ADVANCED CLEAN CARS SUMMARY

1. Background

Despite significant progress in reducing smog-forming and particulate matter criteria emissions from the passenger vehicle fleet, California needs further reductions in order to meet health-based State and federal ambient air quality standards. In addition, climate change continues to pose a serious threat to the economic well-being, public health, natural resources, and the environment of California.

To address the challenge presented by climate change, vehicle greenhouse gas (GHG) emissions must be drastically reduced if we are to meet our goal of an 80 percent reduction by 2050. This 40 year outlook is a far longer time horizon than those employed by the federal agencies under the Clean Air Act, or the requirements to develop the corporate average fuel economy (CAFE) standards. Policies developed under this longer policy timeframe also deliver a continuous policy message to both the manufacturers and consumers that California is committed to significant changes to clean up the cars and lights trucks we drive. We have to start now. There is no time to lose.

Over the past three years California has worked with federal agencies to ensure that the stringent greenhouse gas standards, if adopted, will achieve the dramatic reductions that meet California's needs. Together these standards will provide consumers with the next generation of vehicles, designed to reduce multiple pollutants, while preserving vehicle choice and saving money.

California's Advanced Clean Cars Program

Continuing its leadership role in developing innovative and ground breaking emission control programs, Air Resources Board (ARB) staff has developed the Advanced Clean Cars program, a pioneering approach of a 'package' of regulations, although separate in construction are related in terms of the synergy developed to address both ambient air quality needs and address climate change.

The Advanced Clean Cars program combines the control of smog, soot causing pollutants and greenhouse gas emissions into a single coordinated package of requirements for model years 2015 through 2025. And assures the development of environmentally superior cars that will continue to deliver the performance**,** utility, and safety vehicle owners have come to expect.

The ZEV program will act as the focused technology of the Advanced Clean Cars program by requiring manufacturers to produce increasing numbers of ZEVs and plug-in hybrid electric vehicles in the 2018-2025 model years.

Consumer labeling patterned on California's revolutionary environmental performance label will provide important emissions information in a graphical, easy-to-read and understand format for comparing new vehicle emissions.

In addition, the Advanced Clean Cars program includes amendments to the Clean Fuels Outlet regulation that will assure ultra-clean fuels such as hydrogen are available to meet vehicle demands brought on by these amendments to the ZEV program.

Driving Technology and Improving the Economy

California is a clear leader in innovation and venture capital investment, which will benefit from the Advanced Clean Cars package. California received over half of all clean-tech venture capital investments in the U.S. in the last quarter,[1] and is well poised to continue to serve as an economic hub for technology and job creation related to clean vehicles in the coming years.

These regulations, especially the zero emission vehicle rules, are creating the jobs of the twenty-first century now in California. Three innovative automakers have opened shop in California, and are pushing the market forward and creating jobs in the State. Tesla Motors has resurrected auto manufacturing in California, purchasing and retooling the former NUMMI plant in Fremont, California to produce its Model S sedan. Manufacturing at the Tesla facility is expected to create about 1,000 manufacturing jobs, up to a quarter of those lost when the NUMMI facility closed.[2] Just last week, CODA Automotive opened its new global headquarters in Los Angeles, which will allow the company to grow significantly in coming years. The company also has an assembly plant in Benicia, California, where final assembly of its sedan occurs. Southern California is also home to the global headquarters of ZEV producer Fisker Automotive, as well as engineering and design facilities for many larger automakers and their clean cars programs.

In addition to the automakers, the job and economic center of the plug-in electric vehicle charging sector is in California. In the tradition of the State's innovation driven economy, these companies are helping to develop the early market for ZEVs with novel financing and charging options. Vehicle operating and total cost savings that will materialize as a result of the Advanced Clean Cars program will also increase consumer purchasing power. This effectively puts more cash in Californians' pockets, pumping money back into the local economy, with the resulting effect of increasing economic output and job creation in the State overall. As the standards ramp up, economic modeling suggests an increasing positive economic impact to the State; consumer savings on fuel and operating costs will lead to thousands of additional jobs in the State this decade, and tens of thousands in the next.

Greenhouse Gas Emissions

Recognizing the increasing threat of climate change to the well-being of California's citizens and the environment, in 2002 the Legislature adopted and the Governor signed AB 1493 (Chapter 200, Statutes 2002, Pavley). AB 1493 directed ARB to adopt the maximum feasible and cost-effective reductions in GHG emissions from light-duty

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[1] See: http://www.ey.com/US/en/Newsroom/News-releases/Large-Energy-Storage-deals-push-US-VC-investment-in-cleantech

[2] See: http://abclocal.go.com/kgo/story?section=news/business&id=7453388

vehicles. Vehicle GHG emissions included carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) that are emitted from the tailpipe, as well as emissions of HFC134a, the refrigerant then used in most vehicle air conditioning systems.

As directed by AB 1493, ARB adopted what is commonly referred to as the Pavley regulations, the first in the nation to require significant reductions of GHGs from motor vehicles. These regulations, covering the 2009-2016 and later model years, call for a 17 percent overall reduction in climate change emissions from the light-duty fleet by 2020 and a 25 percent overall reduction by 2030. They also formed the foundation for the federal GHG and fuel economy programs for light-duty vehicles for 2012-2016 model years.

After the Board adopted the Pavley regulations, the Legislature adopted and the Governor signed AB 32, the California Global Warming Solutions Act (Chapter 488, Statutes 2006, Nuñez/Pavley.) AB 32 charges ARB with the responsibility of monitoring and regulating GHG emissions in the State. AB 32 also directed ARB to prepare a scoping plan outlining the State's strategy to achieve the maximum feasible and cost-effective reductions in furtherance of reducing GHG emissions to 1990 levels by 2020. Measure T1 of the scoping plan anticipates an additional 3.8 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) reduction from the passenger vehicle fleet by 2020 beyond the reductions from the 2009-2016 AB 1493 standards.

In addition, in 2005, in order to mitigate the long-term impacts of climate change, the Governor issued Executive Order S-3-05. Among other actions, the Executive Order called for reducing GHG emissions to 80 percent below 1990 levels by 2050. This ambitious yet achievable reduction path and goal are considered necessary to stabilize the long-term climate.

ZEV Program

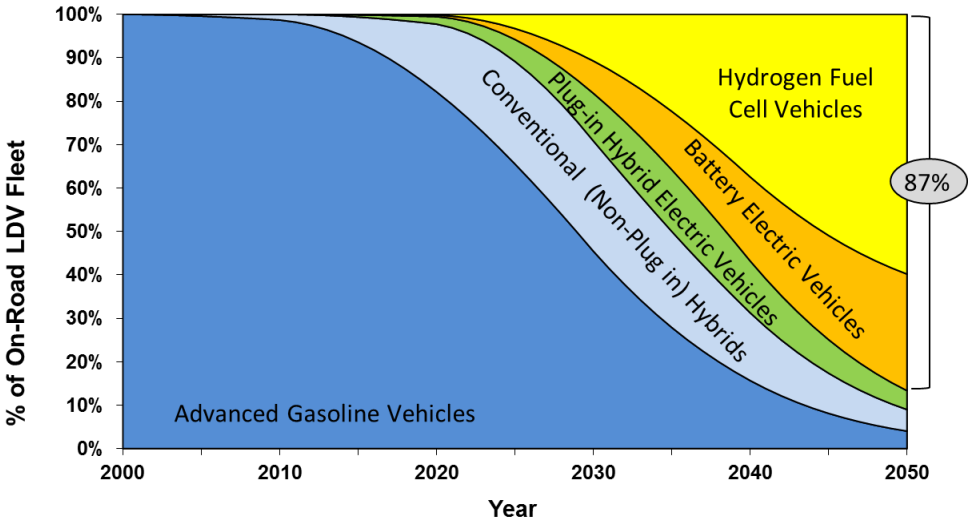
Although originally part of the LEV program, ARB established the ZEV program as a stand-alone regulation in 1999, in recognition of the increasing maturity of zero emission technologies and the critical role they can play in achieving California's air quality goals. Since then, the program has been modified several times to address the pace of development of zero emission technologies.

At its March 2008 hearing, the Board directed staff to redesign the 2015 and later model year ZEV program by strengthening the requirement and focusing primarily on zero emission technologies – battery electric vehicles, hydrogen fuel cell vehicles, and plug-in hybrid electric vehicles – in order to ensure that these low GHG technology vehicles transition from the demonstration phase to full commercialization in a reasonable timeframe to meet long-term emission reduction goals. The proposed amendments to the ZEV program are presented in a separate package, also part of this passenger vehicle rulemaking, as discussed next.

Preparing for the future; Moving beyond Advanced Clean Cars
Beyond 2025, the driving force for lowering emissions in California will be climate change. In order to meet our 2050 GHG goal, the new vehicle feet will need to be primarily composed of advanced technology vehicles such as electric and fuel cell vehicles by 2035 in order to have nearly an entire advanced technology fleet – that is, both new and used vehicles – by 2050. Accordingly, the Advanced Clean Cars program coordinates the goals of the LEV, ZEV, and Clean Fuels Outlet programs in order to lay the foundation for the commercialization and support of these ultra-clean vehicles.

Figure 1 shows the cumulative on-road passenger vehicle fleet mix for one scenario developed by staff that achieves California's 2050 GHG emission reduction goal. Importantly, ZEV sales must constitute nearly 100 percent of new vehicles in 2040 for ZEVs to constitute approximately 87 percent of the on-road fleet by 2050.

Figure 1. On Road Light-Duty Vehicle Scenario to Reach 2050 Goal



2. Low Emission Vehicle (LEV) Program

2.1 Criteria Emission Standards

In order to achieve further criteria emission reductions from the passenger vehicle fleet, staff is proposing several amendments representing a significant strengthening of the LEV program. The major elements of the proposed LEV III program are:

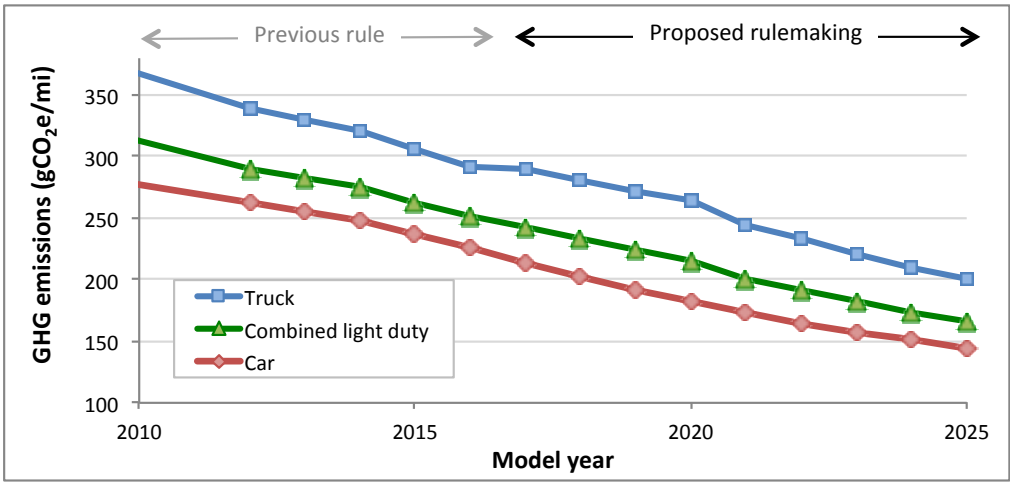
- A reduction of fleet average emissions of new passenger cars (PCs), light-duty trucks (LDTs) and medium-duty passenger vehicles (MDPVs) to super ultra-low-emission vehicle (SULEV) levels by 2025.

- The replacement of separate NMOG and oxides of nitrogen (NOx) standards with combined NMOG plus NOx standards. The combined ROG+NOx standard will decline from 0.100 for passenger cars and light-duty truck 1s and 0.119 for light-duty truck 2s and medium duty passenger vehicles in 2015 to 0.030 for all vehicle categories by 2030.
- An increase of full useful life durability requirements from 120,000 miles to 150,000 miles, which guarantees vehicles operate longer at these extremely low emission particulate levels.
- A backstop to assure continued production of super ultra-low-emission vehicles after PZEVs as a category are moved from the Zero-Emission Vehicle program to the LEV program in 2018.
- More stringent particulate matter (PM) standards for light- and medium-duty vehicles.
- Zero fuel evaporative emission standards for PCs and LDTs, and more stringent evaporative standards for medium-duty vehicles (MDVs).

2.2 Greenhouse Gas Emission Standards

For the 2017-2025 model year standards, ARB proposes to use the United States Environmental Protection Agency (USEPA) approach and adopt separate standards for CO_2, CH_4, and N_2O. The proposed GHG emission standards would reduce new passenger vehicles carbon dioxide (CO_2) emissions from their model year 2016 levels by approximately 34 percent by model year 2025, from about 251 to about 166 gCO_2/mile, based on the projected mix of vehicles sold in California. The basic structure of the standards includes two categories – passenger cars and light-duty trucks – that are consistent with federal categories for light-duty vehicles. The standard targets would reduce car CO_2 emissions by about 36 percent and truck CO_2 emissions by about 32 percent from model year 2016 through 2025. Figure 2 illustrates the basic target emission trends that are projected from the car and truck standards.

Figure 2. Target Emission Reductions from GHG Standards



The CH_4 and N_2O standards will reflect the same stringency as the original GHG standards. The net result is, like the current 2009-2016 California GHG standards, the proposed 2017-2025 standards account for all major sources of vehicle GHG emissions, including upstream emissions associated with vehicle fuels. In addition, California is proposing to align its vehicle air conditioning system requirements with federal requirements.

2.3 Maximum Feasible and Cost-Effective Technologies

Vehicle manufacturers need sufficient lead time to implement new technologies across their vehicle lines both from a feasibility and cost-effectiveness standpoint. Manufacturers will be resource challenged over the next 15 years as they strive to develop and implement technologies ranging from advanced gasoline and diesel engines to electric and fuel cell vehicles, while at the same time lowering criteria emissions of their combustion engines. The phase-in of the Advanced Clean Cars program requirements recognizes this by providing manufacturers with significant lead time and considerable compliance flexibility.

Criteria Emissions

The technology for controlling vehicle emissions is well understood and manufacturers have a wide range of emission control technologies available to achieve "near-zero-at-the-tailpipe (SULEV) emissions. Many of these technologies are already being used today on vehicles meeting LEV II requirements, and staff anticipates that with ongoing improvements to the effectiveness of these technologies, particularly catalyst technology, manufacturers will be able to meet the proposed requirements for smog forming emissions under the LEVIII element of the Advanced Clean Cars package. For some vehicles, specifically the heavier vehicles with larger displacement engines, additional emission control componentry such as secondary air and hydrocarbon absorbers may be required to achieve the proposed emission levels.

Greenhouse Gas Emissions

The proposed GHG standards are also predicated on many existing and emerging technologies that increase engine and transmission efficiency, reduce vehicle energy loads, improve auxiliary and accessory efficiency, and recognize increasingly electrified vehicle subsystems with hybrid and electric drivetrains. Many technologies reduce both criteria emissions and GHGs, with this synergy enhancing technologies, cost effectiveness and demonstrating the importance of California analyzing the passenger vehicle fleet program as a whole.

Previous rulemakings (i.e., California's 2009-2016 and federal 2012-2016 standards) established an original technical basis for the proposed GHG standards. This rulemaking builds on this existing technical foundation with new technical data and the understanding of evolving state-of-the-art engine, transmission, hybrid, and electric-drive technologies. As part of this effort, and without conceding any of California's separate authority, staff has been working with the USEPA and the National Highway Transportation Safety Administration (NHTSA) since early last year to develop a unified national GHG program for motor vehicles beyond 2016. Importantly, while California proposes accepting national program compliance at manufacturers' option, California is only doing so because it believes the proposed standards are stringent enough to meet State GHG emission reduction goals.

2.4 Environmental Impacts

Criteria Emissions

Table 1 provides the emission benefits for calendar years 2023, 2025, 2035, and 2040 for reactive organic gas (ROG), oxides of nitrogen (NOx), and particulate matter (PM2.5) respectively. Emission benefits are fully realized in the 2035-2040 timeframe when nearly all vehicles operating in the fleet are expected to be compliant with the proposed Advanced Clean Car standards. By 2035 ROG statewide emissions would be reduced by an additional 21 percent, NOx emissions by an additional 36 percent, and PM2.5 emissions by 11 percent.

Table 1. Statewide Emission Benefits of the Advanced Clean Car Program: Reactive Organic Gas (ROG), Oxides of Nitrogen (NOx) and Particulate Matter (PM 2.5)

Statewide ROG (tons/day)				
Calendar Year	Adjusted Baseline	Proposed Regulation	Benefits	Percent Reduction
2023	193.2	190.1	3.1	2%
2025	179.1	173.4	5.8	3%
2035	144.9	114.1	30.8	21%
Statewide NOX (tons/day)				
Calendar Year	Adjusted Baseline	Proposed Regulation	Benefits	Percent Reduction
2023	201.3	186.7	14.7	7%
2025	183.7	162.3	21.3	12%
2035	136.8	88.0	48.9	36%
Statewide PM2.5 (tons/day)				
Calendar Year	Adjusted Baseline	Proposed Regulation	Benefits	Percent Reduction
2023	28.2	27.4	0.8	3%
2025	28.6	27.5	1.1	4%
2035	30.5	27.2	3.3	11%

Greenhouse Gas Emissions

The Advanced Clean Cars program would provide major reductions in greenhouse gas emissions. Table 2 shows the greenhouse gas emission benefits in 2020, 2025, 2035, and 2050. By 2025, CO_2 equivalent emissions would be reduced by 13 million metric tons (MMT) per year, which is 12 percent from baseline levels. The reduction increases in 2035 to 31 MMT/Year, a 27 percent reduction from baseline levels. By 2050, the proposed regulation will reduce emissions by more than 40 MMT/Year, the equivalent of taking 8 million cars off the road and a reduction of 33 percent from baseline levels. Viewed cumulatively over the life of the regulation (2017-2050), the proposed Advanced Clean Cars regulation would reduce emissions by more than 850 MMT CO_2 Equivalent, roughly double the total greenhouse gas emissions of California in 1990.

Table 2. CO_2-Equivalent (CO_2e) Emission Benefits from Advanced Clean Car Regulations

Statewide CO_2e Emissions (Million Metric Tons / Year)				
Calendar Year	**Adjusted Baseline with Rebound**	**Proposed Regulation with Rebound**	**Benefits**	**Percent Reduction**
2020	111.7	108.5	3.2	3%
2025	110.9	97.0	13.8	12%
2035	116.1	84.2	31.9	27%
2050	132.4	89.2	43.3	33%

2.5 Cost Effectiveness

Criteria Emissions

Staff based its cost-effectiveness analysis on the projected increase in vehicle price assuming all new vehicles meet the SULEV emission standard in 2025. Table 3 lists the average incremental costs for light-duty LEV III vehicles in 2025.

Table 3. Average Incremental Costs for Light-Duty LEV III Vehicles in 2025

Category	Initial MY2008 certification level	Engine size			Average price ($/vehicle)	Average price ($/vehicle)	Average price to consumer ($/vehicle)
		4-cyl	6-cyl	8-cyl			
PC/LDT1 (up to 8,500 lbs)	LEV	$96	$160	$299	$148	$60	$86
	ULEV	$52	$90	$194	$74		
	SULEV	$0	$1	$2	$0		
LDT2 (8,500 to 14,000 lbs)	LEV	$96	$160	$299	$183	$135	
	ULEV	$52	$90	$194	$128		
	SULEV	$0	$1	$2	$0		

The analysis concluded that the average cost-effectiveness of light-duty vehicles meeting the LEV III program exhaust requirements relative to the 2008 fleet is approximately $5.00 per pound of Non-Methane Organic Gases (NMOG) and Oxides of Nitrogen (NOx) reduced. Staff also concluded that, since the proposed particulate matter (PM), that is, fine soot and other particle standards would be met by engine modifications during the normal course of engine development, no incremental increase in vehicle price would occur as a result. This cost estimate is likely conservative because the baseline 2008 fleet emissions are higher than the 2010 fleet emissions when LEV II is fully phased-in. In addition, the 2025 fleet is projected to include a greater portion of down sized four and six cylinder engines that incur the lower costs to meet SULEV emissions. Stationary source controls can range up to $10 per pound of emissions reduced.

Greenhouse Gas Emissions

Many of the technologies that reduce climate change emissions will also reduce the operating costs of light-duty vehicles. Estimates of the average reduction in operating costs of the new vehicles range from about 4 percent for model year (MY) 2017 vehicles, to over 25 percent for MY2025 vehicles. For every dollar spent, the regulation could save consumers about $3. These savings include the expenditures on electricity and hydrogen associated with operating the greater volume of ZEVs being proposed; in the absence of those amendments the savings would be greater. Overall, purchasers of new vehicles in 2017 and beyond would experience a significant reduction in their operating cost as a result of the proposed regulation.

2.6 Economic Impacts

The greenhouse gas element of the Advanced Clean Cars program may impact several sectors of the economy. The steps that manufacturers will need to take to comply with the Advanced Clean Cars program are expected to result in price increases for new

vehicles, while leading to reduced operating costs. However, the operating cost savings from the use of more efficient vehicles will positively impact consumers and most businesses. Based on staff's analysis, the net effect of the program on the economy is expected to be small but positive.

ARB has made the achievement of environmental justice an integral part of its activities. Accordingly, staff evaluated the economic effects of the Advanced Clean Cars program on low-income households. For those households who purchase new vehicles, the economic effects of the regulations would be no different than on any other consumer. However, because residents in low-income communities tend to purchase used vehicles at a higher rate than residents in middle and high income communities, staff evaluated the effects of the program on the used vehicle market and, more specifically, on low income households that purchase used vehicles.

Staff concluded that, while the Advanced Clean Cars program will cause vehicle prices to increase, as with other consumers, low income consumers will see a significant reduction in vehicle operating costs. The fuel savings from more efficient used vehicles far outweigh the annualized cost of purchasing the vehicle (price increase spread over the years of ownership.) Therefore, while purchase prices for used cars will increase by a small percentage, any increase in price will be offset by the operating cost savings. Table 5 below shows that whether purchasing new or used vehicles, the consumer will experience a net monthly savings from the program.

Table 5. Potential Impact on Monthly Loan Payment and Operating Cost Savings for New 2025 MY Vehicles and 10 Year Old Used Vehicles (2009 dollars)

New 2025 MY Vehicles	
Description	**Advanced Clean Cars Program**
Average Increase in New Vehicle Price	$1,900
Increase in Monthly Loan Payment	$35
Net Lifetime Savings	$4,000
Monthly Operating Savings	$48
Net Monthly Savings	**$12**
Payback Period (Years)	**2.9**
10 Year Old Used Vehicles	
Description	**Advanced Clean Cars Program**
Increase in Used 2025 MY Vehicle Price	$440
Increase in Monthly Loan Payment	$14
Net Lifetime Savings	$2,000
Monthly Operating Cost Savings	$36
Net Monthly Savings	$22
Payback Period (years)	0.9

3. Zero Emission Vehicle Regulation

Many gasoline engines now emit at near zero emission levels of smog forming emissions. Conventional hybrid electric vehicles have been commercialized, and the number of models offered for sale is quickly expanding. Recently, battery electric vehicles (BEV) and plug-in hybrid electric vehicles (PHEV) have been introduced for sale, and fuel cell electric vehicles (FCV) are expected to be sold beginning in 2015. This movement towards commercialization of advanced clean cars has occurred because of the ZEV regulation. Table 6 below summarizes the vehicle placements due to the ZEV regulation to date.

Table 6: Cumulative Vehicle Placements (1996 – 2010)

ZEV Technology Type	Quantity of Vehicles
Fuel Cell	180
Battery Electric	5,200
Neighborhood Electric	28,800
Hybrid or Compressed Natural Gas	380,000
Conventional Gas	1,750,000

The ZEV regulation, which affects passenger cars and light-duty trucks, remains critically important to California's efforts to meet health based air quality goals. More recently, the program's goals have evolved to include paving the way for achieving California's long term climate change emission reduction goals. For these reasons, California remains committed to the commercialization of ZEV technologies.

At its last review of the program, the Board directed staff to strengthen the requirement over the current program and focus primarily on the zero emission drive, that is BEV, hydrogen FCV, and PHEV technologies. The goal of the Board direction was to ensure California remains the central location for moving advanced, low greenhouse gas (GHG) technology vehicles from the demonstration phase to commercialization.

This rulemaking is an opportunity for the Board to commit to the transformation of California's light-duty vehicle fleet. As the technology forcing piece of the Advanced Clean Car (ACC) package, the ZEV regulation along with new LEV III smog-forming pollutant and GHG standards can be the catalyst to that transformative process. Proposed amendments to the regulation therefore focus on technologies that help meet long term emission reduction goals, simplify the program where needed, and increase requirements for 2018 and subsequent model years.

3.1 Proposed Amendments to the ZEV Regulations

2009 through 2017 Model Year Amendments

Staff's goal for amendments affecting the current ZEV regulation through the 2017 model year is to make minor mid-course corrections and clarifications, and enable

manufacturers to successfully meet 2018 and subsequent model year requirements. The amendments include:

A. *Provide Compliance Flexibility:*
   - *Credit Expiration*: Remove limitations on the use of credits (expiration dates).
   - *Intermediate Volume Manufacturer requirements*: Slightly reduce the 2015 through 2017 credit requirement for intermediate volume manufacturers (IVMs, less than 60,000 vehicles produced each year), to allow them to prepare for requirements in 2018.
   - *"Travel provision"*: Extend the provision that allows ZEVs placed in any state that has adopted the California ZEV regulation to count towards the ZEV requirement through 2017 (i.e. extending the "travel provision" for BEVs through 2017).

B. *Adjust Credits and Allowances:* Increase credits for Type V (300 mile FCV) ZEV to appropriately incentivize this longer term technology. Add a Type H advanced technology partial zero emission vehicle (PZEV) allowance to give appropriate credit for BEV-like plug-in hybrid electric vehicles (PHEV), a car that is designed to run primarily on its batteries.

2018 and Subsequent Model Year Amendments

Staff's goal for the proposed amendments for 2018 and subsequent model years is to achieve ZEV and transitional zero emission vehicle (TZEV; most commonly a plug-in hybrid electric vehicle) commercialization through simplifying the regulation and pushing technology to higher volume production in order to achieve cost reductions. The amendments include:

A. *Increase Requirement for 2018 and Subsequent Model Years.* Increase requirements which push ZEVs and plug-in hybrids to about 15.4 percent of new sales by 2025. This will ensure production volumes are at a level sufficient to bring battery and fuel cell technology down the cost curve and reduce incremental ZEV prices.

B. *Focus Regulation on ZEVs and Plug-in Hybrids:* Remove PZEV (near-zero emitting conventional technologies) and advanced technology partial zero emission vehicles (AT PZEV, typically non-plug-in hybrids) credits as compliance options for manufacturers because these technologies are now commercialized.

C. *Amend Manufacturer Size Definitions and Ownership Requirements*. Amend Intermediate and Large Volume Manufacturer (LVM) size definitions to bring all but the smallest manufacturers under the full ZEV requirements by model year 2018; and change the percentage of ownership for combining manufacturers. These changes result in applying the ZEV regulation to manufacturers that represent 97 percent of the light duty vehicle market. Table 7 below shows the manufactures that will be subject to the existing and new requirements.

Table 7: Current Manufacturer Size Status
(2008 – 2010 MY Sales Averages, Rounded)

Existing Large Volume Manufacturers	New Large Volume Manufacturers
Chrysler	BMW
Ford	Daimler
GM	Hyundai
Honda	Kia
Nissan	Mazda
Toyota	Volkswagen

D. *Modify Travel Provision:* The so-called travel provision allows ZEVs placed in any state that has adopted the California ZEV regulation to count towards the ZEV requirement in California. The staff proposes to end the travel provision for BEVs after model year 2017. Extend the travel provision for fuel cell vehicles (FCVs) until sufficient complementary polices are in place in states that have adopted the California ZEV regulation. This will allow FCV technology to continue to mature, and provide time for states that have adopted California's ZEV regulation to build infrastructure and put in place incentives to foster FCVs.

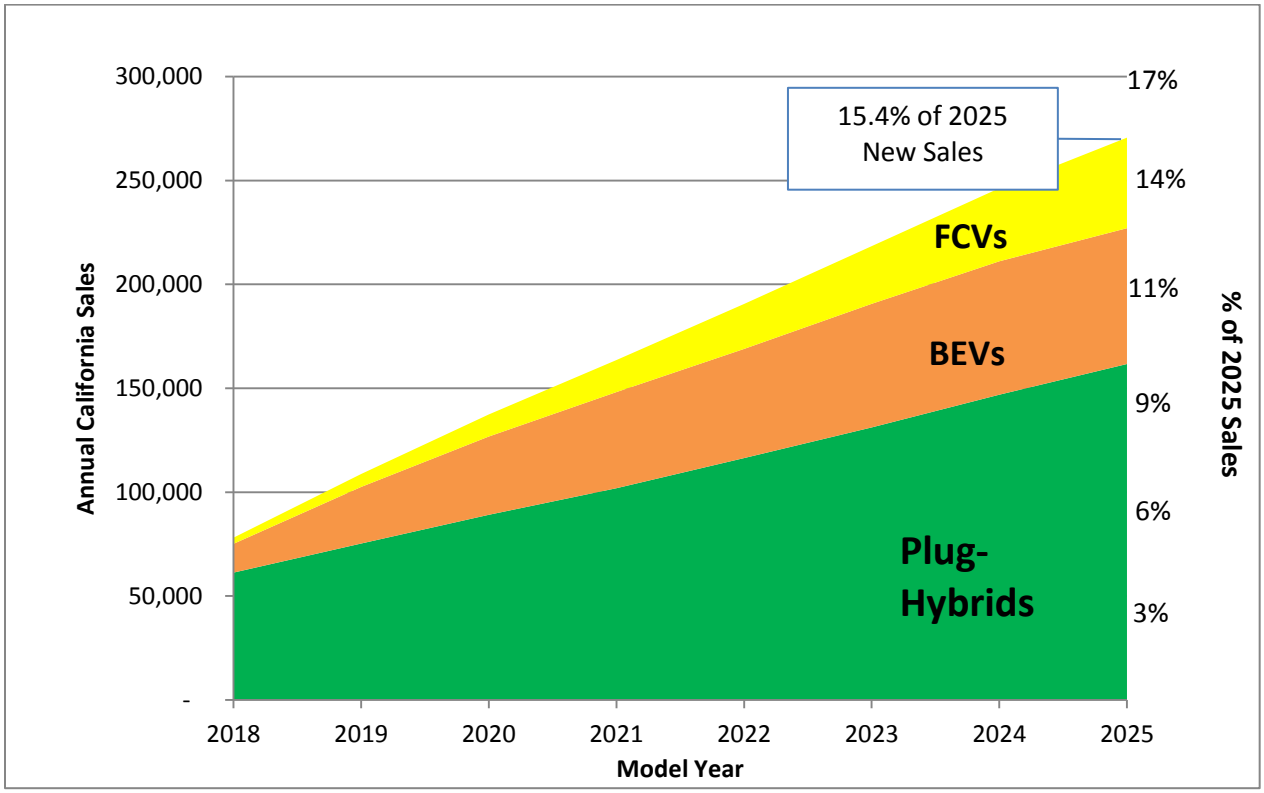
E. *Add GHG-ZEV Over-Compliance Credits:* Allow manufacturers who systematically over-comply with the proposed greenhouse gas fleet standard to offset a portion of their ZEV requirement in 2018 through 2021 model years only.

3.2 Effect of Proposed Amendments

Zero Emission Vehicle Volumes

As a result of staff's proposal, over 1.4 million ZEVs and TZEVs are expected to be produced cumulatively in California by 2025, with 500,000 of those vehicles being pure ZEVs (BEVs and FCVs). Figure 3 illustrates an expected compliance scenario which results in 15.4 percent of new car sales subject to the ZEV regulation.

Figure 3 Expected ZEV Regulation Compliance for 2018 through 2025 Model Years



Recently, a number of manufacturers have announced aggressive production plans for PHEVs and BEVs for the next three model years. Table 8 provides a summary of manufacturers' current program commitments, by technology category, as publicly stated.

Table 8. Future ZEVs and PHEVs Announced by Manufacturers

Manufacturer	Model	Type	Timeframe	Reference
BMW	ActiveE	BEV	2011	BMW, 2011a
	i3	BEV	2013	BMW, 2011b
	i3 Rex	PHEV		BMW, 2011c
	i8	PHEV	2014	BMW, 2011b
BYD	e6	BEV	2012	BYD, 2010
CODA	(*unknown)*	BEV	2011	Popular Mechanics, 2011
Chrysler	Fiat 500 EV	BEV	2012	Chrysler, 2010
Fisker	Karma	PHEV	2011	Fisker, 2011
Ford	C-MAX Energi	PHEV	2012	Ford, 2011a
	Focus Electric	BEV	2011	Ford, 2011b
	Transit Connect Electric	BEV	in production	n/a
GM	Cadillac ELR	PHEV	*(unknown)*	GM, 2011a
	Spark	BEV	2012	GM, 2011b
	Volt	PHEV	in production	n/a
	(unknown)	FCV	2015	USA TODAY, 2010
Honda	Fit EV	BEV	2012	Honda, 2011
	(unknown)	PHEV	2012	
	Clarity FCX	FCV	in production	n/a
Hyundai	Tucson IX	FCV	2015	Bloomberg, 2010
Mercedes Benz	*(unknown)*	BEV	2012	Mercedes, 2011
	F-Cell	FCV	in production	Mercedes, 2010
Mitsubishi	i	BEV	in production	n/a
	Outlander	PHEV	2013	Motor Trend, 2011
Nissan	LEAF	BEV	in production	n/a
Smart	fortwo ED	BEV	in production	n/a
Tesla	Model S	BEV	2012	Tesla, 2011
Think	City	BEV	in production	n/a
Toyota	Prius Plug-In	PHEV	2012	Toyota, 2011b
	RAV-4 EV	BEV	2012	Toyota, 2011c
	Scion iQ-EV	BEV	2012	
	(unknown)	FCV	2015	Toyota, 2011d
Volkswagen	e-up!	BEV	2013	Volkswagen, 2011
Wheego	Whip LiFe	BEV	in production	n/a

3.3 Environmental Benefits

The proposed amendments will also result in an emissions benefit due mostly to increased electricity and hydrogen use, and the resulting decrease in the production and use of gasoline. Figures 6 and 7 compare well to wheel grams per mile emissions of conventional vehicle technologies and ZEV program technologies. The 'fuel cycle' refers to the emissions related to the extraction, transportation, refining, and manufacture or generation of a specific fuel.

Figure 6. Well to Wheel Smog Forming Emissions (ROG + NOx) Comparison

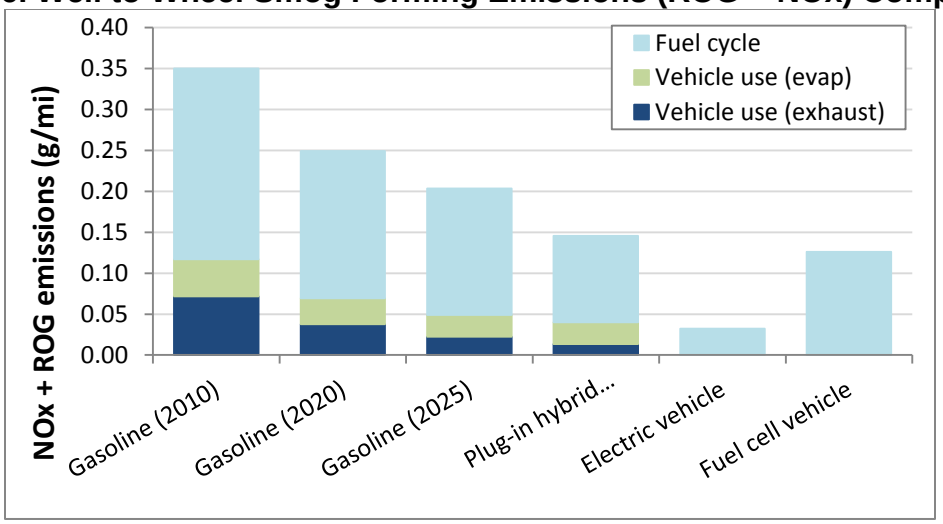
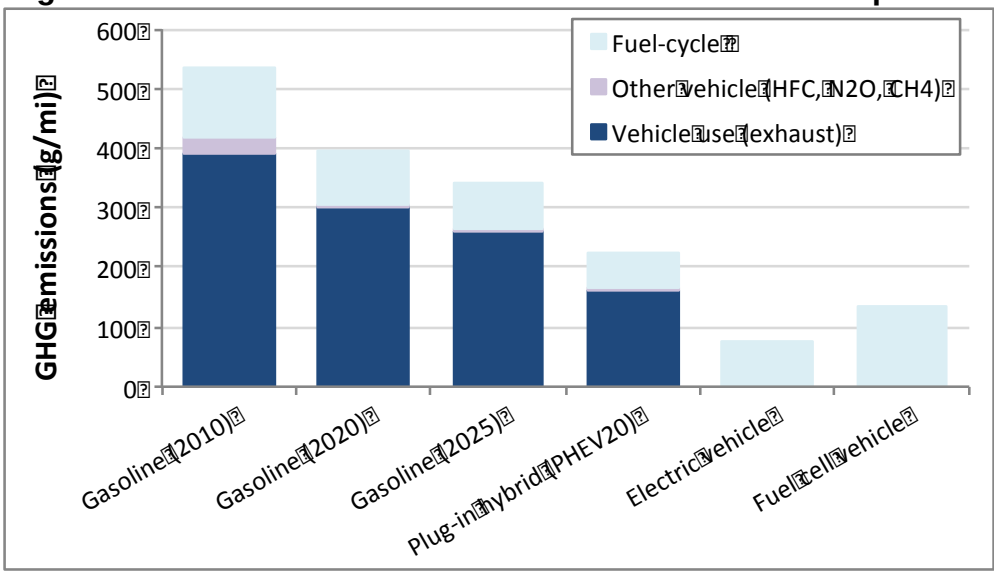


Figure 7. Well to Wheel Greenhouse Gas Emissions Comparison



4. Clean Fuels Outlet Regulation

The CFO regulation requires the construction of alternative fuel outlets for a particular fuel when there are 20,000 alternative fuel vehicles (AFVs) using that fuel. Coordinating the development of alternative fuel infrastructure with AFV deployment is critically important to the successful commercialization of both. This is especially true for ZEVs, specifically hydrogen fuel cell vehicles, where customers rely solely on publically available fuel to use their vehicles.

The Board is proposing changes to this program now in order to address the pending commercialization of zero emission hydrogen fuel cell vehicles. As a zero emission vehicle fuel, hydrogen has many benefits beyond propelling a zero emission vehicle. It can be produced from renewable resources and used in a fuel cell vehicle; a kilogram of hydrogen drives a car twice as far as a gallon of gasoline in a conventional car. As shown in Table 9 below, manufacturers are projecting early commercial volumes of fuel cell vehicles in the 2015 to 2017 timeframe. However, a successful launch of these volumes of vehicles will require fueling stations.

Table 9: Summary of ARB/CEC Auto Manufacturer Survey Results (2010)

2010 Survey	2012	2013	2014	2015-17
Cumulative FCVs Statewide	312	430	1,389	53,000
FCVs in South Coast Air Basin	240	347	1,161	34,230

4.1 Proposed Amendments to the CFO Regulation

The proposed changes to the CFO regulation include:

- Streamlining the compliance requirements. The proposed amendments include modifying the compliance requirements to be less prescriptive and more like performance standards, giving the regulated party the flexibility to determine how best to meet the minimum requirements. Hydrogen infrastructure can be placed at an existing gasoline station or at a freestanding site.

- Adding a lower regional activation trigger. Staff is proposing to add a 10,000 vehicle activation trigger that would apply to an air basin before the statewide trigger of 20,000 is reached. The lower trigger complements auto manufacturers' early commercialization plans to marketing FCVs in regional clusters.

- Applying to zero emission vehicles (ZEVs) and ZEV fuels only. Staff is proposing to change the types of alternative fuel vehicles captured under the regulation from all alternative fuel vehicles (including vehicles using compressed natural

gas and ethanol) certified as low emission vehicles to only those certified as ZEVs when operating on a designated clean fuel.

- Adding a regulatory review for plug-in electric vehicles. Electricity is currently excluded from the definition of designated clean fuel in the regulation. The proposed changes, applying to fuels used in ZEVs would include electricity, however, since most plug-in vehicles are expected to charge at home and public and workplace charging is under development, Staff is proposing to add regulatory language that requires ARB to evaluate the development and usage of workplace and public charging infrastructure, and make recommendations for further actions in two years.

- Changing the regulated party to be the major producer/importers of gasoline. California's seven major petroleum companies supply 93 percent of the gasoline consumed in California, while owning only 13 percent of the retail gasoline outlets. Changing the regulated party from owner/lessors of retail gasoline outlets to "major refiner/importers of gasoline," evenly spreads the requirement to build CFOs among the parties that continue to benefit financially from California's use of gasoline.

- Lowering the regulation sunset provision. Staff is proposing to lower the requirement to build CFOs when the number of hydrogen stations equals five percent of the total number of retail gasoline outlets.

4.2 Impacts of Proposed Clean Amendments

Projected environmental impacts associated with this regulation are expected to be minimal as activities will occur primarily in urban developed areas. The State will benefit from overall reductions in both greenhouse gas and criteria pollutant emissions due to the increased use of hydrogen fuel in fuel cell vehicles.

The anticipated economic impacts of the regulation will mainly be felt during the onset, when hydrogen stations are expected to be less than fully utilized. As station utilization improves due to increased consumer acceptance of FCV technology and confidence in fuel availability, the cost to produce hydrogen will decrease. Staff projects that, with high station utilization, fuel providers will be able to sell hydrogen at an affordable price and realize a return on their investment within three to four years. Offering hydrogen fuel in convenient commercial settings is critical to the successful launch of zero emission vehicles, which will be the cornerstone of long term health based criteria pollutant and climate change emission reduction goals.