVs previously established in the ZEV Regulation.

[13] The amendment is proposed only for MY 2017 because MY 2015 and MY 2016 vehicles are already on the road in California.

IV. ENVIRONMENTAL ANALYSIS

A. Introduction

This chapter provides the basis for ARB's determination that no subsequent or supplemental environmental analysis is required for the proposed amendment to the ZEV Regulation. A brief explanation of this determination is provided in section D below. ARB's regulatory program which involves the adoption, approval, amendment, or repeal of standards, rules, regulations, or plans for the protection and enhancement of the State's ambient air quality has been certified by the California Secretary for Natural Resources under Public Resources Code section 21080.5 of the California Environmental Quality Act (CEQA) (14 CCR 15251(d)). Public agencies with certified regulatory programs are exempt from certain CEQA requirements, including but not limited to, preparing environmental impact reports, negative declarations, and initial studies. ARB, as a lead agency, prepares a substitute environmental document (referred to as an "Environmental Analysis" or "EA") as part of the Staff Report to comply with CEQA (17 CCR 60000-60008). This EA serves as a substitute document equivalent to an addendum to the prior EA prepared for the Advanced Clean Cars Program to explain ARB's determination that no additional environmental analysis is required for the proposed amendments.

B. Prior Environmental Analysis

When the ZEV Regulation was proposed as part of the package of regulations referred to as the Advanced Clean Cars (ACC) Program in December 2011, the Staff Reports: Initial Statement of Reasons (ISORs) prepared for each of the three regulations included as an appendix an environmental analysis prepared under ARB's certified regulatory program (ACC EA). The ACC EA provided a programmatic level of analysis of the potential environmental impacts associated with the entire ACC Program, including the ZEV Regulation. Comments received on the ACC EA were responded to in writing in a document entitled *Response to Comments on the ACC EA* released on March 12, 2012. At its hearing on March 22, 2012, the Board passed Resolution 12-21 certifying the ACC EA, approving the written responses to comments on the ACC EA, and adopting findings and statement of overriding considerations. A Notice of Decision was filed with the Office of the Secretary of the Natural Resources Agency and the State Clearinghouse for public inspection, and posted on ARB's website on March 27, 2012. These documents are available at http://www.arb.ca.gov/regact/2012/zev2012/zev2012.htm .

The ACC EA was based on the reasonably foreseeable compliance responses of the regulated entities covered by the ACC Program. The ACC EA concluded that the

compliance responses to the proposed ACC Program would result in beneficial impacts to air quality through reductions in emissions, including GHGs, criteria air pollutants and precursors, and toxic air contaminants. It further concluded that the proposed ACC Program would result in less-than-significant impacts to agricultural and forest resources, GHGs, land use, minerals, population and housing, public services, and recreation.

The ACC EA also concluded that there could be potentially significant adverse impacts to aesthetics, air quality, and noise (both related to construction), biological resources, cultural resources, geology/soils, hazards/hazardous materials (related to accidental releases), hydrology/water quality, traffic and utilities due to construction and operation of new battery manufacturing facilities, as needed to achieve compliance with the ZEV Regulation.

The ACC EA determined that construction and operation of new manufacturing plants for producing propulsion batteries and fuel cells, though likely to occur in areas with consistent zoning, could result in potentially significant adverse impacts to the ten resource areas listed above. The ACC EA identified mitigation measures to reduce these potentially significant impacts to a less-than-significant level; however, it was determined that the authority to determine project-level impacts and require project-level mitigation lies with the local lead agency for individual projects, which is beyond ARB's authority. Since the ACC EA programmatic analysis could not determine project-specific details of mitigation, there is an inherent uncertainty in the degree of mitigation ultimately implemented to reduce the potentially significant impacts. Therefore, the ACC EA took a conservative approach in its post-mitigation significance conclusion and disclosed, for CEQA compliance purposes, that the potentially significant impacts to these resource areas resulting from the construction and operation of new manufacturing plants may be significant and unavoidable.

C. Proposed Modifications

As previously described in Section III of this Staff Report, the proposed amendment to the ZEV Regulation would modify the ZEV Regulation to permit one vehicle to earn additional ZEV credits under the fast refueling provisions for only one fast refueling event, rather than the 25 events currently allowed. The proposed amendment would be effective only for MY 2017 vehicles.

D. Analysis

a) Legal Standards

When considering modifications to a regulation for which a substitute document equivalent to an EIR or negative declaration had previously been prepared, ARB looks to Public Resources Code section 21166 and CEQA Guidelines section 15162 for guidance on the requirements for subsequent or supplemental environmental review.

CEQA Guidelines section 15162 states:

> *(a) When an EIR has been certified or a negative declaration adopted for a project, no subsequent EIR shall be prepared for that project unless the lead agency determines, on the basis of substantial evidence in the light of the whole record, one or more of the following:*
>
> *(1) Substantial changes are proposed in the project which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects;*
>
> *(2) Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or*
>
> *(3) New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified as complete or the negative declaration was adopted, shows any of the following:*
>
> *(A) The project will have one or more significant effects not discussed in the previous EIR or negative declaration;*
>
> *(B) Significant effects previously examined will be substantially more severe than shown in the previous EIR;*
>
> *(C) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative; or*
>
> *(D) Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more*

significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative.

If a subsequent or supplemental EIR or negative declaration is not required, the lead agency may document its decision and supporting evidence in an addendum (14 CCR 15164 (e)). The addendum and lead agency's findings should include a brief explanation, supported by substantial evidence, of the decision not to prepare a subsequent or supplemental EIR or negative declaration (14 CCR 15164(e)). An addendum need not be circulated for public review, but must be considered by the lead agency prior to making a decision on the project (14 CCR 15164(c), (d)).

b) Basis for Determination

ARB has determined that the proposed amendment does not involve any changes that result in any new significant adverse environmental impacts or a substantial increase in the severity of the significant adverse impacts previously disclosed in the ACC EA. Further, there are no changes in circumstances or new information that would otherwise warrant any subsequent or supplemental environmental review. The ACC EA adequately addresses the implementation of the regulation as modified by the proposed amendment and no additional environmental analysis is required. The basis for ARB's determination that none of the conditions requiring further environmental review are triggered by the proposed modifications is based on the following analysis.

a) There are no substantial changes to the regulation previously analyzed in the Environmental Analysis which require major revisions to the Environmental Analysis involving new significant environmental effects or a substantial increase in the severity of previously identified effects.

Emission impacts from ZEVs are part of the broader light-duty fleet within the LEV III Regulation that establishes fleet average requirements for automakers. Under these requirements, fleet-average emission standards apply to the average emission rates of the various vehicle models marketed by a manufacturer, weighted by the number of vehicles sold or leased by the manufacturer. In meeting the fleet-average standards, manufacturers may certify their vehicles to varying emission levels so long as they comply with the fleet-average emission requirements for that MY. In order to account for this flexibility in meeting the fleet-average emission requirements, the previous ACC EA was designed to account for the wide range of fleet mix scenarios that manufacturers could utilize in meeting overall fleet-average emissions reductions. The proposed amendment to the ZEV Regulation does not change the previous analysis because they will not modify the in-place fleet average emission standards and do not substantially change or lead to any new compliance responses that involve new significant

environmental effects or a substantial increase in the severity of previously identified effects.

The proposed amendment also does not change the percentage requirements of ZEVs within the current ZEV Regulation, but will merely simplify the implementation of the ZEV Regulation as it was originally intended. Manufacturers use ZEV credits to meet annual ZEV compliance requirements and credits are transferrable between manufacturers. A reduction in the number of credits generated per vehicle would ultimately result in an overall reduction in the number of credits available for use in meeting manufacturers' annual requirements. In order to account for this credit shortfall, manufacturers would be required to increase the number of ZEVs and TZEVs delivered for sale in California from 2017 through 2025 in order to comply with the percentage requirements. However, due to the increasing stringency in the ZEV Regulation as adopted in the 2012 rulemaking, manufacturers are already expected to increase production through MY 2025, as analyzed in the ACC EA. Therefore, the proposed amendment does not require any new compliance responses from manufacturers, and any environmental impacts from increased production were covered in the impacts analysis in the ACC EA.

b) *There are no substantial changes with respect to the circumstances under which the regulation is being undertaken which require major revisions to the previous Environmental Analysis involving new significant environmental effects or a substantial increase in the severity of previously identified effects.*

There are no substantial changes to the environmental setting or circumstances in which the amendment to the ZEV Regulation is being implemented compared to that analyzed in the ACC EA. As explained above, the amendment does not modify the in-place fleet average emission standards and does not alter the compliance responses of the regulated entities or result in any changes that significantly affect the physical environment.

c) *There is no new information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous Environmental Analysis was certified as complete, that changes the conclusions of the Environmental Analysis with regard to impacts, mitigation measures, or alternatives;*

No new information of substantial importance has become available to ARB staff since the ACC EA was certified. Therefore, the conclusions found in the ACC EA about the

compliance responses for the ZEV Regulation or potential environmental impacts to any resource areas have not changed.

E. Conclusion

The ACC EA approved in 2012 covered the ZEV Regulation. No supplemental or subsequent environmental analysis is required for the proposed amendment to the ZEV Regulation because, as described above, the proposed change does not result in any new environmental impacts or in a substantial increase in the severity of the impacts previously disclosed for the ZEV Regulation in the ACC EA. Further, there are no changes in circumstances or new information that would otherwise warrant any additional environmental review.

V. ENVIRONMENTAL JUSTICE

State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. ARB is committed to making environmental justice an integral part of its activities. The Board approved its Environmental Justice Policies and Actions (Policies) on December 13, 2001, to establish a framework for incorporating environmental justice into ARB's programs consistent with the directives of State law (ARB 2001). These policies apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low-income and minority communities

Staff does not believe that the proposed amendment will have any adverse environmental justice impacts because the stringency of the ZEV Regulation is not affected by the proposed change to the regulations. The proposed change is intended to ensure that manufacturers meet regulatory compliance through production and sale of ZEVs and TZEVs. The introduction of these clean vehicle technologies into California's fleet will offset emissions from conventional light-duty vehicles and help the State meet future emissions reduction targets. These emission reductions will provide environmental benefits for all Californians by helping to slow the rate of warming from GHG emissions and improve public health.

VI. ECONOMIC IMPACTS ANALYSIS/ASSESSMENT

A. Summary of Proposed Amendment Costs and Impacts

The proposed amendment was developed to help meet the goals of the fast refueling credit provision in the ZEV Regulation. The proposed amendment is required to ensure

that fast refueling ZEV credits are only issued for extension of vehicle range and utility. The primary entities affected by the proposed amendment are ZEV manufacturers that will sell MY 2017 automobiles in California with battery swap capabilities that qualify for ZEV fast refueling credits.

To estimate the economic impacts of the proposed regulatory amendment, a baseline or business-as-usual (BAU) characterization was developed. The economic impact of the proposed regulatory amendment is then evaluated against the BAU scenario. Under the existing ZEV Regulation, fast refueling capable MY 2015 through 2017 vehicles qualify for a total of 5 and 9 credits as Type IV (200+ miles range) and Type V (300+ miles range) ZEVs, respectively. Under the current regulation, a manufacturer may apply up to 25 fast refueling events per vehicle toward the total number of fast refueling vehicles within the manufacturer's fleet for a given MY.

The proposed amendment will ensure that every vehicle earning additional ZEV credits under the fast refueling provisions of the ZEV Regulation has engaged in a fast refueling event. Therefore, if one vehicle demonstrates 25 battery swap events within a 12-month period (following the vehicle's placement in California), the manufacturer would be issued additional ZEV credits for only one vehicle, and not 25 as under the current ZEV Regulation.

Under the current ZEV Regulation, manufacturers can sell excess credits to other manufacturers and create a revenue stream. The estimated direct cost imposed on manufacturers by the proposed amendment can be calculated through the change in revenue generated by ZEV fast refueling credits. Fast refueling credit revenue depends on the total number of MY 2017 vehicles that are awarded additional ZEV credits for demonstration of fast refueling events.

By amending the regulation so an individual vehicle may be awarded additional ZEV credits for only one qualifying fast refueling event, manufacturers participating in battery swap as a fast refueling mechanism will not be able to generate the same number of ZEV credits for the same portion of the fleet that may utilize battery swap. Currently, only one manufacturer in California has plans to continue allowing customers to utilize battery swap through the 2017 MY. Assuming that manufacturer will sell 20,000 vehicles in 2017, 3% of those vehicles can be accommodated by battery swap facilities in the state, those vehicles report 25 swap events throughout the year, and ZEV credits are worth $3,500 each and sold at that price, the one manufacturer would experience a potential reduction of $250 million due to the proposed amendment.

However, as modeled, the proposed amendment is unlikely to have significant impacts on California's economy, including the growth of employment, investment, personal income, and production. All of these economic indicators do not exhibit a significant change when comparing the impact of the proposed amendment to the ZEV Regulation currently being implemented. The estimated cost impacts of the proposed amendment represent the upper bound of anticipated impacts, providing additional confirmation that the likely economic impact would be negligible given the size of the California economy.

B. Major Regulations

For a major regulation proposed on or after November 1, 2013, a standardized regulatory impact assessment (SRIA) is required. A major regulation is one "that will have an economic impact on California business enterprises and individuals in an amount exceeding fifty million dollars ($50,000,000) in any 12-month period between the date the major regulation is filed with the Secretary of State through 12 months after the major regulation is estimated to be fully implemented, as estimated by the agency." (Govt. Code Section 11342.548).

The proposed amendment is determined to be a major regulation requiring a Standardized Regulatory Impact Assessment (SRIA) as the estimated direct cost impacts of the amendment exceed $50 million in a 12-month period after full implementation. The proposed amendment could reduce the revenue generated from the sale of ZEV credits, which is defined as a direct cost to regulated parties. ARB has estimated that the proposed amendment could result in direct costs to regulated parties of up to $252 million during 2017 and 2018, when the amendment would be fully implemented.

C. Summary of Standardized Regulatory Impact Assessment Macroeconomic Analysis

1. Effect on Jobs within California

As modeled, the proposed amendment would have a small impact on employment growth relative to the current ZEV Regulation (BAU). Table 2 shows a slowing in the growth of employment equivalent to 1,200 and 1,300 jobs in 2017 and 2018, respectively. In the following two years as the proposed amendment is phased out, employment growth begins to increase but is still slightly slower than under the BAU scenario.

The slowing of job growth is primarily due to the increase in consumer price for new motor vehicles, and subsequent budget reallocation. As modeled, consumers would spend more on new vehicle purchases and reduce all other expenditures, slowing employment growth throughout California. However, the slowing of employment growth is negligible to California's economy with 16 million industrial jobs in 2014.[14]

[14] Source: Employment Development Department of the State of California website: http://www.labormarketinfo.edd.ca.gov/.

Table 2: Changes in Employment Growth

	2017	2018	2019	2020
Change (percent)	0.01%	0.01%	0.00%	0.00%
Change in Jobs	-1,200	-1,300	-175	-75

The value in each year is interpreted as the reference year value less the BAU value in that same year. The change in jobs is rounded to the nearest 25.

2. Effect on Businesses within California

Table 3 shows that the proposed amendment slows output growth for the California motor vehicle manufacturing industry in 2017 and 2018. The change in output growth can be attributed to the potential reduction in fast refueling credit generation. The total change in output includes all California vehicle manufacturers, and represents a minor percentage change from the output levels estimated under the BAU scenario.

Table 3: Changes in Output Growth

Industry Name		2017	2018	2019	2020
Motor Vehicle Manufacturing	**Change (percent)**	-0.21%	-0.21%	0.00%	0.00%
	Change (2014 M$)	-$11.26	-$11.19	$0.00	$0.00

The value in each year is interpreted as the reference year value less the BAU value in that same year. The values presented above are rounded to the nearest $10,000.

3. Competitive Advantages/Disadvantages for Current Businesses

Based on the direct cost estimation, the proposed amendment would not change the competitiveness of directly regulated entities. The underlying purpose of the fast refueling provision of the ZEV Regulation is to level the playing field between gas-powered and zero emission vehicles and is unaffected by the proposed amendment. Thus, ZEV manufacturers are not expected to face competitive disadvantages as a result of the proposed amendment.

4. Increase/Decrease of Investment in California

As modeled in the SRIA, the proposed amendment would produce very small impacts on California private business investment from 2017 through 2020 (Table 4). The change in private investment can be linked to decreased cash flow of ZEV manufacturers resulting from reduced ZEV credit revenue, restricting potential investment in capital equipment.

Table 4: Change in Gross Domestic Private Investment Growth

		2017	2018	2019	2020
Private Investment	**Change (percent)**	0.01%	0.01%	0.00%	0.00%
	Change (2014 M$)	-$23.38	-$34.75	-$16.44	-$6.44

The values presented above are rounded to the nearest $10,000.

5. Incentives for Innovation in Products, Materials, or Processes

The proposed amendment does not change the opportunity to generate ZEV credits for manufacturing zero emission vehicles, nor would it eliminate the opportunity to generate fast refueling credits through a battery exchange program. ZEV manufacturers are still encouraged and awarded credits for innovative technologies and methods that allow for fast refueling. Implementation of the proposed amendment would only serve to ensure the integrity of the ZEV credit market. Table 5 shows that the proposed amendment slows output growth for the California motor vehicle manufacturing industry in 2017 and 2018.

Table 5: Changes in Output Growth

Industry Name		2017	2018	2019	2020
Motor Vehicle Manufacturing	**Change (percent)**	-0.21%	-0.21%	0.00%	0.00%
	Change (2014 M$)	-$11.26	-$11.19	$0.00	$0.00

. The values presented above are rounded to the nearest $10,000.

6. Benefits of the Proposed Regulation

The objective of the proposed amendments to the ZEV Regulation is to make changes to the fast refueling provisions. The proposed regulatory changes would ensure that fast refueling credits are awarded for extension of vehicle range and utility. Continued compliance with the ZEV Regulation will create a positive impact on emission benefits and air quality throughout California.

D. Reasonable Alternatives to the Regulation and the Agency's Reason for Rejecting those Alternatives

Staff analyzed two alternatives to the proposed amendment to the ZEV Regulation:

- Do not amend the ZEV Regulation (No Project Alternative);
- Remove the fast refueling provision for battery swap events.

No alternative considered by the agency would be more effective in carrying out the purpose for which the regulation is proposed or would be as effective as or less burdensome to affected private persons than the proposed regulation.

1. Alternative 1: No Action. The ZEV Regulation's Fast Refueling Credit Provision is Not Amended.

a. Costs and Benefits

Alternative 1 would impose no additional costs on consumers or ZEV manufacturers relative to the BAU. This scenario would allow the ZEV Regulation to continue as it was written in California Code of Regulations, title 13, section 1962.1.

b. Economic Impacts

Since Alternative 1 does not impose any additional costs to industries or consumers, there would be no economic impacts relative to the BAU scenario. The current ZEV Regulation is included in the BAU scenario, and would continue to be implemented through the period in which the proposed amendment would be implemented. Compared to the BAU scenario, there would be no changes in GSP, personal income, private investment, or other economic indicators.

c. Cost-Effectiveness

Alternative 1 may be a less-costly alternative compared to the proposed amendment as it does not impose any fiscal costs or regulatory costs that may be associated with the development and enforcement of the proposed amendment.

d. Reason for Rejection

Alternative 1 does not sufficiently meet the goals of the proposed amendment, which is to ensure that any vehicle earing additional ZEV credits under the fast refueling provisions has participated in an actual fast refueling event. Therefore, it is not a viable alternative to the proposed amendment.

2. Alternative 2: Remove the Battery Swap Program from Qualifying as Fast Refueling

Alternative 2 would effectively disallow credit generation from the battery swap program and additional ZEV credits for battery swap events would not be generated.

a. Costs and Benefits

Alternative 2 would have a direct cost to ZEV manufacturers, as ZEV credit revenue would decline relative to the current ZEV Regulation. As modeled (analogous to the analysis of the proposed amendment), this would result in higher consumer prices for new vehicles. Compared to the existing ZEV Regulation, this alternative would entirely

eliminate revenue generated from battery swap demonstrations. Based on projections for MY 2017, the direct cost imposed on manufactures from this alternative would be $262.5 million (see Figure 1, *infra*), spread over calendar years 2017 and 2018.

Based on the modeling assumption made by ARB, the direct cost can be estimated using Eq. 3, where $\Delta = 5P \cdot TR \cdot V(SW_i - SW_j)$.

Using the same inputs used to estimate the direct cost of the proposed amendment, this alternative would require that $SW_j = 0$ (i.e., no battery swap events are awarded ZEV credits):

$$\Delta = 5(\$3{,}500) \cdot 0.03 \cdot 20{,}000(25 - 0) = \$262{,}500{,}000.$$

b. Economic Impacts

As modeled, Alternative 2 would have a very small impact on GSP, personal income, and private investment. The greatest impacts are during the first two years as the proposed amendment is implemented. In the following years, the effects of the economic impacts are attenuated. Through 2020, there are negligible declines in the growth of GSP, personal income, and private investment. These results are not considerably different from the estimated impacts under the proposed amendment and are presented in Table 6.

Table 6: Alternative 2 (Compared to BAU)

		2017	2018	2019	2020
Employment Growth	**Change (percent)**	0.01%	0.01%	0.00%	0.00%
	Change (2014 M$)	-1,250	-1,350	-175	-75
Motor Vehicle Manufacturing Output	**Change (percent)**	-0.26%	-0.25%	0.00%	0.00%
	Change (2014 M$)	-$11.73	-$11.65	$0.00	$0.00
Private Investment	**Change (percent)**	0.01%	0.01%	0.00%	0.00%
	Change (2014 M$)	-$23.35	-$34.30	-$15.29	-$5.16
Personal Income	**Change (percent)**	0.00%	0.00%	0.00%	0.00%
	Change (2014 M$)	-$76.90	-$93.26	-$24.90	-$15.63
GSP	**Change (percent)**	0.00%	0.01%	0.00%	0.00%
	Change (2014 M$)	-$104.98	-$115.72	-$16.60	-$7.08

c. Cost-Effectiveness

Alternative 2 would have significantly lower regulatory and enforcement costs, when compared to the proposed amendment, as no enforcement and regulation-maintenance efforts would be required.

d. Reason for Rejection

While Alternative 2 may provide a lower cost solution, it does not provide the desired encouragement for development of innovative methods to refuel ZEVs at speeds equivalent to those of gasoline- or diesel-powered cars. Therefore, Alternative 2 does not meet the goals of the ZEV Regulation and is not a viable alternative to the proposed amendment.

3. IMPACT ON SMALL BUSINESS – The Board has not identified any alternatives that would lessen any adverse impact on small business, because the proposed amendment and alternatives do not affect small business.

E. Significant Adverse Economic Impact directly affecting business

1. Direct Costs on Typical Businesses

The primary entities affected by the proposed amendment are ZEV manufacturers that will sell MY 2017 automobiles in California with battery swap capabilities that qualify for ZEV fast refueling credits.[15]

Direct Cost Estimation

Under the current ZEV Regulation, manufacturers can sell excess credits to other manufacturers and create a significant revenue stream. Currently, ZEV-only manufacturers are using battery swapping as a fast refueling mechanism. These manufacturers sell credits to generate additional revenue.

The estimated direct cost imposed on manufacturers by the proposed amendment can be calculated through the change in revenue generated by ZEV fast refueling credits. Fast refueling credit revenue depends on the number of fast refueling events that are demonstrated by MY 2017 vehicles within the first year of their placement in the California market. The change in credit revenue between the BAU scenario i and the proposed amendment j, is denoted Δ, and can be modeled as:

$$\Delta = P\left[\left(Q_B + Q_{FR_i}\right) - \left(Q_B + Q_{FR_j}\right)\right], \qquad \textbf{Eq. 1}$$

where P denotes the dollar value of a ZEV credit, Q_B represents the allotted amount of ZEV base credits, and Q_{FR} represents ZEV fast refueling credits. ZEV base credits

[15] As the ZEV Regulation's fast refueling credit provisions will be discontinued beginning with MY 2018 vehicles, the proposed amendment will only affect MY 2017 ZEV manufacturers with fast refueling capabilities. MY 2018 and beyond ZEVs will be awarded credits based on standard driving cycle range.

represent the number of credits a qualifying ZEV would receive in the absence of a documented fast refueling event. Fast refueling credits are the number of credits a qualifying ZEV would receive (in addition to the base credits) for a documented fast refueling event.

Under the current ZEV Regulation, a MY 2017 manufacturer can earn 4 base credits for each Type V ZEV it places in the California market, and an additional 5 fast refueling credits for each demonstrated fast refueling event. However, the manufacturer can only report up to 25 fast refueling events within a 12-month period from delivery of each MY 2017 vehicle. The number of creditable fast refueling events also cannot exceed the total number of MY 2017 vehicles in the manufacturer's vehicle fleet.

Let V denote the projected sales volume for the MY that this amendment will affect (2017), SW the number of annual swaps, and TR the take rate of fast swap stations. Then Eq. 1 can also be represented as follows:

$$\Delta = P(4V + 5TR \cdot V \cdot SW_i) - P\big(4V + 5TR \cdot V \cdot SW_j\big), \qquad \textbf{Eq. 2}$$

where $P \geq 0$, $V \geq 0$, $0 \leq TR \leq 1$, and $0 \leq SW \leq 25$.

Inputs

Estimating the direct costs of the proposed amendment, as outlined in Eq.2, requires assumptions related to the cost of ZEV credits over time, ZEV sales in California, and the number of battery swaps per vehicle. In this document, generous assumptions are made to avoid underestimating the true cost impact, including assumptions related to the inputs defined below.

Credit Price: The credit price is the dollar value of a single credit traded in the ZEV credit market. ARB estimates a ZEV credit price of $3,500.

The ZEV credit price is calculated by dividing the credit revenues reported by ZEV manufacturers for fiscal year 2013 by the number of credits transferred or sold during the same time period. For this calculation, ARB used public filings of ZEV credit revenues reported to the U.S. Securities and Exchange Commission (SEC) and ZEV credit transfers between manufacturers and third parties reported to ARB.[16,17]

[16] Manufacturers' ZEV credit revenues are reported to the U.S. SEC in Quarterly and Annual Reports (Forms 10-Q and 10-K), pursuant to section 13 or 15(d) of the Securities Exchange Act of 1934. ARB based credit price assumptions on ZEV credit revenues for fiscal year 2013 (October 1, 2012 – September 30, 2013), which are reported in nominal dollars. ARB was unable to estimate the credit price for other fiscal years due to data limitations.

[17] ARB, 2012b. California Air Resources Board. September 3, 2013. 2012 Zero Emission Vehicle Manufacturer Credit Balances. http://www.arb.ca.gov/msprog/zevprog/zevcredits/2012zevcredits.htm.

ARB assumes that the value of a ZEV credit, here estimated at $3,500, will hold for credit transfers taking place during the period when the proposed amendment is expected to take effect in MYs 2017 through 2018.[18]

Sales Volume: Sales volume is the total number of battery swap capable MY 2017 ZEVs that will be produced and delivered for sale in California. ARB estimates there will be 20,000 MY 2017 Type IV and V ZEVs that qualify for fast refueling credits based on review of 2012, 2013, and 2014 ZEV sales in California.[19]

ARB assumes all battery swap capable MY 2017 ZEVs will be Type V vehicles with electric ranges of at least 300 miles. These vehicles qualify for the largest number of combined ZEV base and fast refueling credits, a total of 9 credits for MY 2017.

Take Rate: The take rate is the proportion of projected MY 2017 Type V ZEV sales that are expected to receive fast refueling credits. ARB estimates that battery swap facilities in California will serve 3 percent of the MY 2017 Type V ZEV fleet (600 unique vehicles) between 2017 and 2018.

Currently, there is one battery swap facility operating in California.[20] The fastest, non-home based charging alternative to a battery swap is a charging facility that can offer more than 100kW of power output. At the time of this analysis 29 DC Quick Chargers were available in California that could output more than 100kW.[21] Assuming the ratio of battery swap facilities to DC Quick Chargers persists through 2018 (1 battery swap for every 29 DC Quick Charge facilities), ARB assumes 3 percent of all MY 2017 vehicles with fast charge capability will utilize the battery swap facility. Thus, the battery swap station would accommodate up to 600 MY 2017 ZEVs with fast refueling capabilities (out of the projected 20,000), a take rate of 3 percent.

Annual Swaps: Annual swaps are the number of demonstrated battery swap events expected in a year. An estimate of annual swaps is used in the BAU scenario for evaluating the impact of the proposed amendment. Since manufacturers are currently allowed to report up to 25 fast refueling events per battery swap of one vehicle, as an upper bound ARB assumes that each MY 2017 Type V ZEV would take 25 trips annually that are long enough to warrant battery swap events. This assumption is made both in the BAU scenario and in the modeling of the proposed amendment.

Direct Cost Estimation Results

[18] The price of a ZEV credit is not expected to exceed the $5,000 penalty applied to manufacturers that do not comply with ARB's ZEV standards (California Health and Safety Code section 43211). ARB interprets the overall penalty for ZEV non-compliance to be $5,000 per whole credit not produced.

[19] The 20,000 vehicle sales estimate includes likely increases in ZEV production volume and the introduction of new models (of both Type IV and Type V ZEVs) between MYs 2015 and 2017.

[20] Tesla, 2014. Teslamotors.com. December 19, 2014. Blog: Battery Swap Pilot Program. http://www.teslamotors.com/blog/battery-swap-pilot-program. Accessed May 7, 2015.

[21] U.S. DOE, 2015. U.S. Department of Energy's Alternative Fueling Station Locator. September 9, 2015. http://www.afdc.energy.gov/locator/stations/.

From the inputs discussed above, the estimated change in ZEV credit revenue resulting from the proposed amendment is:

$$P = \$3{,}500, \qquad TR = 0.03, \qquad V = 20{,}000, \qquad SW_i = 25, \qquad SW_j = 1;$$

$$\Delta = \$262{,}500{,}000 - \$10{,}500{,}000 = \$\mathbf{252{,}000{,}000}.$$

Figure 1: ZEV Fast Refueling Credit Valuation (or Revenues)[22]

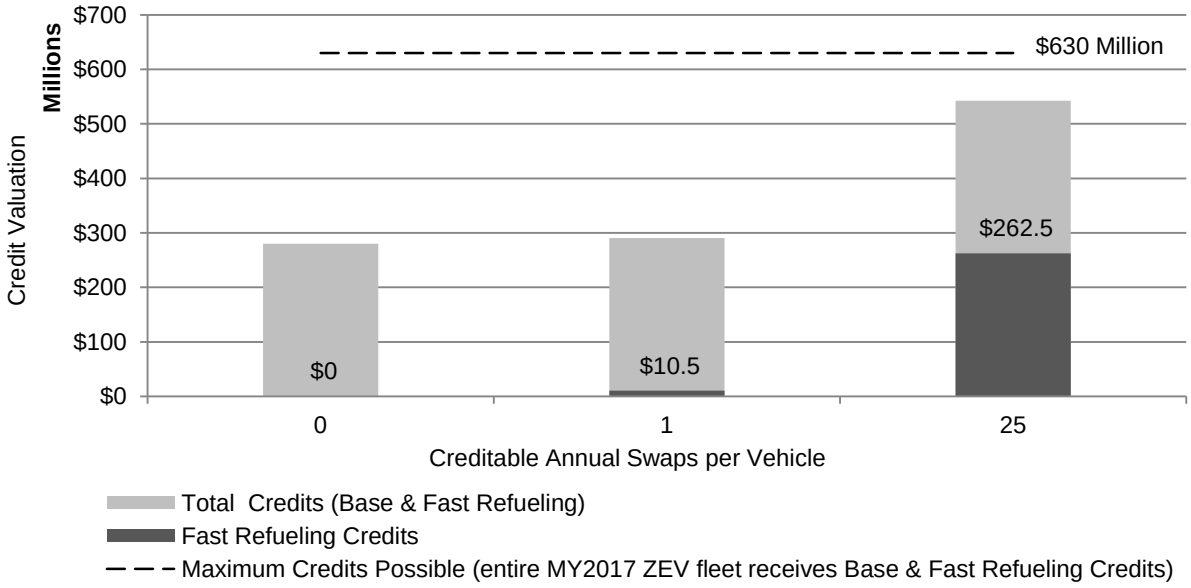

Figure 1 shows the estimated change in credit revenue between the BAU scenario, with an assumed 25 battery swaps per MY 2017 vehicle, and the proposed amendment, with one battery swap per MY 2017 vehicle. The proposed amendment is estimated to result in a $252 million loss in credit revenues for California ZEV manufactures.

The direct cost impacts of the proposed amendment depend on the number of annual battery swaps that qualify for a fast refueling event:

$$\Delta = 5P \cdot TR \cdot V\left(SW_i - SW_j\right). \qquad \textbf{Eq. 3}$$

As outlined in Eq. 3, the estimated change in ZEV credit revenue is based on the difference between SW_i and SW_j. All other estimated variables used to measure the direct cost impacts of the proposed amendment (credit price, in particular) are assumed to remain unchanged between the BAU scenario and the proposed amendment.

[22] Figure 1 relies on ARB's estimates of the ZEV credit price ($3,500), sales volume of MY 2017 Type V ZEVs in California (20,000), annual take rate at battery swap facilities (3 percent), and the annual swaps per vehicle (0, 1, and 25).

Modified Annual Swaps Scenario

ARB also considered a second scenario in estimating the direct costs of the proposed amendment. The modified annual swap scenario varies only in the assumed number of annual swaps per MY 2017 ZEV. Rather than assume the maximum of 25 annual battery swaps, this scenario relies on a calculation of the likely number of annual swaps that would be demonstrated by MY 2017 ZEVs. Assuming all MY 2017 ZEVs are Type V and capable of fast refueling and achieving 300 miles of electric range, ARB estimated the number of swaps needed to meet the average driver's daily driving needs in a year. While assumptions about credit price, sales volume, and take rate are unchanged, additional inputs were used to estimate the required number of swaps, as detailed below.

Fleet Utility Factor: The fleet utility factor characterizes the proportion of days and trips in a year that the average driver can meet his/her conventional driving needs by the Average Electric Range (AER) of a vehicle in a particular fleet. The fleet utility factor is calculated by dividing the charge-depleting miles of a specific fleet of vehicles by their total miles traveled.[23]

Utility Factor Gap: The utility factor gap measures the difference between full vehicle utility (100 percent) and the fleet utility factor. The fleet utility factor is calculated using average trips and miles driven per day, thus the utility factor gap can be multiplied by 365 to estimate the proportion of days in a year that a vehicle's AER does not satisfy conventional driving needs. ARB assumes that the maximum number of battery swap events should not exceed the proportion of days where conventional driving needs are not met by a vehicle's usable AER.[24]

Annual Swaps: Based on SAE International's calculations of fleet utility factor, ARB estimates that each MY 2017 Type V ZEV would take 10 trips annually that are long enough to warrant battery swap events. Under this scenario, ARB estimates that the likely number of reported fast refueling events per MY 2017 vehicle would not exceed 10, on average, in both the BAU and under the proposed amendment.

Figure 2 illustrates varying ranges of a fleet's AER and the corresponding utility factor gap and number of annual battery swap events:

[23] SAE, 2009. SAE International, J2841. Revised September 2010. Utility Factor Definitions for Plug-In Hybrid Electric Vehicles Using Travel Survey.

[24] Since, on average, ZEVs do not completely deplete their battery charge before recharging, a reserve range of 40 miles is used to approximate an electric vehicle's usable AER.

Figure 2: Annual Swaps based on Utility Factor Gap[25]

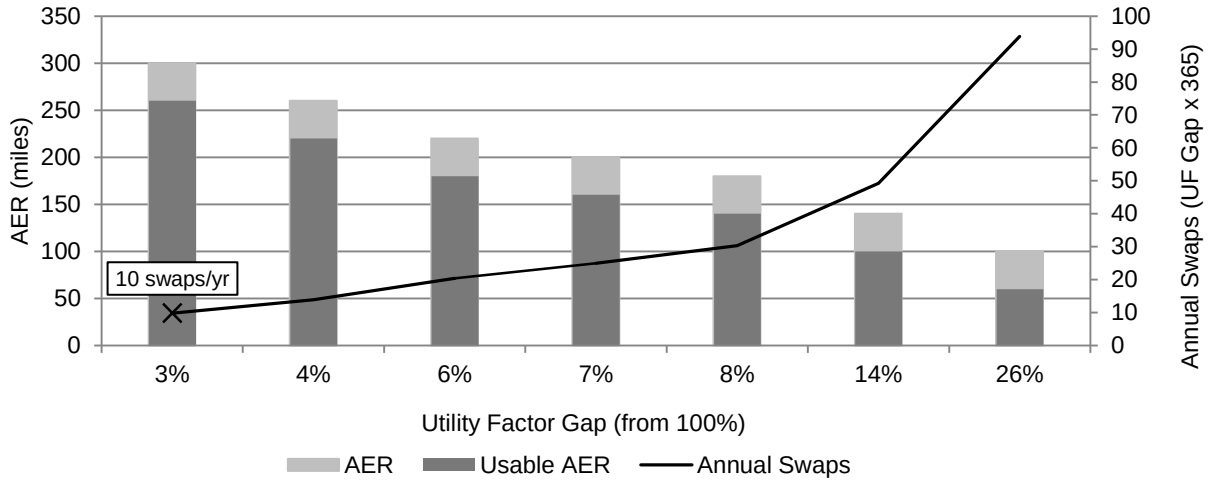

Figure 2 shows that the annual number of fast refueling events increases significantly for vehicles that have a lower AER. Since all MY 2017 ZEVs are assumed to be capable of achieving 300 miles, the corresponding usable AER, utility factor, and utility factor gap for these vehicles are: 260 miles, 97 percent, and 3 percent, respectively. Therefore, in the first 12 months after a vehicle has been placed, ARB estimates that the likely number of reported fast refueling events per vehicle would not exceed 10 for MY 2017 ZEVs.

Direct Cost Estimation Results of the Modified Annual Swaps Scenario

From the inputs discussed above, the estimated change in ZEV credit revenue resulting from the proposed amendment is:

$$P = \$3{,}500, \qquad TR = 0.03, \qquad V = 20{,}000, \qquad SW_i = 10, \qquad SW_j = 1;$$

$$\Delta = \$105{,}000{,}000 - \$10{,}500{,}000 = \$\mathbf{94{,}500{,}000}.$$

[25] SAE, 2009. Society of Automotive Engineers (SAE) J2841. Revised September 2010. Utility Factor Definitions for Plug-In Hybrid Electric Vehicles Using Travel Survey.

Figure 3: ZEV Fast Refueling Credit Valuation (or Revenues) including Modified Annual Swaps Scenario[26]

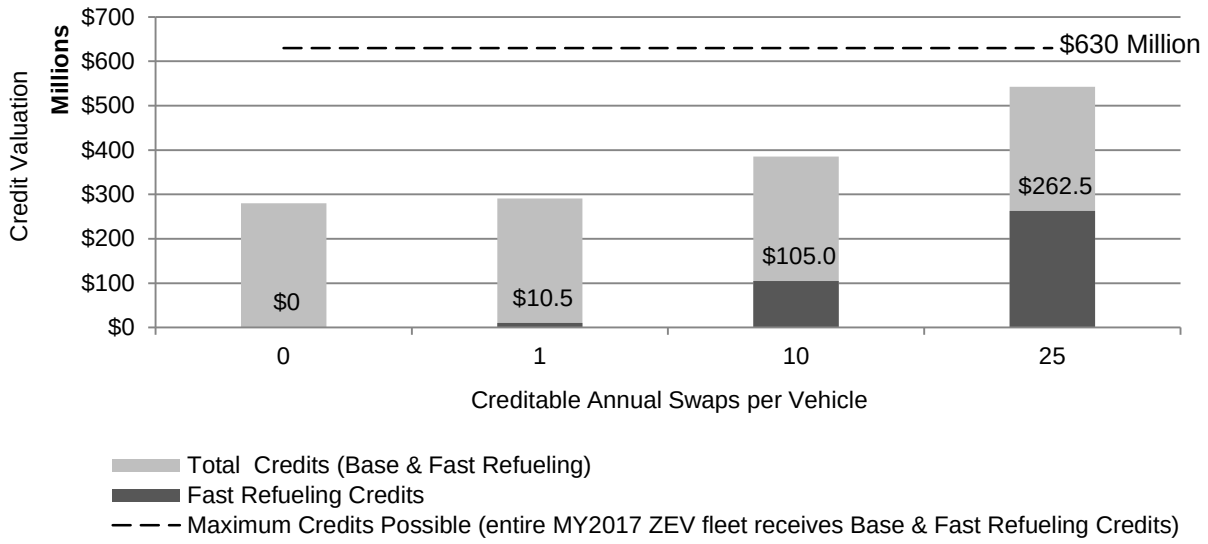

Figure 3 shows the estimated change in credit revenue between the current ZEV Regulation (assuming 10 and 25 battery swaps per vehicle) and the proposed amendment with one battery swap per vehicle. Under the modified annual swaps scenario (assuming 10 battery swaps), the proposed amendment could result in an estimated $94.5 million loss in credit revenues for California ZEV manufactures.

While it is plausible, and even likely, that MY 2017 ZEVs will demonstrate at most 10 annual battery swaps, the current regulation allows for 25 battery swaps per vehicle to qualify for credits. Therefore, to estimate the upper bound of the economic impacts of the proposed amendment, ARB assumes that MY 2017 ZEVs will take 25 trips annually that are long enough to warrant battery swaps under the current regulation. The direct cost impact derived from this assumption, $252 million, is used in the remainder of the document to estimate the impacts of the proposed amendment on California's economy, and should be considered an upper bound of the potential cost impact of the proposed regulation.

F. Justification for Adoption of Regulations Different from Federal Regulations Contained in the Code of Federal Regulations

Currently, there are no comparable federal regulations mandating auto manufacturers to produce TZEVs and/or ZEVs. California has authority to set its own standards to reduce emissions further to meet federal and state ambient air quality standards and climate change requirements and goals, and to require additional and separate

[26] Figure 3 relies on ARB's estimates of the ZEV credit price ($3,500), sales volume of MY 2017 Type V ZEVs in California (20,000), annual take rate at battery swap facilities (3 percent), and the annual swaps per vehicle (0, 1, 10, and 25).

reporting. The differing state requirements proposed are necessary to achieve additional benefits for human health, public welfare, and the environment as envisioned by authorizing legislation.

VII. SUMMARY AND RATIONALE FOR PROPOSED REGULATIONS

The need and rationale for the proposed amendment was detailed and discussed extensively in Section III. In this section, staff seeks to give a clear and simple description of the proposed amendment to the ZEV Regulation.

Pursuant to Government Code sections 11346.2(b)(1) and 11349.1, and California Code of Regulations, title 1, section 10, staff is providing a brief summary below that identifies the section in the regulation where the amendment is proposed and describes the rationale for the proposed amendment. Proposed modifications to the regulations that merely correct errors in the text or are editorial in nature are not summarized below.

§1962.1 Zero-Emission Vehicle Standards for 2009 through 2017 Model Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.

Subdivision (d)(5)(B)1. The purpose of this subdivision is to define issuance of fast refueling ZEV credits. Language has been amended in order to reduce the current number of eligible fast refueling events for any Type III, IV, or V ZEV from the current level of 25 per vehicle, to allow only one eligible fast refueling event per vehicle.

List of Changes to "California Exhaust Emission Standards and Test Procedures for 2009 through 2017 Model Zero-Emission Vehicles and Hybrid Electric Vehicles in the Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicle Classes"

Section C. Zero Emission Vehicle Standards

The amendment made to section 1962.1 has been duplicated in this section of the test procedure.

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