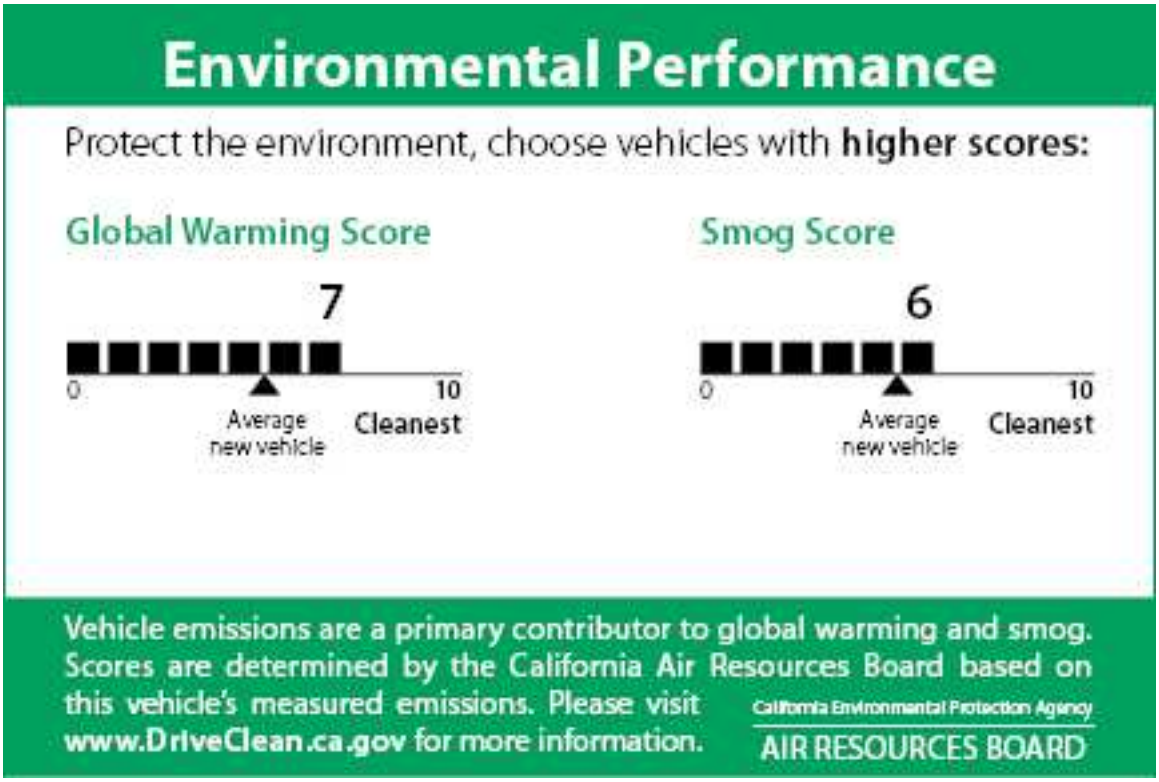
**State of California**
**AIR RESOURCES BOARD**

# STAFF REPORT: INITIAL STATEMENT OF REASONS FOR RULEMAKING

## PROPOSED AMENDMENTS TO THE SMOG INDEX VEHICLE EMISSIONS LABEL

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## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

# EXECUTIVE SUMMARY

California citizens purchase approximately 2 million[1] new passenger cars, light-duty trucks, and medium duty passenger vehicles each year. In addition, the California fleet of 25 million on-road vehicles travels about 900 million miles each day. This equates to 2,288 tons per day[2] of smog precursor emissions and 0.35 million tons per day[3] of global warming gas emissions. Even with the addition of cleaner vehicles to California's vehicle population, both smog forming emissions and global warming emissions from motor vehicles will continue to have a major impact on California's environment for years to come.

Over the past several years there have been a number of studies using focus groups and market research to evaluate different types of vehicle labeling and ranking programs. In these studies, respondents preferred some kind of overall environmental score that they could have faith in and would be applicable across the country and across all vehicles. Respondents stated that the information needs to be presented in a way that consumers find simple and understandable. Unfortunately, consumers do not have a clear understanding of environmental factors as they relate to car choice and tend to assign responsibility for this issue to government or industry. However, there appears to be growing public awareness of environmental issues. A recent California Field Poll indicates the majority of Californians consider global warming a serious problem.[4]

Consumer awareness of a vehicle's environmental footprint would help consumers make the cleanest purchasing choice possible when selecting a new vehicle. Ultimately, consumer decisions to buy cleaner cars could result in lower emissions than would be achieved from regulating vehicles alone.

To provide vehicle emissions information to consumers, the Air Resources Board (ARB) has required a Smog Index Label on new vehicles since the 1998 model year (MY). The Smog Index Label provides consumers with an indication of the relative emissions performance of new light-duty vehicles for smog forming exhaust emissions of non-methane organic gas, oxides of nitrogen, and evaporative hydrocarbons.

In 2005 Assembly Bill (AB) 1229 was signed into law adding Health & Safety Code § 43200.1 which, among other things, requires ARB to develop a greenhouse gas index and label, and to review the existing Smog Index Label. Staff proposes amending the Smog Index Label to add a Greenhouse Gas Index, and add specific requirements to label information and presentation to enhance label appearance and consistency. These labeling requirements are prescriptive by nature and will require one label size

[1] **California Air Resources Board:** *Certification Data Reported to the California Air Resources Board in 2005*
[2] **California Air Resources Board:** *2005 Estimated Annual Average Emissions*
[3] **Inventory of California Greenhouse Gas Emissions and Sinks:** *1990-1999, California Energy Commission Staff Report*
[4] **San Jose Mercury News**, *"Survey finds 81% worried about global warming," April 12, 2007.*

and design to be used by all affected vehicle manufacturers. Staff recommends the new label regulations take affect for all passenger cars, light-duty trucks, and medium-duty passenger vehicles manufactured on or after October 1, 2008.

**Proposed Index Requirements**

During the review staff found noticeable differences in the way the current smog index values are presented by different manufacturers, making it difficult for consumers to compare smog forming emission values from one vehicle to the next. As a result, staff proposes modifications to the graphics and content of the existing California Smog Index Label and is also proposing a new Global Warming Index to be included on the new label.

The current Smog Index Label uses a relative ratio to compare actual vehicle emissions to an average vehicle. Staff found inconsistencies in existing label size and presentation of content used by manufacturers which creates confusion and misunderstanding by consumers. Prior market research by the United States Environmental Protection Agency (U.S. EPA), based on consumer focus groups, recommended a simple scale from 1 -10 for both Air Pollution and Greenhouse Gas (GHG) emissions. Staff also performed market research based on consumer focus groups and determined that using a simpler scale from 1-10 represents the optimal way to present emissions information.

For the Smog Index, staff recommends using a simple scale from 1-10 where 1 represents the dirtiest vehicle available and 10 the cleanest based on vehicle emission certification standards. This scale is consistent with the U.S. EPA scale currently used on their Green Vehicle Guide website. U.S. EPA found that through focus groups this scale was meaningful for prospective car buyers. While U.S. EPA provides these scores on its website, vehicle labeling using these scores is voluntary. Currently none of the auto manufacturers label their vehicles using U.S. EPA's program, however some manufacturers reference their vehicles' scores in product literature.

For the global warming index, staff developed a scoring system also using a simple 1-10 scale. The scoring system incorporates all vehicle greenhouse gases mandated by the ARB greenhouse gas emission standards, which take effect for 2009 model year. Similar to Smog scores, the U.S. EPA provides greenhouse gas scores on its website but does not require scores be printed on new vehicle labels. U.S. EPA's greenhouse gas scores are based on different calculation methods and at this time are not aligned with staff's proposed scoring system.

Staff recommends that the scoring system be re-analyzed when 2012 MY California certification data becomes available. This new analysis is required because annual reductions in global warming emissions, as required by ARB's greenhouse gas emission standards, may alter the distribution of scores over time.

**Label**

In designing the new California Environmental Performance label, staff turned to market research specialists for help and sought out consumer-based input from focus groups to provide clarity and understanding of a newly designed label. The purpose of these focus groups was to build upon the work previously done and to obtain up-to-date information from California specific consumers. As a result staff designed a new label based on this research. The label best understood by respondents is shown in figure 1.

**Figure 1: Proposed California Environmental Performance Label**

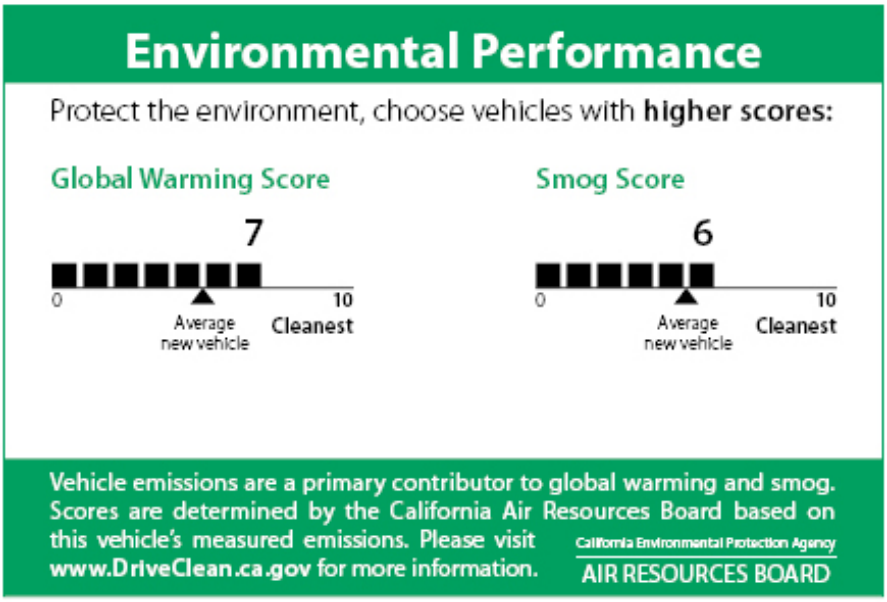



Figure 1 shows the Global Warming score on the left and the Smog Score on the right. The black boxes represent the score of the labeled vehicle. A triangle below the scale shows the score of an average vehicle for comparison purposes. It was clear in the focus groups that with the word "cleanest" under the 10 and with the statement: "Protect the environment, choose vehicles with the higher scores" meant vehicles with more black boxes were cleaner vehicles. The statement at the bottom of the label describes the impact of motor vehicles on smog and global warming. It also points consumers to the ARB's www.DriveClean.ca.gov website which is a consumer oriented website with information about clean cars, alternative fuel and advanced technology vehicles.

**Economic Impacts**

This regulation proposes modifications to the existing Smog Index Label and adds a global warming score to the existing label. Based on the amount of added information required and the addition of the new global warming score, the size of the label must be increased. In addition, Health and Safety Code § 43200.1 requires use of a color other than black for some portion of the label.

The total annual cost to implement this regulation is estimated to be $245,000 for the industry as a whole. The annual cost for a typical manufacturer is estimated to be $8,167. This cost estimate will vary slightly by manufacturer depending on the actual number of assembly plants, ports of entry, printers required, and vehicles produced.

**Environmental Benefit**

The purpose of the label is to encourage purchasers to buy new vehicles with the lowest emissions. To the extent that the label accomplishes this, vehicle emissions will decrease. Staff has no basis upon which to quantify this effect, thus no estimates of cost effectiveness have been made.

**Staff Recommendation**

Staff recommends the Board approves the new label. The proposed label will provide clarity for consumers and help them make environmentally beneficial choices.

# I. Introduction and Background

California citizens purchase approximately 2 million[5] new passenger cars, light-duty trucks, and medium duty passenger vehicles each year. In addition, the California fleet of 25 million on-road vehicles travel about 900 million miles each day. This equates to 2,288 tons per day[6] of smog precursor emissions and 0.35 million tons per day[7] of global warming gas emissions. Even with the addition of cleaner vehicles to California's vehicle population, both smog forming emissions and global warming emissions from motor vehicles will continue to have a major impact on California's environment for years to come. Consumer awareness of a vehicle's environmental footprint would help consumers make the cleanest purchasing choice possible when selecting a new vehicle. Ultimately, consumer decisions could result in lower emissions than would result from regulated emission standard requirements alone.

The average new car purchaser is not aware of the various smog forming pollutant emission requirements that apply to new vehicles and the regulatory terms used to describe emission levels. For example, a California certified vehicle is identified as being a low-emission vehicle (LEV), ultra-low-emission vehicle (ULEV), super-ultra-low-emission vehicle (SULEV), partial zero-emission vehicle (PZEV), or zero-emission vehicle (ZEV). Likewise, in some instances, federally certified vehicles using an emissions "bin" certification level from bin 1 through bin 9a can also be sold in California. Both the U.S. EPA's Green Vehicle Guide website and the California's DriveClean website offer emission classification identifiers to aid the consumer in selecting clean vehicles. However, these vehicle classifications used across multiple information sources can differ and overlap at times, providing additional challenges for the consumer to identify cleaner new vehicles. In addition to smog forming pollutants, cars emit greenhouse gases. Consumers are only just beginning to understand the greenhouse gas emissions impacts from cars and have little or no information available about new cars on which to base an informed purchase decision.

In order to ensure that Californians are effectively informed as to the environmental impact of new vehicle purchases, Health & Safety Code § 43200.1 requires the Air Resources Board (ARB) to revise the existing Smog Index Label to include a Global Warming Index.

[5] California Air Resources Board: *Certification Data Reported to the California Air Resources Board in 2005*
[6] **California Air Resources Board:** *2005 Estimated Annual Average Emissions*
[7] **Inventory of California Greenhouse Gas Emissions and Sinks:** *1990-1999, California Energy Commission Staff Report*

## II. Need for Regulatory Amendments

ARB requires that each new passenger car and light-duty truck offered for sale have a window label that includes a rating of its smog-forming emissions, called the smog index. On October 6, 2005, Assembly Bill 1229 was signed into law (Chapter 575, now Health & Safety Code § 43200.1), which directs the Air Resources Board to review and revise the existing Smog Index Label and to develop a Global Warming Index. A summary of the requirements follows.

- No later than July 1, 2007, revise regulations relating to the smog index decal, to rename the existing decal and to provide specified smog forming, and global warming emissions information.
- Label is required to be effective for model year 2009 and subsequent model year new motor vehicles.
- Label is required for all passenger cars and light-duty trucks with a gross vehicle weight of 8,500 pounds and medium-duty passenger vehicles less than 10,000 pounds.
- Global warming index shall include emissions from vehicle operation and upstream emissions.
- Label shall include projected average vehicle emissions and lowest emission vehicle reference points.
- Label shall use at least one color ink in addition to black.
- Staff shall hold at least one public workshop.
- Staff shall seek input from automotive consumers, graphic design professionals, and other relevant labeling formats.
- This bill permits the ARB to recommend to the Legislature additional sources of air pollution that emit significant amounts of global warming gases for which the disclosure of information regarding those emissions would be an effective means of educating the public about the sources of global warming and its impacts.

Health & Safety Code § 43200 requires the label to be placed on the driver's side window or, if it cannot be so placed, to the windshield. This restrictive placement of the label was unintended and could have raised safety concerns. Assembly Bill 2557 was signed into law (Chapter 419) on September 22, 2006, permitting the label to be placed on a side window to the rear of the driver, or if it cannot be so placed, to the windshield.

A review of the implementation of the existing Smog Index Label shows a lack of consistent label design used by auto manufacturers. Appendix B shows different variations of labels used by the manufacturers. Based on the requirements of Health & Safety Code 43200.1 and staff's findings regarding the existing Smog Index Label, a proposal for a new Environmental Performance Label has been developed and is presented in this report.

## III. Environmental Justice and Public Outreach

The ARB is committed to ensuring that all California communities have clean, healthful air by addressing not only the regional smog that hangs over our cities but also the more localized toxic air pollution that is generated within our communities. The ARB works to ensure that all individuals in California, especially children and the elderly, can live, work and play in a healthful environment that is free from harmful exposure to air pollution.

### A. Environmental Justice

On December 13, 2001, the Board approved Environmental Justice Policies and Actions, which formally established a framework for incorporating environmental justice into the ARB's programs, consistent with the directives of State law and policy[8]. "Environmental Justice" is defined 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. These policies apply to all communities in California but, environmental justice issues have been raised more in the context of low-income and minority communities because of past land use policies and the accumulative impact of a concentration of emitting facilities in some neighborhoods.

To achieve this goal, the ARB has established a Community Health Program and emphasized community health issues in our existing programs. ARB has published, "The Public Participation Guide to Air Quality Decision Making in California" to use as a basic tool and for information needed to understand and participate in air pollution policy planning, permitting, and regulatory decision making processes[9]. The Environmental Justice Policies are intended to promote the fair treatment of all Californians and cover the full spectrum of ARB activities. Underlying these Policies is a recognition that we need to engage community members in a meaningful way as we carry out our activities. People should have the best possible information about the air they breathe and what is being done to reduce unhealthful air pollution in their communities. The ARB recognizes its obligation to work closely with all stakeholders; communities, environmental and public health organizations, industry, business owners, other agencies, and all other interested parties to successfully implement these policies. Our outreach efforts, described below, facilitate this objective.

### B. Outreach Efforts

The ARB strives to involve the widest number of affected persons in the development of its regulations. To this end, staff held informal public workshops and meetings prior to publishing the notice and staff report. Information from these workshops can be found

[8] Information for these programs can be found at **http://www.arb.ca.gov/ch/programs/ej/ejpolicies.pdf**.
[9] Information on this program can be found at **http://www.arb.ca.gov/ch/public_participation.htm**.

through the Vehicle Emissions Labeling website[10]. For this rule, staff conducted two public workshops and numerous focused meetings. Notices for the workshops were posted to Vehicle Emissions Labeling web site and e-mailed to subscribers of ARB's electronic list server. Those workshops held in Sacramento were webcast for individuals who could not travel to the meeting locations. Attendees of the workshops included representatives from auto manufacturers, environmental organizations, and other parties interested in vehicle emissions labeling. To generate additional public participation and to enhance the information flow between ARB and interested persons, staff made all documents, including workshop presentations, available via the Vehicle Emissions Labeling web site.

**Table III-1: Workshop Dates and Locations**

| Date | Location |
|---|---|
| February 15, 2005 | Sacramento |
| March 16, 2006 | Sacramento |

Outreach and public participation are important components of ARB's regulatory development process. As part of the outreach efforts, ARB staff made extensive personal contacts with auto manufacturers, environmental organizations, U.S. EPA, other state air quality agencies and other affected parties through meetings, telephone calls, and electronic list-serves. These activities included holding two public workshops, nine focused meetings and conducting more than 50 telephone conversations. Staff met with a number of the same stakeholders for focused meetings throughout the rulemaking process to receive feedback on staff's proposed regulatory amendments. Alternatives were suggested to the proposed regulation and explored by staff.

[10] More information on Vehicle Emissions Labeling Programs can be found at http://www.arb.ca.gov/msprog/labeling/labeling.htm

## IV. Staff Proposal – Smog Score

### A. Existing Requirements

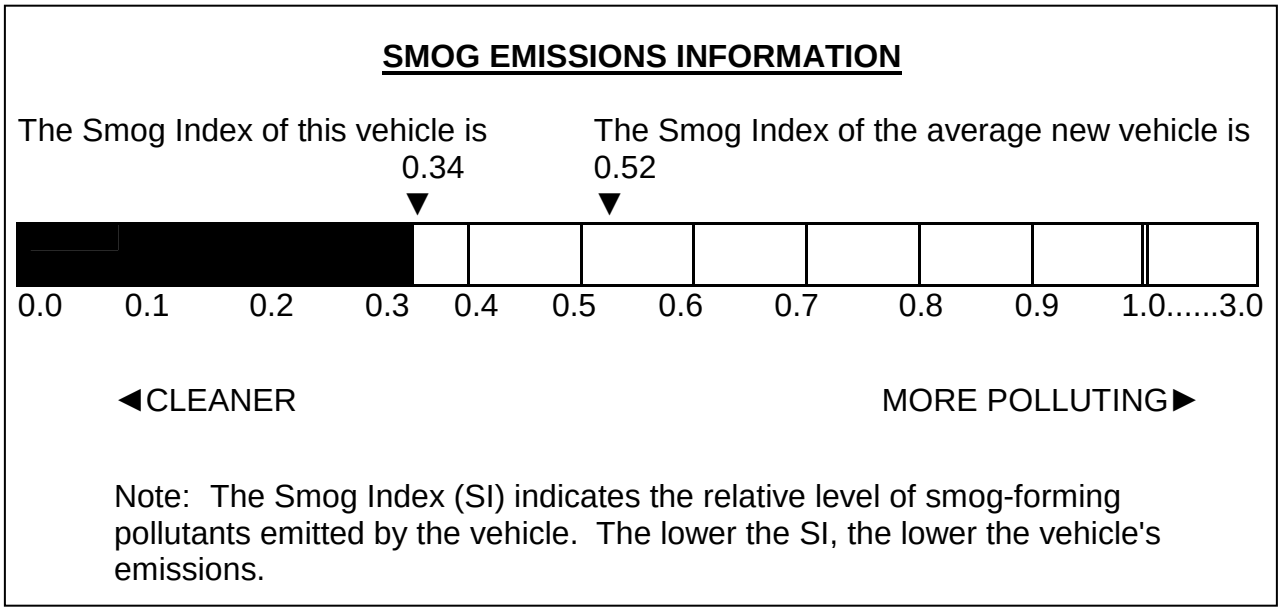
The California Smog Index Label provides consumers with an indication of the relative contribution of new light-duty vehicles to smog formation based on exhaust non-methane organic gas (NMOG), oxides of nitrogen (NOx), and evaporative hydrocarbon (HC) emissions. The current Smog Index Label uses a relative ratio to compare the vehicle being labeled to a base vehicle as determined by the ARB. The equation for this ratio is as follows:

$$\text{Smog Index} = \frac{\text{NMOG+NOx+HC (vehicle being certified)}}{\text{NMOG+NOx+HC (base vehicle)}}$$

Where NMOG and NOx are tailpipe emissions, HC is evaporative emissions.

This smog index ratio is then displayed graphically on a label, usually as a number less then 1.0, along with the smog index of an average new vehicle for the model year of the vehicle being sold. Figure IV-1 illustrates a typical Smog Index Label:

**Figure IV-1: Current Smog Index Label**




This label began appearing on new vehicles offered for sale in California in 1998 and is also appearing on vehicles sold in other states that have adopted California standards. Some vehicle manufacturers have incorporated the Smog Index information into the

new vehicle's Monroney label, which provides pricing information and the vehicle's U.S. EPA fuel economy ratings.

The existing smog index regulations have allowed the manufacturers to vary the size and graphical representation of the Smog Index over time. Today, each vehicle manufacturer has its own graphical representation of the scale, some similar to the one shown above, some showing a scale from 0.0 – 2.0, and some showing a scale from 0.0 – 3.0. As the length of the scale increases from "0.0 – 1.0" to "0.0 – 2.0" and even "0.0 – 3.0," the importance of a smog index ratio whose number is typically less than 1.0 may diminish. Appendix B contains some example pictures of actual 2007 Smog Index Labels being used by various vehicle manufacturers. For this reason staff proposes prescriptive label requirements.

The U.S. EPA does not require a smog index or score to be included on new cars. On its website, it provides a rating on a scale from 1-10 (ten being lowest emitting or cleanest), as part of its Green Vehicle Guide[11]. Separate ratings are provided for vehicles certified to California new vehicle emission standards.

### B. Staff Proposal

Staff is proposing to modify the graphics and content of the label to increase consumer awareness and understanding of the Smog Index Label. Staff proposes using a simple scale of 1-10 where 1 represents the dirtiest vehicle available and 10 the cleanest. This is the opposite of the current scale, where 0.0 is the cleanest. Staff proposes using this new scale for two reasons. First, consumer focus group research indicates more consumers understand 10 is well performing, and 1 is poor performing. Second, the U.S. EPA has a popular website that uses the 1-10 scale for both smog and greenhouse gas ratings of new vehicles (Green Vehicle Guide[10]). The proposed Smog scores based on the 1-10 scale are shown in Table III-1. Staff has worked with U.S. EPA and included federal standards (bins) in the ranking system, and U.S. EPA staff indicates it may change its rating to be consistent with California. A more detailed technical analysis and discussion of the new scores can be found in Appendix C: Technical Analysis.

[11] United States Environmental Protection Agency: *Green Vehicle Guide, www.epa.gov/greenvehicles*

**Table IV-1: Proposed 2009 Smog Score by Certification**

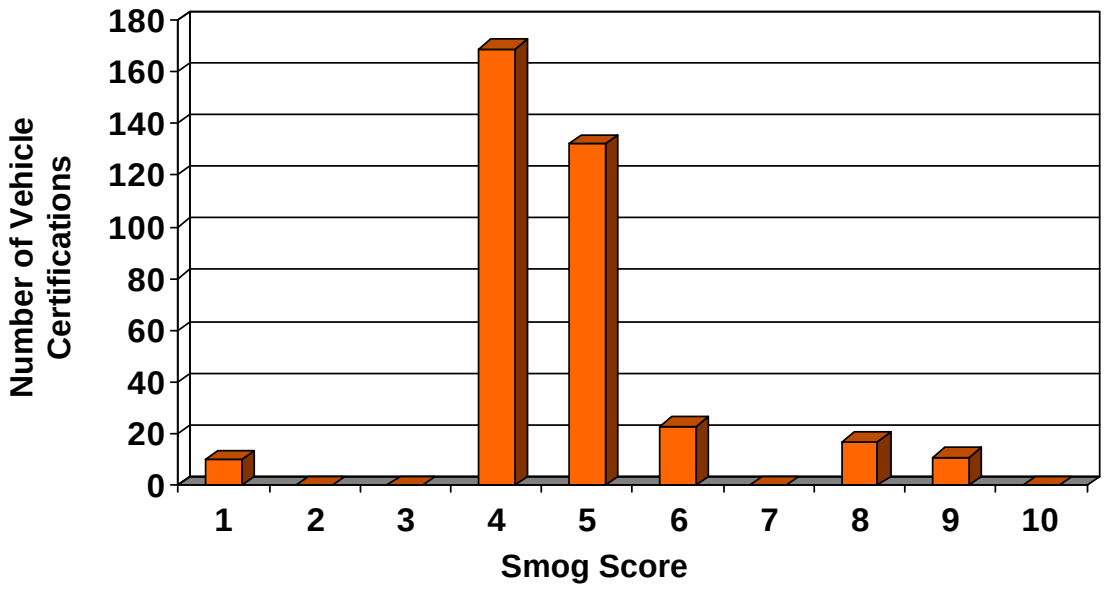
| California Emissions Certification - Federal Bins | NMOG + NOx (g/mile) | 2009 Smog Score |
|---|---|---|
| Zero Emission Vehicle (ZEV) or Bin 1 | 0.0 | 10 |
| Partial Zero Emission Vehicle (PZEV) | 0.030 | 9 |
| Super Ultra Low Emission Vehicle (SULEV) or Bin 2 | 0.030 | 8 |
| Bin 3 | 0.085 | 7 |
| Bin 4 | 0.110 | 6 |
| Ultra Low Emission Vehicle (ULEV) | 0.125 | 5 |
| Low Emission Vehicle (LEV) or Bin 5 | 0.160 | 4 |
| Low Emission Vehicle (LEV) (option 1)* or Bin 6 and SULEV medium duty passenger vehicles | 0.190 – 0.200 | 3 |
| Bin 7 | 0.240 | 2 |
| Bin 8a or ULEV (medium duty passenger vehicles) | 0.325 | 1 |

* LEV (option 1) is an optional certification standard for qualifying work vehicles.

Table III-1 lists the certification levels by their California terminology or by U.S. EPA "bins," the tailpipe emission standard for NMOG and NOx and the proposed Smog Score. While the PZEV and SULEV – Bin 2 vehicles are certified to the same exhaust emission standard, PZEV certified vehicles receive a higher score due to their zero evaporative emissions and extended 150,000 mile emission warranty.

Applying this Smog scale to the 2007 MY California certification data yielded the model based distribution of Smog scores shown on Figure IV-2. This distribution is based on 2007 MY California certification data and may look different for the 2009 MY as vehicle manufacturers continue to certify to cleaner standards.

**Figure IV-2: Distribution of California Certification Levels by Smog Score**



Based on all 2007 MY vehicles, the average vehicle model score is closest to a 5 on the proposed scale, which correlates to an Ultra Low Emission Vehicle (ULEV) certification standard. This is a count of vehicle models however, not a sales weighted fleet average. In 2009, the fleet average emission standard would also be closest to the ULEV certification standard and receive a score of 5. Staff therefore recommends using the ULEV certification as the average and setting the Smog score of 5 to represent the average vehicle. Vehicles with a score of 1 are typically medium-duty passenger vehicles, such as the Ford E-250 Econoline.

For bi-fuel, fuel flexible, and dual-fuel vehicles, vehicles capable of operating on gasoline and an alternate fuel like ethanol propane or natural gas, the scores displayed on the label will be based on only the highest emitting fuel. The label will direct consumers to visit ARB's web site at www.DriveClean.ca.gov to find information on flexible fuel vehicles and the impact of using an alternative fuel on smog forming pollutant and greenhouse gas emissions.

# V. Staff Proposal – Global Warming Score

## A. Existing Consumer Information

Neither the U.S. EPA nor the ARB currently requires greenhouse gas emissions to be reported on a new vehicle label. U.S. EPA reports a vehicle's CO2 emissions in its web-based Green Vehicle Guide. The score is based on the CO2 emissions from the federal test procedure, and the fuel used. Other greenhouse gases, such as nitrous oxides, are not included in the published score. Separate ratings for California certified vehicles are provided.

## B. Staff Proposal

Staff proposes to use a global warming scoring system for labeling that is based on emissions data from ARB's motor vehicle greenhouse gas emissions regulation. The motor vehicle greenhouse gas regulation bases compliance on four different sources of pollutants: (1) carbon dioxide ($CO_2$), methane ($CH_4$) and nitrous oxide ($N_2O$) emissions resulting directly from operation of the vehicle, (2) exhaust $CO_2$ emissions resulting from operating the air conditioning system (indirect air conditioning (A/C) emissions), (3) refrigerant emissions from the air conditioning system due to either leakage, losses during recharging, sudden releases due to accidents, or release from scrappage of the vehicle at end of life (direct A/C emissions), and (4) upstream emissions associated with the production of the fuel used by the vehicle. Upstream emissions are included so that vehicles using an alternative fuel, a fuel other than gasoline or diesel, will be given an appropriate score relative to the production and consumption of the fuel used.

The greenhouse gas regulation establishes a $CO_2$ "equivalent" value that includes all the various global warming gases based on their relative contribution to global warming. The $CO_2$ equivalent value is as follows:

$$CO_{2\ \text{Equivalent}} = CO_2 + 296 \times N_2O + 23 \times CH_4 - \text{A/C Direct Emissions Allowance} - \text{A/C Indirect Emissions Allowance}$$

Using this equation, and accounting for the upstream emissions factor for alternative fuels, ARB accounts for all global warming gasses being released into the atmosphere due to the operation of each vehicle.

To maintain simplicity, the greenhouse gas regulation uses the upstream emissions for vehicles that use conventional fuels as a "baseline" against which to compare the relative upstream emissions of alternative fuel vehicles. Therefore, when certifying gasoline or diesel-fuel vehicles, manufacturers will report only the "direct" or "on vehicle" emissions. Table IV-1 lists the $CO_2$ upstream adjustment factor for alternative fuels used for the greenhouse gas regulation.

**Table V-1: Upstream Adjustment Factors for Alternative Fuels**

| Fuel | $CO_{2Equivalent}$ Adjustment Factor |
|---|---|
| Conventional Gasoline (RFG) | 1.00 |
| Compressed Natural Gas (CNG) | 1.03 |
| Liquid Propane Gas (LPG) | 0.89 |
| Ethanol (E85) | 0.74 |

The $CO_{2Equivalent}$ emissions will be multiplied by the $CO_{2Equivalent}$ Adjustment Factor for the alternative fuel, as shown in the Table V-1. For hydrogen internal combustion engine vehicles, hydrogen fuel cell electric and battery electric vehicles, the grams per mile average $CO_{2Equivalent}$ value is the sum of the upstream emissions and the A/C direct emissions. Therefore these vehicles will be given a constant $CO_{2Equivalent}$ value listed in Table V-2.

**Table V-2: Upstream $CO_{2Equivalent}$ Values for Hydrogen Internal Combustion Engine, Hydrogen Fuel Cell Electric, and Battery Electric Vehicles**

| Fuel | $CO_{2Equivalent}$ Value (grams/mile) |
|---|---|
| Electricity | 130 |
| Hydrogen – Fuel Cell | 210 |
| Hydrogen – Internal Combustion Engine (ICE) | 290 |

As required by the greenhouse gas regulation, $CO_{2Equivalent}$ values are reported for both city and highway testing cycles and than combined to represent a 55% city and 45% highway driving ratio. This $CO_{2Equivalent}$ combined value, including likely credits achievable from direct AC emission reductions, is the value that staff used to develop a global warming scoring and labeling system.

Staff performed a statistical analysis on the $CO_2$ data available from the model year 2007 California Certifications. Manufacturers are not yet certifying their vehicles to the greenhouse gas regulation standards, and not all manufacturers currently provide ARB with this data. Staff requested a complete set of $CO_2$ data from all manufacturers[12] but

[12] Air Resources Board: *February 28, 2007 letter to Steven Douglas, Director; Alliance of Automobile Manufacturers and February 28, 2007 letter to John Cabaniss, Director; Association of International Automobile Manufacturers.*

received minimal feedback. Statistically, the available data was sufficient to represent the new vehicle fleet as a whole. To better illustrate this point, staff compared the California dataset to a more complete dataset from Federal certifications. As seen in Table V-3, the California and Federal average and standard deviation values are very close to being equal when not including the MDPV category. The similarity in values helps demonstrate that the available $CO_2$ data is adequate to represent the entire fleet.

**Table V-3: Statistical Distribution of California and Federal CO2 Data**

| $CO_2$ combined (g/mile) | California (with MDPV data) | California (without MDPV data) | Federal |
|---|---|---|---|
| **Minimum** | 130 | 130 | 133 |
| **Maximum** | 874 | 570 | 662 |
| **Average** | 358 | 355 | 348 |
| **Standard Deviation** | 101 | 81 | 76 |

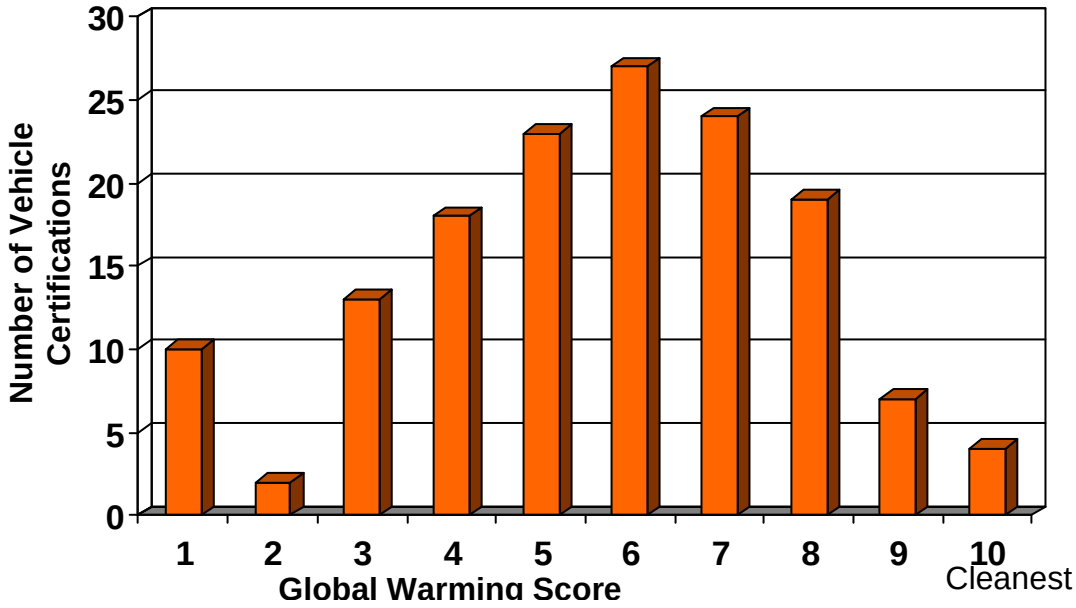
Staff used the statistical average of 360 grams per mile (g/mile) $CO_2$ and set that as 5 on the scale. Using a standard deviation of 80 g/mile, staff developed a scoring system based on two standard deviations from the average to simulate a normal distribution of scores. The two extremes blend into the best and worst scores. Applying this principle to the California dataset staff developed the global warming scoring system found in Table V-4.

**Table V-4: Proposed Global Warming Scores based on $CO_{2Equivalent}$ Emissions**

| Proposed Global Warming Score | $CO_{2Equivalent}$ grams per mile |
|---|---|
| **10** | Less than 200 |
| **9** | 200-239 |
| **8** | 240-279 |
| **7** | 280-319 |
| **6** | 320-359 |
| **5** | 360-399 |
| **4** | 400-439 |
| **3** | 440-479 |
| **2** | 480-519 |
| **1** | 520 and up |

Applying this global warming scoring system to the 2007 MY California certification dataset yields the distribution of scores as shown in Figure-V-1 which closely resembles a normal distribution.

**Figure V-1: Distribution of Global Warming Scores**




The spike at the low end of the scale (score of 1) represents the larger medium-duty passenger vehicles, such as the Ford E-250 Econoline and Expedition. Vehicles with a score of 10 are typically hybrid passenger cars, such as Toyota Prius and Honda Civic Hybrid. Average vehicles obtaining a score of 5 are typically large passenger cars and small light-duty trucks, such as the Ford Crown Victory, Toyota 4Runner, and Honda Odyssey van.

Staff recommends using this global warming scoring system on the label required by Health & Safety Code 43200.1

The greenhouse gas regulation requires vehicle manufacturers to decrease the fleet average $CO_{2Equivalent}$ emissions incrementally from 2009 to 2016 at which point the fleet average $CO_{2Equivalenmt}$ emissions remain constant. Staff looked at these incremental adjustments and determined that by the 2012 MY, on average, vehicles will have reduced the amount of $CO_{2Equivalent}$ emissions to the point of skewing the normal distribution of scores to the higher end of the scale. For example, the incremental change between global warming scores as proposed by this report is 40 (g/mile). Following the reductions required by the greenhouse gas regulation, the fleet average emissions will have been reduced by 84 (g/mile) by 2012. Therefore vehicles on average would be jumping one or more global warming scores to the next cleanest score and skewing the normal distribution of scores. Staff also believes this would be an appropriate time to evaluate the need for modifying the indices or labeling provision to reflect potentially increasing alternative fuels use in California.

A more technical analysis of the global warming scoring system can be found in Appendix C: Technical Analysis.

## VI. Proposed Environmental Performance Label Requirements

A review of the existing Smog Index Label yielded many inconsistencies from manufacturer to manufacturer. As mentioned earlier in this report, the many variations of labels from one manufacturer to the next make it difficult for the consumer to compare vehicles. Appendix B shows a sampling of the many different variations of labels used by vehicle manufacturers. Based on this finding, staff decided to develop a uniform label that is easier to read and understand. To do this, staff decided to hire market research specialists to help.

In March 2007, ARB staff contracted with two market research firms to conduct two focus groups to evaluate various components of the proposed emissions label. The label designs evaluated were borrowed from the U.S. EPA's Green Vehicle Guide. The U.S. EPA developed its guide from performing numerous focus group tests over the years, and extensive market research. The purpose of our focus groups was to build upon the work already done by obtaining up to date information and receiving information from California-specific consumers.

Two focus groups were conducted in Los Angeles, California, on March 28, 2007 to obtain reactions to draft labels. One group was comprised of eight people and one group was comprised of nine people. One criterion for selection was that participants must have purchased a new vehicle within calendar years 2006 or 2007. Group number one was comprised of smaller vehicle buyers and group number two was comprised of larger vehicle buyers. The reason behind this grouping was that consumers of similar vehicle sizes would feel more comfortable talking with each other.

The following are some of the key findings of the vehicle emissions labeling focus groups[13]:

- Size of label. Consumers preferred the proposed minimum emissions label size of 4" x 6". The proposed minimum size was noticeable, simple and easy to read. The consumers felt the sample emissions label sized 1 1/4" x 4 ¼" placed on the Monroney label sized approximately 11" x 17", was too small and that they would not read it. Consumers preferred the emission label to be separate and next to Monroney label so that one would not have to walk around to the other side of car to read it. Consumers also did not like the sample size 2 ½" x 4" of the current smog index. They felt it contained too much information on too small of a label.

- Color of the label border. Consumers liked the green border of the proposed emissions label. They felt green represents the environment, conservation and that color catches the eye.

[13] Vehicle Emissions Labeling Focus Groups Qualitative Research, April 6, 2007, prepared for the California Air Resources Board by ConsumerQuest,

- Global Warming Score title versus Greenhouse Gas Score title. Consumers strongly preferred Global Warming Score. It had more meaning and was to the point.

- Cleanest versus Best as an additional indicator at end of scale. Consumers definitely preferred Cleanest. They felt it was more descriptive.

- Scale representation. Consumers preferred solid black blocks over either a solid black bar or a gradient over the entire scale. The blocks were more definitive and gave another counting mechanism. Colored blocks, whether green or blue, were not important. From a distance consumers think more blocks would mean worse pollution. However, when consumers look closer they understand the scale with 10 being the cleanest.

- Identification of agency or group responsible for the label. Consumers preferred California Environmental Protection Agency title with line over Air Resources Board versus just Air Resources Board. They felt it was more official looking and recognizable.

- Consumers desired more information on how the scores were determined. To address this concern staff has added an additional statement to the bottom border of the proposed emissions label.

Staff has used the information from these focus groups and other stakeholder input to develop the proposed design of the vehicle emissions label. These labeling requirements are prescriptive by nature and will require one label size and design to be used by all affected vehicle manufacturers. The design of the proposed vehicle emissions label is shown in figure VI-1. Figure VI-2 shows a flexible fuel vehicle with the “Alternate” fuel statement added.

**Figure VI-1: California Environmental Performance Label**

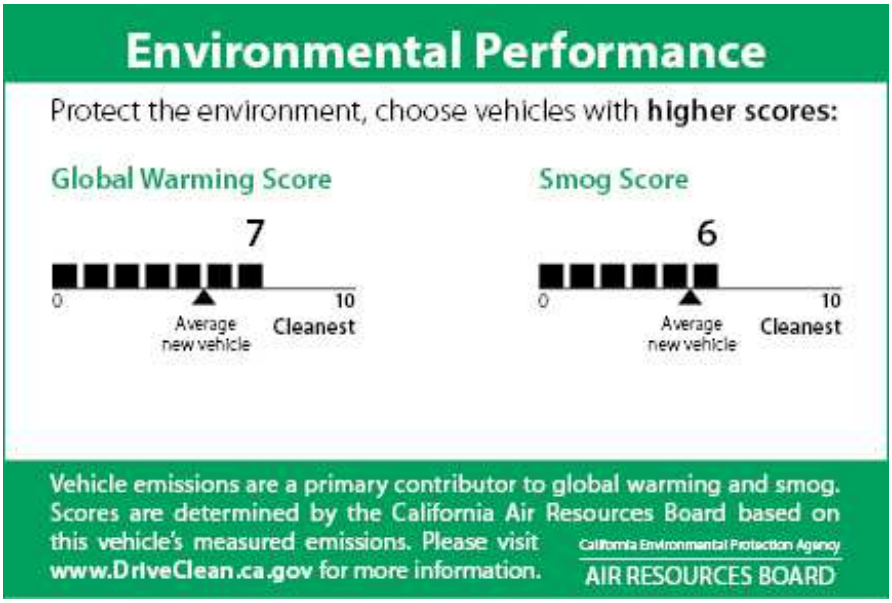



**Figure VI-2: California Environmental Performance Label with Flex-Fuel Vehicle Statement**

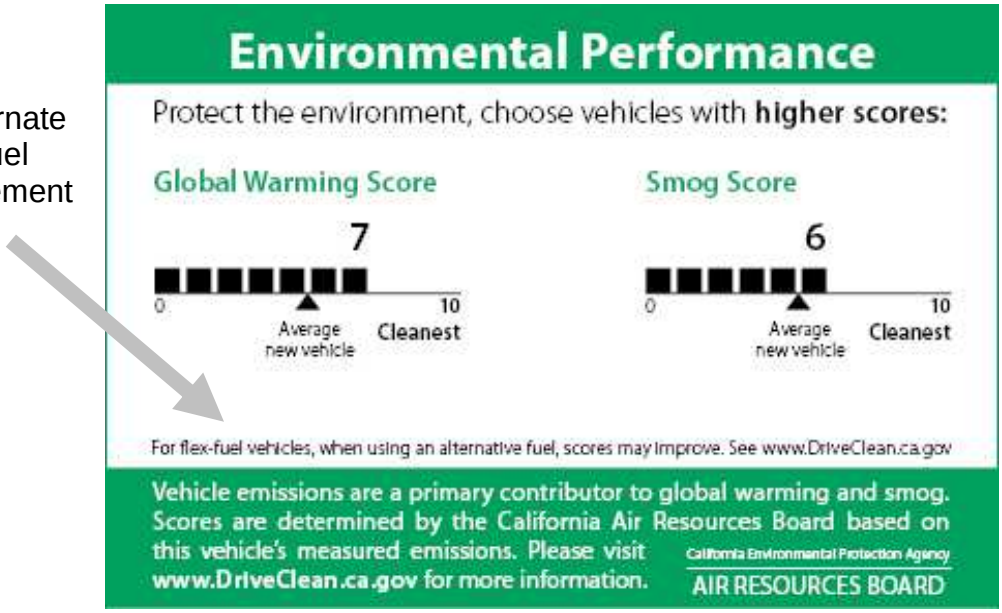



Figure VI-1 shows the Global Warming score on the left and the Smog Score on the right. The black boxes represent the score of the labeled vehicle. A triangle below the scale shows the score of an average vehicle for comparison purposes. It was clear in

the focus groups that with the word “cleanest” under the 10 and with the statement: “Protect the environment, choose vehicles with the higher scores” vehicles with more black boxes were cleaner vehicles. The statement at the bottom of the label describes the impact of motor vehicles on smog and global warming. It also points consumers to the ARB’s www.DriveClean.ca.gov website which is a consumer oriented website with information about clean cars, alternative fuel and advanced technology vehicles.

# VII. Economic Impacts

## A. Background

Staff is proposing to revise the current smog index and add a global warming index as required by statute. The statute also requires, among other things, that the label contain the use of at least one color of ink other than black (at H&S § 43200.1(b)(2)(D)) and to seek input from consumer focus groups in determining the color, which resulted in the selection of the color green.

Changes to the existing label, required by statute to include the additional global warming index information, necessitate an increase in the size of the label. Existing label sizes vary from 1½ x 6 inches to 2 ½ x 4 inches due to the current regulatory requirements for label content. Because of the amount of information already contained on the Smog Index Label and the fact that a new global warming index must be added, the size of the label must be increased to accommodate both indices. The findings of the consumer focus groups indicate that the new label size should be at least 4 x 6 inches.

Since the statute requires using a color other than black for some portion of the label, the color green was chosen as it represents an environmental color to most consumers. Most vehicle manufacturers claim to be currently using only black ink printers. Adding a color to the label requires the manufacturers to either obtain pre-printed color labels or replace their existing printers with color printers. Staff was able to analyze these costs and include them as an economic impact to the industry as a whole.

## B. Estimated Costs

### 1. Label Size

Part of the cost imposed on the manufacturers, based on these regulations, is associated with the increase in label size. Since the vehicle manufacturers are already required to print a Smog Index Label, staff reasoned that only minor costs would be incurred for setup, programming, or testing of the new label.

The increase in label size does not appear to cause much concern for existing assembly line printers as these printers are already capable of printing labels up to 6 inches wide and even Monroney labels up to 11 inches wide. The Monroney label is a federally mandated sticker affixed to the side window or windshield of every new passenger car and light-duty truck sold in the United States. The sticker includes consumer information such as the manufacturer's suggested retail price (MSRP), vehicle specifications, standard equipment and warranty details, optional equipment and pricing, and U.S. EPA city and highway fuel economy ratings.

Requiring a label to increase from 2.5 x 4 inches to 4 x 6 inches will add an estimated 0.8 cents per label based on minimum case package purchasing quantities of label feedstock. This cost will decrease as order quantities increase. Staff conservatively rounded this cost up to 1 cent per label which equates to 1 cent per vehicle produced.

Based on 2005 California vehicle sales data of approximately 2 million passenger cars, light-duty trucks, and medium-duty passenger vehicles, this would impose an industry wide annual operating cost increase of $20,000. Thirty vehicle manufacturers are currently certifying their products for sale in California. These manufacturers sell anywhere from 50 to 450,000 vehicles a year to California citizens. Based on market share, individual manufacturer costs would vary anywhere from $1 annually to $4,350 annually, but on average would equate to $667 per manufacturer per year.

### 2. Label Color

The addition of color also imposes a cost to the vehicle manufacturer. Regulating a specific color or colors by ARB would require the manufacturer to bear the cost of ordering pre-printed color labels to use as feedstock or bear the cost of replacing their existing black ink printers. Each solution to providing color labels is acceptable to staff, therefore an analysis of each solution follows. A more detailed and technical analysis can be found in Appendix C.

**Replace Existing Label Stock with Pre-Printed Color Label Stock**

Pre-printed color labels can be used as feedstock as long as all the information on the label presented in color is constant for all labels and the information being printed for each vehicle is in black. The new label, as recommended by staff, allows for this possibility. The per-label cost to go from a non-color feedstock label to color feedstock label is estimated to be about 5 cents per label. This equates to a 5 cents per vehicle cost increase. Based on 2005 California vehicle sales data of approximately 2 million passenger cars, light-duty trucks, and medium-duty passenger vehicles, this would impose a total annual operating cost increase of $100,000 across all manufacturers. Individual manufacturer costs would vary based on their actual production volume, but on average would equate to $3,333 per manufacturer per year.

Staff believes this option may be used for an extended period of time by small volume manufacturers but only for the first year or two by medium to large volume manufacturers. In discussions with the manufacturers, staff was given the impression that color labels are something the manufacturers have already been considering. Therefore, staff believes that manufacturers will upgrade existing black ink printers to color printers.

### Replace Existing Black Ink Printers with Color Printers

Staff expects manufacturers will replace existing black ink printers with color printers as existing printers wear out. New industrial laser-jet color printers cost about $6,000 each verses $5,000 for an equivalent black ink laser-jet printer. Therefore, staff reasoned that a manufacturer would only incur the incremental cost increase of $1,000 per printer. Staff reasoned that existing printers will continue to be used through the end of their useful lifecycle before being replaced or will be reutilized elsewhere in the organization. Either way, medium and large manufacturers will upgrade to color printers within the first three years of implementation. Staff estimated the range of printers required to be from as few as 2 to as many as 52 per manufacturer, based on the number of assembly facilities and ports used by each manufacturer. The total number of printer replacements required for the industry as a whole is estimated to be 286 which equates to a total statewide incremental cost increase of $286,000 or about $10,000 per average manufacturer.

This one time capital cost can be annualized over the 3-5 year life of a printer. Staff used a conservative replacement cycle of three years and a 5% real discount rate. Therefore the statewide 3-year annualized capital recovery cost will be $105,000 or about $3,500 per manufacturer. There is also an annual operational cost for switching from black ink cartridges to color ink cartridges. This annual cost was determined to be $120,000 statewide based on the estimated number of vehicles sold in California. This annual cost averages out to be $4,000 per manufacturer. Therefore the total annual cost per average manufacturer is the sum of the annualized one time capital cost and the annual operational cost which equates to $7,500.

### Cost Comparison

The annual cost per average manufacturer ($7,500) for upgrading to color printers is clearly higher than the annual cost ($3,333) for ordering pre-printed color labels. Manufacturers sell anywhere from 50 to 450,000 vehicles a year to California citizens. The smaller manufacturers would be required to distribute the high capital and operational costs of using color printers over a relatively small number of production vehicles. Staff analyzed this scenario and estimated an annual cost to be as high as $20.00 per vehicle. The larger manufacturers can distribute these capital and operational costs over a much larger number of production vehicles bringing the annual cost to as little as 2 cents per vehicle. This is why staff believes larger vehicle manufacturers will choose to upgrade to color printers rather than use pre-printed color labels.

## C. Total Cost of Implementation

The estimated maximum total annual cost to implement this regulation is calculated as the annualized capital cost to upgrade existing printers plus the annual

operating cost for increasing the label size and using color cartridges. For the industry as a whole this equates to $245,000 per year. The initial annualized capital cost for an average manufacturer to implement this regulation is estimated to be $3,500. The annual ongoing cost for increasing label size ($667) and using color cartridges ($4,000) for a typical manufacturer is estimated to be $4,667. Therefore the total annual cost, on average, to print the new larger color labels is estimated to be $8,167 ($3,500 + $4,667). This cost estimate will vary slightly by manufacturer depending on the actual number of assembly plants, ports of entry, printers required, and vehicles produced.

## VIII. Estimated Environmental Benefits

Staff expects that the proposed label will affect the purchasing choices of some vehicle buyers, however the degree to which this occurs is not known. If consumers buy vehicles with lower smog indices, smog emissions will be lower. If they buy vehicles with lower global warming indices, these emissions may also decrease. However, compliance with the current greenhouse gas emissions standards is based on a fleet average $CO_{2Equivalent}$ value by each manufacturer. Thus it may be possible that purchase of a cleaner vehicle will allow a manufacturer to produce additional vehicles with higher emissions (at presumably a lower cost). This would negate the effect of the label resulting in no change in greenhouse gas emissions. Over time however, staff expects that increased awareness of the benefits of purchasing a vehicle with low greenhouse gas emissions will result in market pressure to increase the number of models available with low emissions, with the result being manufacturer fleet wide emissions will be lower than required by regulation. The increased consumer awareness of vehicle greenhouse gas emissions may also encourage purchasers of other products to buy green.

# IX. Issues

## A. Lead Time Requirements

The vehicle manufacturers have expressed concerns with mandating a new label for all 2009 MY vehicles. The first and foremost concern hinges around the fact that all vehicle manufacturers have the ability to introduce 2009 MY vehicles as early as January of 2008. Therefore, there is no way to label such early introduction vehicles with a newly regulated label if the regulation itself does not become law before these early vehicles are ready for market distribution. The vehicle manufacturers have also stated that a substantial lead time to implement a new label must be considered due to the time required to purchase new label stock or printers, restructure existing assembly procedures, and reprogram existing assembly line computer language to adapt to the new label format. The following summary illustrates the main concerns the vehicle manufactures stressed for changing or implementing a new vehicle labeling program.

Staff solicited feedback from the vehicle manufacturers on actual implementation time once the regulation became law. Staff reviewed this feedback and provides the following overview of the implementation process and estimated processing time:

- Label Database Set-up: Link emission scores with variable label values. (6 months)
- Label Design and Specification: Incorporate new design with existing labels and specify ink, durability, paper, etc. (1 month)
- Label/Printer Procurement: Purchase new label feedstock and if necessary, new printers. (3 months)
- Label Delivery and Implementation: Ship new label feedstock and printers to all assembly plants and ports and integrate new labeling process into assembly line. (1 month).

Staff notes that the first process, Label Database Set-up, can be accomplished simultaneously with the other processes. However, the last three steps must be accomplished in succession. Therefore, the critical path for a new label implementation is estimated to be 6 months. Staff realizes that not all vehicle manufacturers operate identically and some variations to this process may occur during implementation, therefore staff recommends adding one additional month to the critical path in order to account for any variations.

Based on this information, staff recommends allowing at least a 7-month lead time for implementation of the new label requirements once they are approved by the Office of Administrative Law. Staff estimates this will occur no later than February, 2008. Allowing for a 7-month implementation lead-time, staff recommends the new label take affect for all vehicles manufactured beginning October 1, 2008.

### B. Label Size

The vehicle manufacturers have also indicated concern about the proposed label size. They've stated that increasing the size of the label from what they currently produce to the proposed 4 x 6 inches may 1) impact the placement of the label and 2) create visibility problems for consumers wanting to test drive the vehicle.

Some vehicle manufacturers place the current Smog Index Label on the vehicle as a separate label, sized approximately 2.5 x 4 inches, and other vehicle manufacturers place the current Smog Index, sized approximately 1.25 x 4.25 inches, on the Monroney label. A Monroney label, sized 11 x 17 inches includes the vehicle's options, pricing, fuel economy information and other information. By incorporating the California Smog Index label onto the Monroney label the vehicle manufacturers have indicated the Smog Index would begin appearing in all 50 states and not just in California. Unfortunately, the Monroney label already contains a tremendous amount of consumer information and the available space for a new Environmental Performance Label is limited. Staff presented a sample of both current industry labels to consumer focus groups held in March 2007, Los Angeles, California. The focus groups felt the sample emissions labels were too small and that they would not notice or read it. Consumers preferred the emission label not be located on the Monroney label and preferred the proposed size of 4 x 6 inches. Staff concluded that maintaining a minimum label size of 4 x 6 inches is required for consumer awareness and readability.

The second issue related to a large label is the potential obstruction of driver vision for consumers during test drives. The primary concern is for vehicles without rear side windows such as two-seater sports cars and convertibles. Vehicle manufacturers recommended that a smaller label be authorized for use on such vehicles to limit the already obstructed driver vision from all other federally required labels. Staff does not recommend reducing the size of the label in such cases because the placement of the California label is not restricted to side windows only. Like the current Smog Index Label, the proposed 4 x 6 inch label (which is only expanding by an inch or two over the existing label) may also be placed on the windshield if there is no space available on the side windows. There is sufficient windshield area to place the label without interfering with the driver's view.

## X. Alternatives

Thus far no alternative considered by the ARB has been identified that would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action. The following alternatives were considered in reaching this conclusion.

### A. Alternative 1: Keep Existing Smog Index Label and Add a Global Warming Index

One alternative would be to keep the existing Smog Index Label and expand it to add a global warming index. Staff felt this was not the best alternative for two reasons. First, the existing smog index is not well understood by consumers and focus group research suggests it needs revision. Second, the label does not have room for adding a new global warming index, and thus a second label for this index would have to be added. For these reasons a new, larger label is necessary.

Because this alternative requires expanding the existing label or adding a new label, staff assumed there is no cost difference between this alternative and the one staff is proposing.

### B. Alternative 2: Incorporate SmartWay Certification Mark

U.S. EPA launched the air pollution and greenhouse gas scores on their Green Vehicle Guide in 2005 to provide consumers with emissions information that allows them to compare the environmental performance of vehicles. In January 2006, the SmartWay certification mark was added to the Green Vehicle Guide to highlight vehicles that are very good environmental performers relative to other vehicles.

The SmartWay certification mark is achieved if a vehicle receives a minimum of a 6 on both the Greenhouse Gas Score and the Air Pollution Score and receives a combined score of 13 or higher. The SmartWay certification mark is shown in Figure X-1.

**Figure X-1: U.S. EPA SmartWay Certification Mark**


Staff reviewed the SmartWay program and included the SmartWay certification mark on the new label in focus group discussions. Response to SmartWay was positive and participants liked that the cleanest vehicles were identified using a logo. However ARB and U.S. EPA currently use different methods to determine global warming emissions. Staff recommends that the use of the SmartWay certification mark on the new label be

deferred until after the U.S. EPA's and ARB's methods for scoring global warming gases have been harmonized.

The cost of including the SmartWay certification mark is no different than the estimated cost for the proposed label. Staff assumes that most manufacturers will upgrade to color printers therefore there would be no additional cost to print out the color SmartWay logo.

### C. Conclusion

Having considered these alternatives, staff concludes that the proposed regulations are the best alternative because they allow staff to incorporate all previous market research and provide the consumers with a new Environmental Performance Label that will be noticed.

## XI. References

California Air Resources Board, Certification Data Reported to the California Air Resources Board, 2005.

California Air Resources Board, Estimated Annual Average Emissions, 2005.

California Air Resources Board, Letter to Steve Douglas, Director, Automobile Manufacturers and letter to John Cabaniss, Director, Association of International Automobile Manufacturers, February 28, 2007.

California Energy Commission Staff Report, "Inventory of California Greenhouse Gas Emissions and Sinks," 1990-1999.

San Jose Mercury News, "Survey finds 81% worried about global warming," April 12, 2007.

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United States Environmental Protection Agency, www.epa.gov, "Green Vehicle Guide," 2007.

# Appendix A – Regulation Language

**§ 1965. Emission Control, ~~and~~ Smog Index, and Environmental Performance Labels - 1979 and Subsequent Model-Year Motor Vehicles.**

In addition to all other requirements, emission control labels are required by the California certification procedures contained in the "California Motor Vehicle Emission Control and Smog Index Label Specifications for 1978 through 2003 Model Year Motorcycles, Light-, Medium- And Heavy-Duty Engines And Vehicles," adopted March 1, 1978, as last amended September 5, 2003, which is incorporated herein by reference, the "California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty trucks and Medium-Duty Vehicles," incorporated by reference in §1961(d), the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles," incorporated by reference in §1956.8(b), the "California Interim Certification Procedures for 2004 and Subsequent Model Hybrid-Electric Vehicle Classes," incorporated by reference in §1956.8(b) and (d), and the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," incorporated by reference in §1956.8(d). Smog index labels for passenger cars and light-duty trucks shall conform to the "California Smog Index Label Specifications for 2004 Through 2009 Model Year Passenger Cars and Light-Duty Trucks," adopted September 5, 2003, as last amended **{insert date}**, which is incorporated herein by reference. Environmental Performance labels for passenger cars, light-duty trucks, and medium-duty passenger vehicles shall conform to the "California Environmental Performance Label Specifications for 2009 and Subsequent Model Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles," adopted **{insert date}**, which are incorporated herein by reference. Motorcycles shall meet the requirements of Title 40 Code of Federal Regulations section 86.413-78, as last amended October 28, 1977, which is incorporated herein by reference.

Note: Authority cited: Sections 39600, 39601, ~~and~~ 43200, and 43200.1, Health and Safety Code. Reference: Sections 39002, 39003, 43000, 43013, 43018.5, 43100, 43101, 43102, 43103, 43104, 43107, ~~and~~ 43200, and 43200.1, Health and Safety Code.

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**State of California**
**AIR RESOURCES BOARD**

# CALIFORNIA SMOG INDEX LABEL SPECIFICATIONS FOR 2004 ~~AND SUBSEQUENT~~ THROUGH 2009 MODEL YEAR PASSENGER CARS AND LIGHT-DUTY TRUCKS

Adopted: September 5, 2003
Amended: {Insert Date}

Note: This new document is an abbreviated version of the "California Motor Vehicle Emission Control and Smog Index Label Specifications" (the old Label Specifications document), which has been sunsetted after the 2003 model year. All of the tune-up label requirements in the old Label Specifications document applicable to light-, medium and heavy-duty vehicles and motorcycles are being incorporated into their respective test procedure documents effective with the 2004 model year, making a separate document covering the California tune-up label requirements no longer necessary.

Effective with the 2004 model year, all of the smog index requirements in the old Label Specifications document have been moved to the new document shown here. Paragraph 1of this new document was previously contained in paragraph 11 of the old Label Specifications document; paragraphs 2, 3, and 4 were previously set forth in paragraphs 3.5, 3.5(c), and 3.5(d) respectively of the old Label Specifications document; and Appendix A in this new document is identical to Appendix A in the old Label Specifications document.

**State of California**
**AIR RESOURCES BOARD**

## California Smog Index Label Specifications

1. **Prohibition**. The sale and registration in this state of any certified new 2004 ~~and subsequent~~ through 2009 model passenger car or light-duty truck to which a smog index label has not been affixed in accordance with these procedures is prohibited.

2. **Requirements**. A smog index label made of paper or plastic shall be securely affixed in a location specified in section 43200 of the Health and Safety Code. The smog index label shall display the smog index for the vehicle, as specified in section 3 below, and the fleet average smog index, which shall be referred to as "The Smog Index of the average new vehicle." Every model-year, the fleet average smog index shall be updated on the smog index label as specified in section 4 below. The smog index label shall also include information to inform purchasers of the significance of the smog index. The smog index label shall take the form set forth in Appendix A of this document. An alternative label may be used if shown to yield equivalent clarity and if approved in advance by the Executive Officer.

3. **Smog Indices**. The following smog indices shall apply to 2004 ~~and subsequent~~ through 2009 model-year passenger cars and light-duty trucks 0-8500 lbs. GVW:

| | Enhanced Evap. 2.0g/ diurnal + hot soak test, 0.05 g/mi – running loss test, at 100,000 miles | PCs 0.5 g/ diurnal + hot soak test, 0.05 g/mi – running loss test, at 150,000 miles | LDTs < 6,000 lbs. GVW 0.65 g/ diurnal + hot soak test, 0.05 g/mi – running loss test, at 150,000 miles | LDTs 6,001-8,500 lbs. GVW 0.90 g/ diurnal + hot soak test, 0.05 g/mi - running loss test, at 150,000 miles | Evap. Exempt |
|---|---|---|---|---|---|
| **LEV I** | | | | | |
| Passenger Cars and Light-Duty Truck 1 (0-3750 lbs. LVW) | | | | | |
| LEV | 1.00 | 0.92 | 0.93 | 0.94 | 0.80 |
| ULEV | 0.90 | 0.82 | 0.83 | 0.84 | 0.70 |
| ZEV | n/a | n/a | n/a | n/a | 0.00 |
| Light-Duty Truck 2 (3751-5750 lbs. LVW) | | | | | |
| LEV | 1.65 | n/a | 1.58 | 1.60 | 1.45 |
| ULEV | 1.51 | n/a | 1.44 | 1.45 | 1.30 |
| ZEV | n/a | n/a | n/a | n/a | 0.00 |
| **LEV II** | | | | | |
| Passenger Cars; Light-Duty Truck 1 (0-3750 lbs. LVW); Light-Duty Truck 2 (3751 lbs. LVW – 8500 lbs. GVWR) | | | | | |
| LEV | 0.57 | 0.49 | 0.50 (0.55)[1] | 0.51 (0.57)[1] | 0.36 |
| ULEV | 0.46 | 0.39 | 0.40 | 0.41 | 0.26 |
| SULE | 0.29 | 0.21 | 0.22 | 0.23 | 0.09 |
| ZEV | n/a | n/a | n/a | n/a | 0.00 |

[1] The smog index in parentheses applies to the optional LEV II LEV standard. Up to 4% of a manufacturer's light-duty truck 2 fleet with a maximum base payload of 2500 lbs. may be certified to a standard of 0.07 g/mi NOx at 50,000 miles.

4. **Fleet Average Smog Indices:** The following fleet average smog indices shall apply to 2004 ~~and subsequent~~ through 2009 model-year passenger cars and light-duty trucks 0-8500 lbs. GVW:

| 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 and subsequent |
|---|---|---|---|---|---|---|
| 1.02 | 0.80 | 0.58 | 0.40 | 0.38 | 0.37 | 0.36 |

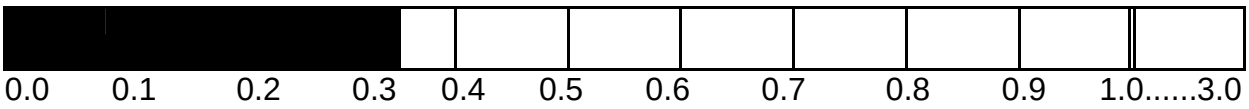
5. **Sunset:** These specifications will sunset on September 30, 2008. All passenger cars and light-duty trucks manufactured on October 1, 2008 and thereafter must comply with the "California Environmental Performance Label Specifications" incorporated by reference in Title 13 California Code of Regulations § 1965.

## APPENDIX A

## SMOG EMISSIONS INFORMATION

The Smog Index of this vehicle is 0.34

The Smog Index of the average new vehicle is 0.52




◄CLEANER MORE POLLUTING►

Note: The Smog Index (SI) indicates the relative level of smog-forming pollutants emitted by the vehicle. The lower the SI, the lower the vehicle's emissions.

Note for commenters: The entire text of these proposed specifications is new.

**State of California**
**AIR RESOURCES BOARD**

# CALIFORNIA ENVIRONMENTALPERFORMANCE LABEL SPECIFICATIONS FOR 2009 AND SUBSEQUENT MODEL YEAR PASSENGER CARS, LIGHT-DUTY TRUCKS, AND MEDIUM-DUTY PASSENGER VEHICLES

Adopted: {Insert Date}

Note: These specifications shall take effect for all vehicles manufactured on October 1, 2008 and thereafter. On October 1, 2008, the Environmental Performance Label will replace the Smog Index Label; therefore vehicles manufactured on October 1, 2008, and thereafter will no longer require a Smog Index Label. Replacing the Smog Index Label with the new Environmental Performance Label prior to October 1, 2008, is acceptable.

**State of California**
**AIR RESOURCES BOARD**

## California Environmental Performance Label Specifications

1. **Prohibition**. The sale and registration in this state of any certified new 2009 and subsequent model passenger car, light-duty truck, and medium-duty passenger vehicle manufactured on or after October 1, 2008 to which an Environmental Performance label has not been affixed in accordance with these procedures is prohibited. Affixing the Environmental Performance label to a vehicle manufactured before October 1, 2008 in lieu of the Smog Index Label is optional, however, each such label optionally affixed and not meeting all specifications herein, is prohibited.

2. **Requirements**. An Environmental Performance label made of paper or plastic shall be securely affixed in a location specified in section 43200 of the Health and Safety Code. The Environmental Performance label shall display the global warming score for the vehicle, as specified in section 3 below. The Environmental Performance label shall display the smog score for the vehicle, as specified in section 4 below. The environmental performance label shall take the form set forth in section 7 and Attachment A of this document.

3. **Global Warming Score**

   (a) The global warming emissions value used to determine a vehicle's score shall be the CO2Equivalent value as calculated according to Title 13, California Code of Regulations § 1961.1(a)(1)(B) and certified pursuant thereto.

   (b) The average new vehicle $CO_{2Equivalent}$ combined value is projected to be 360 grams per mile and shall be assigned a score of 5.

   (c) The scores in the following table shall apply to all passenger cars and light-duty trucks 0-8500 pounds GVW and medium-duty passenger vehicles 8,500-10,000 GVW:

| Grams per mile $CO_{2Equivalent}$ combined | Global Warming Score |
|---|---|
| Less than 200 | 10 |
| 200-239 | 9 |
| 240-279 | 8 |
| 280-319 | 7 |
| 320-359 | 6 |
| 360-399 | 5 |
| 400-439 | 4 |
| 440-479 | 3 |
| 480-519 | 2 |
| 520 and up | 1 |

**4. Smog Score**

(a) The average new vehicle is assigned an Ultra-Low-Emission Vehicle (ULEV) certification and is assigned a score of 5.

(b) The scores in the following table apply to 2009 and subsequent model-year passenger cars and light-duty trucks 0-8500 pounds GVW and medium-duty passenger vehicles 8,500-10,000 GVW:

| California Emissions Category - Federal Bins | NMOG + NOx (g/mile) | Smog Score |
|---|---|---|
| ZEV – Bin 1 | 0.0 | 10 |
| PZEV | 0.030 | 9 |
| SULEV – Bin 2 | 0.030 | 8 |
| Bin 3 | 0.085 | 7 |
| Bin 4 | 0.110 | 6 |
| ULEV | 0.125 | 5 |
| LEV – Bin 5 | 0.160 | 4 |
| [LEV (option 1) – Bin 6] and [SULEV (MDPV)] | 0.190 – 0.200 | 3 |
| Bin 7 | 0.240 | 2 |
| ULEV (MDPV) – Bin 8a | 0.325 | 1 |

**5. Bi-Fuel, Fuel-Flexible, and Dual-Fuel Vehicles**. Notwithstanding Title 13, California Code of Regulations, Section 1961.1(a)(1)(B)(2)(a), the global warming score is based on exhaust mass emission tests when the vehicle is operating on gasoline.

**6. Environmental Performance Label format requirements.** Detailed printing specifications are given in Attachment A of this part and apply to the provisions in this section.

(a) Environmental performance labels:

(1) Must be rectangular in shape with a minimum size of 6 x 4 inches.

(2) Must be outlined with a 1 point green line and have exactly a 0.5 inch section of green at the top and exactly a 1 inch section of green at the bottom.

(b) Label information. The information on each label must meet the following requirements:

(1) The color for the background as specified in Attachment A is PMS 347 C selected from the Pantone Matching System, solid coated swatch book. When printing in 4 color process the color build for the prescribed green is:

| | |
|---|---|
| Cyan | 100 |
| Magenta | 0 |
| Yellow | 86 |
| Black | 3 |

(2) "Environmental Performance" is the title of the label. This title must be centered in the top section of green. See Attachment A for font and color requirements.

(3) The phrase "Protect the environment, choose vehicles with higher scores:" must appear. This phrase must start exactly 2 picas (0.341 inches) from the left edge of label. See Attachment A for font and color requirements.

(4) "Global Warming Score" is a title that must always appear over its respective scale. This title must start exactly 2 picas (0.341 inches) from the left edge. See Attachment A for font and color requirements.

(5) The number for the Global Warming Score is variable and must appear over the block it represents on the global warming scale. Scores are determined in section 3. See Attachment A for font and color requirements.

(6) The number 0 must appear on the left most side of the scale it is under. See Attachment A for font and color requirements.

(7) "Average New Vehicle" must appear under both scales at the center point, which is marked by a triangle (item 15 in the style guide). See Attachment A for font and color requirements.

(8) This statement must appear in the lower section of green on every label: "Vehicle emissions are a primary contributor to global warming and smog. Scores are determined by the California Air Resources Board based on this vehicle's measured emissions. Please visit **www.DriveClean.ca.gov** for more information." This statement must start exactly 2 picas (0.341 inches) from the left edge. The third row of text will end at the word "visit" and drop

down to a fourth line of text to allow room for item 17, the ARB logotype. See Attachment A for font and color requirements.

(9) "higher scores:" must be bolded. See Attachment A for font and color requirements.

(10) "Smog Score" must appear over its respective scale. It shall end exactly 1.5 inches away from the right edge, and shall be flush left with its scale. See Attachment A for font and color requirements.

(11) The number for the Smog Score is variable and must appear over the block it represents on the smog scale. Scores are determined in section 4. See Attachment A for font and color requirements.

(12) Squares on the scales. Each square represents a single point on the scale. If a vehicle scores a 5, on a given scale, there will be five squares to represent that score. The first square must be flush left with the scale line (Attachment A item 13) and the tenth square must be flush right with item 13, therefore maintaining a distance of exactly 0.042 inches between squares, even when not all ten squares are present. See Attachment A for size and color requirements.

(13) The scale line must appear on both scales and must be a consistent length. It must always be flush left with its respective title. See Attachment A for font and color requirements.

(14) A number 10 must appear flush right with Attachment A item 13 of both scales. The number 10 represents the highest score a vehicle can get on each scale. See Attachment A for font and color requirements.

(15) A triangle must appear at the center point of both scales representing where the average new vehicle falls on each scale. See Attachment A for font and color requirements.

(16) The title "Cleanest" must appear flush right and underneath the 10 (Attachment A item 14) on both scales. It must always be bold. See Attachment A for font and color requirements.

(17) The California Environmental Protection Agency / Air Resources Board logotype must appear in the lower right hand corner, ending exactly 0.3 inches from the right edge. See Attachment A for font and color requirements.

(18) The Drive Clean website (**www.DriveClean.ca.gov**) should always appear in the Myriad Semi-bold within Item 8. See Appendix A for font and size specifications.

(19) This statement must appear for bi-fueled vehicles: “For bi-fuel vehicles, when using an alternative fuel, scores may improve. See **www.DriveClean.ca.gov**”.

(20) This statement must appear for fuel-flexible vehicles: “For flex-fuel vehicles, when using an alternative fuel, scores may improve. See **www.DriveClean.ca.gov**”.

(21) This statement must appear for dual-fuel vehicles: “For dual-fuel vehicles, when using an alternative fuel, scores may improve. See **www.DriveClean.ca.gov**”.

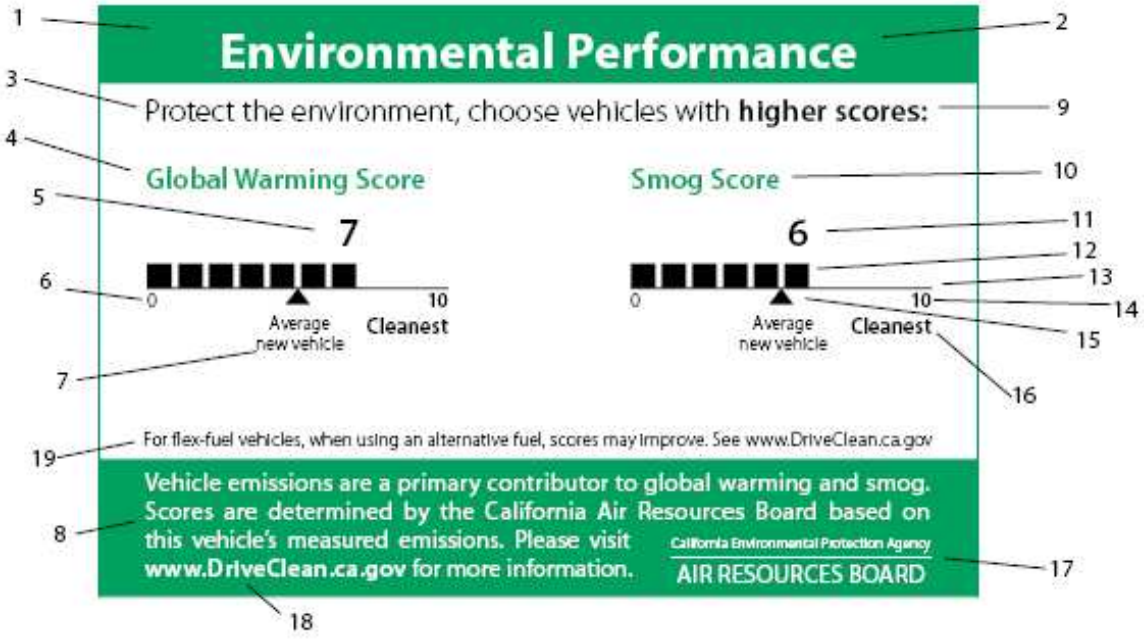
7. **Severability**. Each provision of this section is severable, and in the event that any provision of this section is held to be invalid, the remainder of these specifications remains in full force and effect.

## ATTACHMENT A

## ENVIRONMENTAL PERFORMANCE LABEL STYLE REQUIREMENTS

| | |
|---|---|
| 1 | Label Background 6 x 4 inches whole; top green: 6 x 0.5 inches;<br>Bottom green: 6 x1 inches; green stroke: 1 point; Color: PMS 347 C |
| 2 | font: Myriad Pro Bold; size: 25 points; color: knocked out of green (appears white) |
| 3 | font: Myriad Pro Light; size: 15 points; color: Black |
| 4, 10 | font: Myriad Pro Semi-bold; size: 14.4 points; color: PMS 347 C |
| 5, 11 | font: Myriad Pro Semi-bold; size: 19.2 points; color: Black |
| 6, 14 | font: Myriad Pro Light; size: 9.6 points; color: Black |
| 7 | font: Myriad Pro Light; size/leading: 9/10.8 points; color: Black |
| 8 | font: Myriad Pro Regular; size/leading: 11.3/13.5 points; color: knocked out of green (appears white) |
| 9 | font: Myriad Pro Semi-bold; size: 15 points; color: Black |
| 12 | size: 0.167 x 0.167 inches; color: Black; distance: 0.042 inches apart |
| 13 | Scale Line: length: 2.05 inches; stroke: 1 point; color: Black |
| 15 | size: 0.167 x 1.11 inches; color: Black |
| 16 | font: Myriad Pro Semi-bold; size: 10.5 points; color: Black |
| 17 | California Environmental Protection Agency / Air Resources Board logotype:<br>Top Row: font: Myriad Pro Regular; size: 7 points (Title Case)<br>Bottom Row: font Myriad Pro Regular; size: 12 points (All Caps)<br>Line weight: 1 point;<br>Color for all: knocked out of green (appears white) |
| 18 | **www.DriveClean.ca.gov**:<br>Font: Myriad Pro Semi-bold<br>Size: 12 points<br>Color: knocked out of green (appears white) |
| 19 | Flex-fuel phrase (variable element): font: Myriad Pro Light; size: 9 points; color: Black |

## Environmental Performance Label



California Environmental Protection Agency
AIR RESOURCES BOARD

# CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2001 AND SUBSEQUENT MODEL PASSENGER CARS, LIGHT-DUTY TRUCKS, AND MEDIUM-DUTY VEHICLES

| | |
|---|---|
| Adopted: | August 5, 1999 |
| Amended: | December 27, 2000 |
| Amended: | July 30, 2002 |
| Amended: | September 5, 2003 (corrected February 20, 2004) |
| Amended: | May 28, 2004 |
| Amended: | August 4, 2005 |
| Amended: | June 22, 2006 |
| Amended: | [INSERT DATE OF AMENDMENT] |
| Amended: | [INSERT DATE OF AMENDMENT] |

Note: The proposed amendments to this document are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions compared to the test procedures as adopted by the Board on June 22, 2006. Amendments to this document as adopted on March 22, 2007 as part of the "Rulemaking to Consider Amendments to California's Emission Warranty Information Reporting and Recall Regulations and Emission Test Procedures," are indicated by double underline to indicate additions and ~~double strikeout~~ to indicate deletions compared to the test procedures as amended on June 22, 2006. Existing intervening text that is not amended is indicated by "* * * *". The amendments proposed here are non-substantive in that they impose no additional or changed requirements beyond those proposed for Section 1965, but are proposed here to maintain consistency.

NOTE: This document is incorporated by reference in sections 1960.1(k) and 1961(d), title 13, California Code of Regulations (CCR). It contains the majority of the requirements necessary for certification of a passenger car, light-duty truck or medium-duty vehicle for sale in California, in addition to containing the exhaust emission standards and test procedures for these motor vehicles. However, reference is made in these test procedures to other ARB documents that contain additional requirements necessary to complete an application for certification. These other documents are designed to be used in conjunction with this document. They include:

1. "California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes" (incorporated by reference in section 1962, title 13, CCR);

2. "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles" (incorporated by reference in section 1976(c), title 13, CCR);

3. "California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles" (incorporated by reference in section 1978(b), title 13, CCR);

4. OBD II (section 1968, et seq. title 13, CCR, as applicable);

5. "California Smog Index Label Specifications for 2004 through 2009 Model Year Passenger Cars and Light-Duty Trucks" (incorporated by reference in section 1965, title 13, CCR);

6. "California Environmental Performance Specifications for 2009 and Subsequent Model Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles" (incorporated by reference in 1965, title 13, CCR);

~~6~~7. Warranty Requirements (sections 2037 and 2038, title 13, CCR);

~~7~~8. "Specifications for Fill Pipes and Openings of Motor Vehicle Fuel Tanks" (incorporated by reference in section 2235, title 13, CCR);

~~8~~9. Guidelines for Certification of Federally Certified Light-Duty Motor Vehicles for Sale in California (incorporated by section 1960.5, title 13, CCR); and

~~9~~10. "California Non-Methane Organic Gas Test Procedures," (incorporated by reference in section 1961(d), title 13, CCR).

The section numbering conventions for this document are set forth in Part I, section A.3 on page A-2.

**CALIFORNIA EXHAUST EMISSION STANDARDS AND TEST PROCEDURES FOR 2001 AND SUBSEQUENT MODEL PASSENGER CARS, LIGHT-DUTY TRUCKS AND MEDIUM-DUTY VEHICLES**

The provisions of Subparts B, C, and S, Part 86, Title 40, Code of Federal Regulations, as adopted or amended on May 4, 1999 or as last amended on such other date set forth next to the 40 CFR Part 86 section title listed below, and to the extent they pertain to exhaust emission standards and test procedures, are hereby adopted as the "California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," with the following exceptions and additions.

## PART I: GENERAL PROVISIONS FOR CERTIFICATION AND IN-USE VERIFICATION OF EMISSIONS

* * * *

### C. General Requirements for Certification

* * * *

#### 3. §86.1807 Vehicle Labeling

* * * *

#### 3.3 California Labeling Requirements.

3.3.1. In addition to the federal requirements set forth in §86.1807, labeling shall conform with the requirements specified in section 1965, title 13, CCR, and the "California Smog Index Label Specifications <u>for 2004 through 2009 Model Year Passenger Cars and Light-Duty Trucks</u>" <u>and "California Environmental Performance Specifications for 2009 and Subsequent Model Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Passenger Vehicles"</u> as incorporated by reference in section 1965, title 13, CCR. In cases where there is conflict with the federal label specifications, the California requirements shall apply.

* * * *

## PROPOSED REGULATION ORDER

Set forth below are the proposed amendments to title 13 of the California Code of Regulations. Proposed amendments are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions. Amendments to §1961 that were adopted by the Board on March 22, 2007 as part of the "Rulemaking to Consider Amendments to California's Emission Warranty Information Reporting and Recall Regulations and Emission Test Procedures," but which have not yet been approved by the Office of Administrative Law are indicated in double underline to indicate additions and ~~double strikeout~~ to indicate deletions. The amendments proposed here are non-substantive in that they impose no additional or changed requirements beyond those proposed for Section 1965, but are proposed here to maintain consistency.

### § 1961. Exhaust Emission Standards and Test Procedures - 2004 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.

*Introduction.* [No change.]

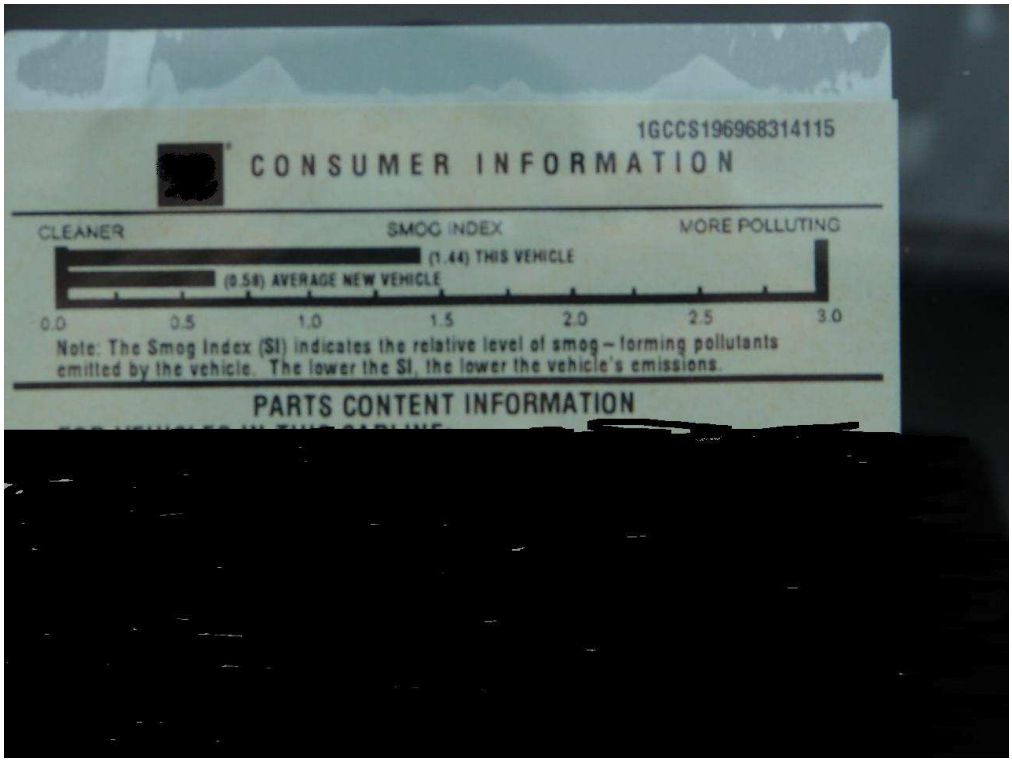
Sections (a) through (c). [No change.]

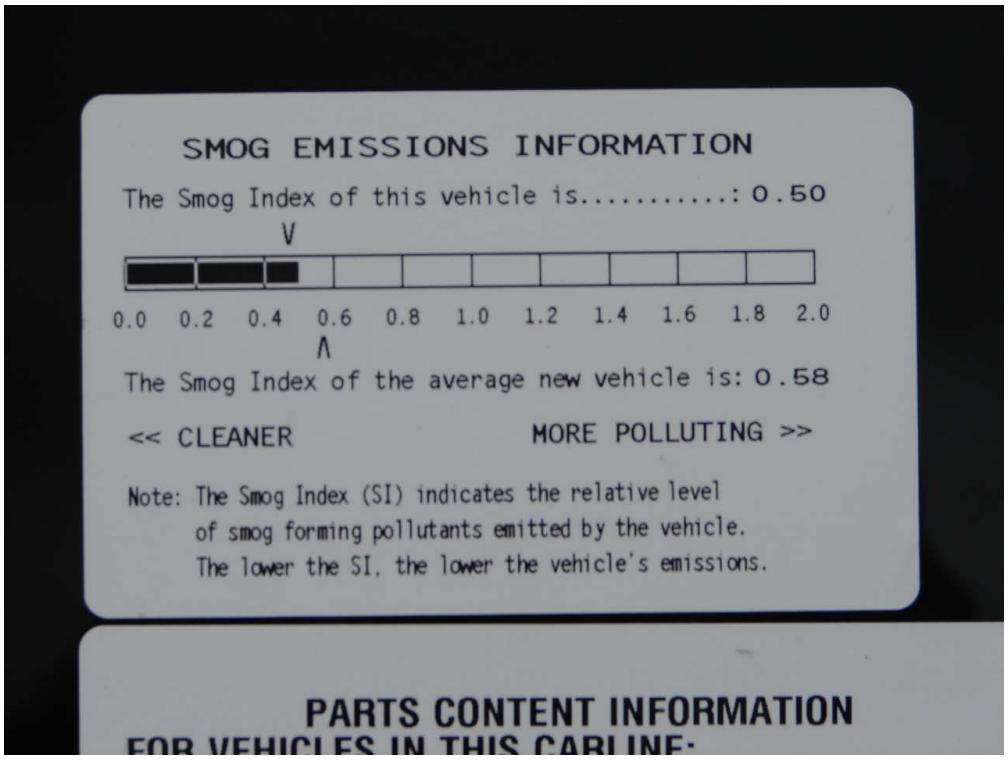
(d) *Test Procedures.* The certification requirements and test procedures for determining compliance with the emission standards in this section are set forth in the "California Exhaust Emission Standards and Test Procedures for 2001 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles," as amended ~~June 22, 2006~~ ~~[insert date of amendment for the March 22, 2007 emission warranty rulemaking]~~ [insert date of amendment for this rulemaking], and the "California Non-Methane Organic Gas Test Procedures," as amended July 30, 2002, which are incorporated herein by reference. In the case of hybrid electric vehicles and on-board fuel-fired heaters, the certification requirements and test procedures for determining compliance with the emission standards in this section are set forth in the "California Exhaust Emission Standards and Test Procedures for 2005 and Subsequent Model Zero-Emission Vehicles, and 2001 and Subsequent Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes," incorporated by reference in section 1962.

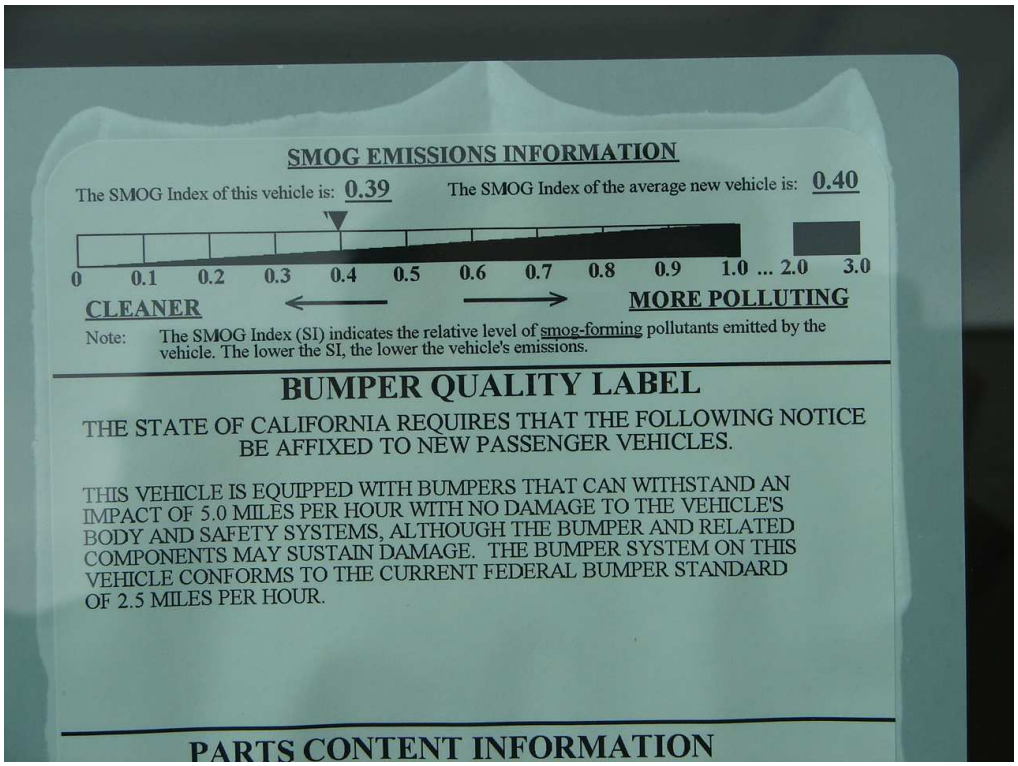
Section (e). [No change.]

Note: Authority cited: Sections 39500, 39600, 39601, 43013, 43018, 43101, 43104 and 43105, Health and Safety Code. Reference: Sections 39002, 39003, 39667, 43000, 43009.5, 43013, 43018, 43100, 43101, 43101.5, 43102, 43104, 43105, 43106, 43204, and 43205, Health and Safety Code.

# Appendix B – Example Existing Smog Index Labels





SMOG EMISSIONS INFORMATION

The SMOG Index of this vehicle is: 0.39 The SMOG Index of the average new vehicle is: 0.40

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 ... 2.0 3.0

CLEANER ← → MORE POLLUTING

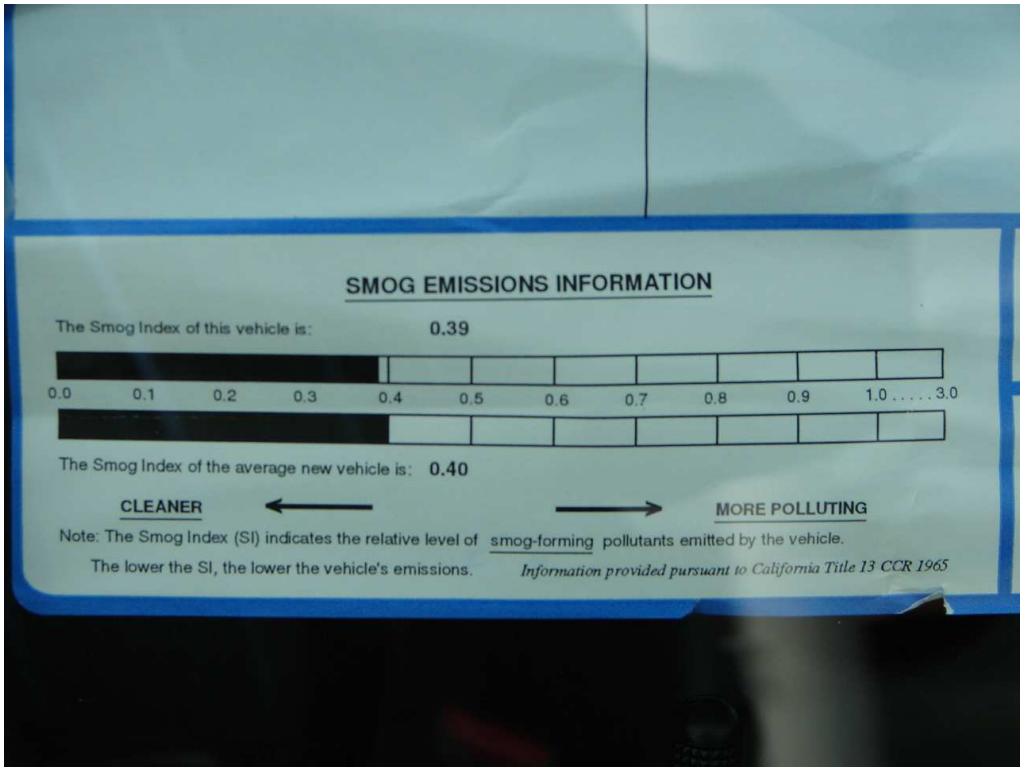
Note: The SMOG Index (SI) indicates the relative level of smog-forming pollutants emitted by the vehicle. The lower the SI, the lower the vehicle's emissions.

BUMPER QUALITY LABEL

THE STATE OF CALIFORNIA REQUIRES THAT THE FOLLOWING NOTICE BE AFFIXED TO NEW PASSENGER VEHICLES.

THIS VEHICLE IS EQUIPPED WITH BUMPERS THAT CAN WITHSTAND AN IMPACT OF 5.0 MILES PER HOUR WITH NO DAMAGE TO THE VEHICLE'S BODY AND SAFETY SYSTEMS, ALTHOUGH THE BUMPER AND RELATED COMPONENTS MAY SUSTAIN DAMAGE. THE BUMPER SYSTEM ON THIS VEHICLE CONFORMS TO THE CURRENT FEDERAL BUMPER STANDARD OF 2.5 MILES PER HOUR.

PARTS CONTENT INFORMATION



SMOG EMISSIONS INFORMATION

The Smog Index of this vehicle is: 0.39

0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 . . . . . 3.0

The Smog Index of the average new vehicle is: 0.40

CLEANER ← → MORE POLLUTING

Note: The Smog Index (SI) indicates the relative level of smog-forming pollutants emitted by the vehicle.

The lower the SI, the lower the vehicle's emissions.

*Information provided pursuant to California Title 13 CCR 1965*

# Appendix C - Technical Analysis

This Appendix focuses on the technical analysis ARB staff underwent to develop a new Smog and Global Warming scoring system for developing a new vehicle emissions label. This Appendix also focuses on the detailed analysis of the economic impact of replacing existing black and white printers with color printer to print color labels.

## A. Smog Score

In developing a new Smog scoring system, staff looked at California's LEV II regulations that will be in affect for all 2009 MY vehicles. Table C-1 represents the California LEV II emission certification limits for the 2009 MY and the current air pollution score used by the U.S. EPA.

**Table C-1: California Light-Duty Vehicle Emissions Standards for Air Pollutants**

| California LEV II Program | | | | | | |
|---|---|---|---|---|---|---|
| **Standard** | **Model Year** | **Vehicles** | **Emission Limits at Full Useful Life (120,000 miles) Maximum Allowed Grams per Mile** | | | **Current Air Pollution Score** |
| | | | **NOx** | **NMOG** | **NMOG+NOx** | |
| ZEV | 2004+ | PC, LDT 8500 lbs or less | 0.00 | 0.000 | 0.000 | 10 |
| PZEV* | 2004+ | PC, LDT 8500 lbs or less | 0.02 | 0.010 | 0.030 | 9.5 |
| SULEV | 2004+ | PC, LDT 8500 lbs or less | 0.02 | 0.010 | 0.030 | 9 |
| ULEV | 2004+ | PC, LDT 8500 lbs or less | 0.07 | 0.055 | 0.125 | 7 |
| LEV | 2004+ | PC, LDT 8500 lbs or less | 0.07 | 0.090 | 0.160 | 6 |
| LEV option 1 | 2004+ | PC, LDT 8500 lbs or less | 0.10 | 0.090 | 0.190 | 5 |
| SULEV | 2004+ | MDV 8501-10,000 lbs | 0.10 | 0.100 | 0.200 | 4 |
| ULEV | 2004+ | MDV 8501-10,000 lbs | 0.20 | 0.143 | 0.343 | 3 |
| LEV | 2004+ | MDV 8501-10,000 lbs | 0.20 | 0.195 | 0.395 | 2 |
| SULEV | 2004+ | MDV 10,001-14,000 lbs | 0.20 | 0.117 | 0.317 | 3 |
| ULEV | 2004+ | MDV 10,001-14,000 lbs | 0.40 | 0.167 | 0.567 | 2 |
| LEV | 2004+ | MDV 10,001-14,000 lbs | 0.40 | 0.230 | 0.630 | 1 |

* Vehicles certified as PZEV have a 150,000 useful life, zero evaporative emissions and a manufacturer 15 years/150,000 miles emissions warrantee.

Table C-1 includes California certification limits for all vehicles up to 14,000 lbs. GVWR. However, AB 1229 only requires labels to be applied to vehicles up to 10,000 lbs. GVWR. Therefore the last three shaded rows of this table are not applicable to the labeling requirements.

The applicable NMOG+NOx certification values range from 0.0 (g/mile) being the cleanest to 0.395 (g/mile) being the dirtiest. This 2009 range of certification levels is less than the current range used by the U.S. EPA Green Vehicle Guide for scoring air pollution; therefore,

a new scoring system must be developed. In keeping with the philosophy of harmonizing the new California scale with the U.S. EPA scale, staff took a look at the Federal certification levels for the 2009 model year. Table C-2 illustrates these values along with the current air pollution scores for each certification level.

**Table C-2: U.S. EPA Light-Duty Vehicle Emissions Standards for Air Pollutants**

| Federal Tier 2 Program | | | | | | |
|---|---|---|---|---|---|---|
| **Standard** | **Model Year** | **Vehicles** | **Emission Limits at Full Useful Life (100,000-120,000 miles) Maximum Allowed Grams per Mile** | | | **Current Air Pollution Score** |
| | | | **NOx** | **NMOG** | **NMOG+NOx** | |
| Bin 1 | 2004+ | LDV, LLDT, HLDT, MDPV | 0.00 | 0.000 | 0.000 | 10 |
| Bin 2 | 2004+ | LDV, LLDT, HLDT, MDPV | 0.02 | 0.010 | 0.030 | 9 |
| Bin 3 | 2004+ | LDV, LLDT, HLDT, MDPV | 0.03 | 0.055 | 0.085 | 8 |
| Bin 4 | 2004+ | LDV, LLDT, HLDT, MDPV | 0.04 | 0.070 | 0.110 | 7 |
| Bin 5 | 2004+ | LDV, LLDT, HLDT, MDPV | 0.07 | 0.090 | 0.160 | 6 |
| Bin 6 | 2004+ | LDV, LLDT, HLDT, MDPV | 0.10 | 0.090 | 0.190 | 5 |
| Bin 7 | 2004+ | LDV, LLDT, HLDT, MDPV | 0.15 | 0.090 | 0.240 | 4 |
| Bin 8a | 2004+ | LDV, LLDT, HLDT, MDPV | 0.20 | 0.125 | 0.325 | 3 |
| Bin 8b | 2004-2008 | HLDT, MDPV | 0.20 | 0.156 | 0.356 | 3 |
| Bin 9a | 2004-2008 | LDV, LLDT | 0.30 | 0.090 | 0.390 | 2 |
| Bin 9b | 2004-2008 | LDT2 | 0.30 | 0.130 | 0.430 | 2 |
| Bin 9c | 2004-2008 | HLDT, MDPV | 0.30 | 0.180 | 0.480 | 2 |
| Bin 10a | 2004-2008 | LDV, LLDT | 0.60 | 0.156 | 0.756 | 1 |
| Bin 10b | 2004-2008 | HLDT, MDPV | 0.60 | 0.230 | 0.830 | 1 |
| Bin 10c | 2004-2008 | LDT4, MDPV | 0.60 | 0.280 | 0.880 | 1 |
| Bin 11 | 2004-2008 | MDVP | 0.90 | 0.280 | 1.180 | 0 |

Again, the last eight shaded rows (Bin8b-Bin 11) in table C-2 will not apply to 2009 model year vehicles and the range of certification levels will be reduced to those identified in the non-shaded lines.

Table C-2 represents eight certification levels for all vehicles manufactured up to 10,000 lbs. GVWR. The certification values for NMOG+NOx range from 0.0 (g/mile) being the cleanest to 0.325 (g/mile) being the dirtiest. Like the California table, this 2009 range of certification levels is less then the current range used by the U.S. EPA Green Vehicle Guide to score air pollution; therefore, a new scoring system must be developed. The best way to develop a new scoring system is to merge the California certification levels and the Federal certification levels into one table. Table C-3 represents these two certification tables merged together.

It should be noted that in 2009, the applicable emission standards for California MDPVs are less stringent than the dirtiest federal Bin 8a standards as shown in table C-3. However, California regulations specify that when this occurs, the “cleaner federal vehicle” must be sold in California. Consequently, no 2009 MY MDPVs are expected to be certified to LEV

(MDPV) or ULEV (MDPV) standards in California. Therefore, only the certification levels identified in the non-shaded rows of Table C-3 would be applicable in the 2009 MY:

**Table C-3: 2009 Federal and California Combined Certification Levels**

| Emissions Category | NMOG + NOx (g/mile) |
|---|---|
| ZEV – Bin 1 | 0.000 |
| PZEV – SULEV – Bin 2 | 0.030 |
| Bin 3 | 0.085 |
| Bin 4 | 0.110 |
| ULEV | 0.125 |
| LEV – Bin 5 | 0.160 |
| LEV (option 1) – Bin 6 | 0.190 |
| SULEV (MDPV) | 0.200 |
| Bin 7 | 0.240 |
| Bin 8a | 0.325 |
| ULEV (MDPV) | 0.343 |
| LEV (MDPV) | 0.395 |

After removing the bottom two rows, Table C-3 does provide 10 distinct certification levels so applying a scale from 1-10 would be simple. However, there are important differences between the SULEV and PZEV California certification requirements. First, the full-useful life for a SULEV is 120,000 miles versus 150,000 miles for a PZEV. Second, a PZEV must be certified to "zero" evaporative emissions standards and carry a 15 year/150,000 mile extended emissions warranty, which is not required for the SULEV standard. This is why the PZEV certification level is assigned a score of 9.5 in the current U.S. EPA air pollution scoring system. Staff therefore recommends that the PZEV certification level be treated as a distinct certification level and be assigned a score better than a vehicle certifying to SULEV standards. By separating the PZEV from the SULEV certification levels, the combined California and Federal certification table looks as shown in Table C-4.

**Table C-4: 2009 Federal and California Combined Certification Levels with PZEV Category**

| Emissions Category | NMOG + NOx (g/mile) |
|---|---|
| ZEV – Bin 1 | 0.000 |
| PZEV | 0.030 |
| SULEV – Bin 2 | 0.030 |
| Bin 3 | 0.085 |
| Bin 4 | 0.110 |
| ULEV | 0.125 |
| LEV – Bin 5 | 0.160 |
| LEV (option 1) – Bin 6 | 0.190 |
| SULEV (MDPV) | 0.200 |
| Bin 7 | 0.240 |
| ULEV (MDPV) – Bin 8a | 0.325 |

Based on table C-4, there are 11 total certification levels so applying a simple 1-10 would require combining two levels or eliminating one level. One option is to find the two certification levels that are separated by the least amount and combine those two levels into one. This option makes sense if the separation is small relative to all other differences between certification levels or at least compared to the average separation between certification levels. Looking at table C-4, we see that the minimum separation between certification levels takes place between the LEV (option 1) – Bin 6 certification level at 0.190 (g/mile) and the SULEV (MDPV) certification level at 0.200 (g/mile). This small difference of 0.010 (g/mile) is relatively small compared to the average difference of 0.039 (g/mile). Therefore, combining these two certification levels into one would yield a Smog Score distribution with 10 levels as shown on Table C-5.

**Table C-5: 2009 Smog Score by Certification**

| California Emissions Category – Federal Bins | NMOG + NOx (g/mile) | Possible 2009 Smog Score |
|---|---|---|
| ZEV – Bin 1 | 0.0 | 10 |
| PZEV | 0.030 | 9 |
| SULEV – Bin 2 | 0.030 | 8 |
| Bin 3 | 0.085 | 7 |
| Bin 4 | 0.110 | 6 |
| ULEV | 0.125 | 5 |
| LEV – Bin 5 | 0.160 | 4 |
| [LEV (option 1) – Bin 6] and [SULEV (MDPV)] | 0.190 – 0.200 | 3 |
| Bin 7 | 0.240 | 2 |
| ULEV (MDPV) – Bin 8a | 0.325 | 1 |

Applying this proposed Smog scoring system to all 2007 MY California certification data yielded the distribution of Smog scores as shown on Figure C-1.

The statistical average of smog-forming (NMOG + NOx) emissions calculated based on the emission standards to which 2007 MY vehicles certify is 0.139 (g/mile). This statistical average places the average vehicle available on the market today somewhere between a Smog score of 4 and 5. For the 2009 MY, it is expected that a statistically average vehicle sold in California will be a ULEV certification and will receive a score of 5.

An alternate Smog scoring system can be developed using a straight line scale based on the range (dirtiest to cleanest) of emission levels and let the certification levels fall into whatever score they achieve. In this case the range is 0.325 – 0.0 (g/mile). Realizing that a Smog score of 10 must be reserved for a true zero emission vehicle, this leaves nine remaining Smog scores that must be divided up equally into an overall range of 0.325 (g/mile). Therefore:

$$0.325/9 = 0.036 \text{ increments/score}$$

The straight line scale applied to the 2009 Certification levels and possible Smog Scores is shown on Table C-6.

**Figure C-1: Distribution of Smog Scores Based on 2007 Model Year Certifications**

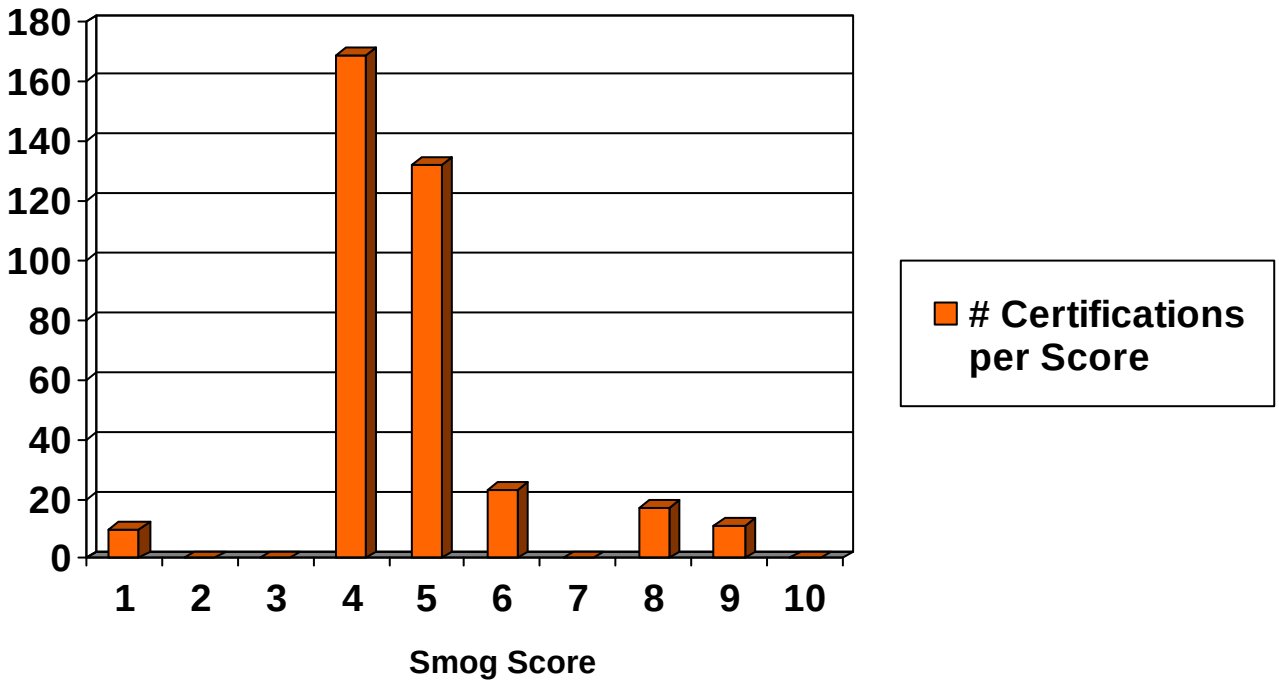



**Table C-6: Possible 2009 Smog Score by Straight Line Analysis**

| California Emissions Category - Federal Bins | NMOG + NOx (g/mile) | Straight Line Scale | Possible 2009 Smog Score |
|---|---|---|---|
| ZEV – Bin 1 | 0.000 | 0 | 10 |
| PZEV | 0.030 | 0.001-0.036 | 9.5* |
| SULEV – Bin 2 | 0.030 | | 9 |
| | | 0.037-0.072 | 8 |
| Bin 3 | 0.085 | 0.073-0.108 | 7 |
| Bin 4 | 0.110 | 0.109-0.144 | 6 |
| ULEV | 0.125 | | 6 |
| LEV – Bin 5 | 0.160 | 0.145-0.180 | 5 |
| LEV (option 1) – Bin 6 | 0.190 | 0.181-0.216 | 4 |
| SULEV (MDPV) | 0.200 | | 4 |
| Bin 7 | 0.240 | 0.217-0.252 | 3 |
| | | 0.253-0.288 | 2 |
| ULEV (MDPV) – Bin 8a | 0.325 | >0.289 | 1 |

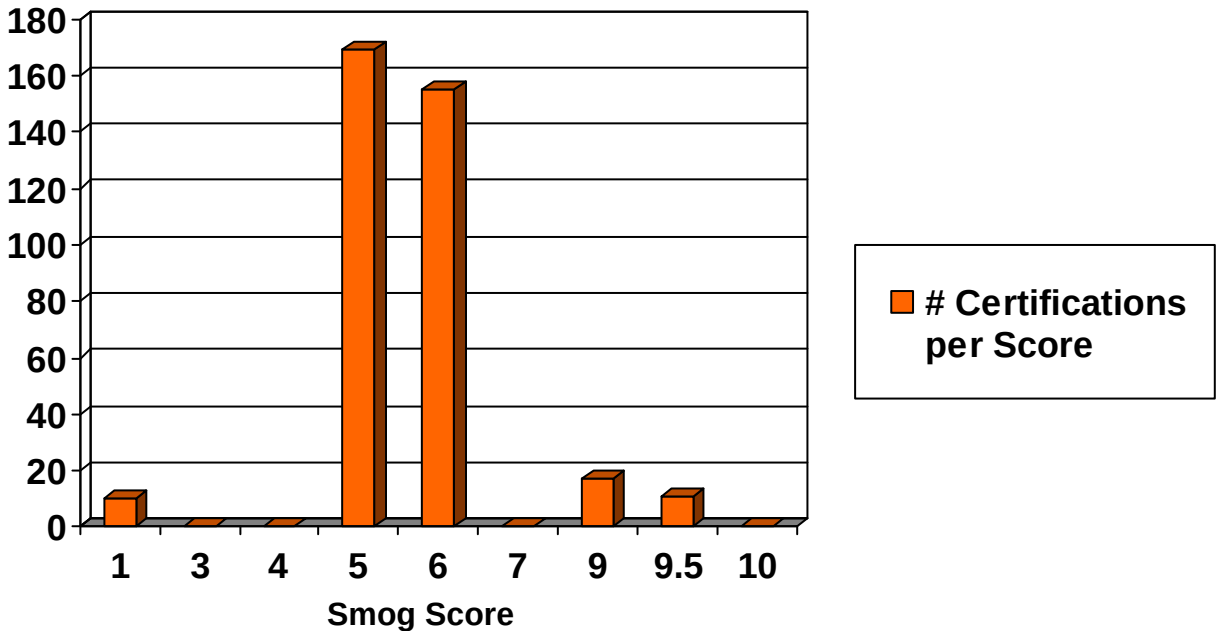
* A Smog Score of 9.5 was given to vehicles certifying to the California PZEV standards based on the longer useful life, “zero” evaporative emissions requirements, and extended warranty for these vehicles compared to vehicles certifying to the SULEV standards.

Staff looked at table C-6 and noticed two distinct issues. First, there are two instances where a single Smog score overlaps multiple certification levels. The Smog score of 4 appears twice in the table as does the Smog score of 6. This overlap is due primarily to the small incremental difference between a few certification levels. For Example, the difference between the Federal Bin 4 certification level of 0.110 (g/mile) and the California ULEV certification level of 0.125 (g/mile) is only 0.015 (g/mile) allowing these two certification levels to achieve the same score of 6. The same holds true for the California LEV (option 1) certification level (which is also the Federal Bin 6 certification level) of 0.190 (g/mile) and the California SULEV (MDPV) certification level of 0.200 (g/mile). The relative difference between these two certification levels is only 0.010 (g/mile) allowing them both to achieve the same Smog score of 4.

The second issue with this Smog score option is that some scores are not assigned to a certification level and would not appear on the new label. Looking at table C-6 staff noticed that the Smog scores of 8 and 2 are not assigned to a certification standard. This is due to the fact that there is a relatively large difference between certification levels where the Smog score of 8 and 2 do not appear.

Applying this proposed Smog scale to the model year 2007 California certification data yielded the model based distribution of Smog scores as shown in Figure C-2.

**Figure C-2: Distribution of Smog Scores Based on 2007 Model Year Certifications**




In this case, the statistical average of 0.139 (g/mile) receives a score of 6 on the Smog scale. This average score of 6 on a scale from 1-10 did not seem appropriate as most consumers associate the number 5 as being the average on a scale from 1-10,

Staff looked at the two distinct distributions of scores (figures 11.1 and 11.2) and noticed that they appear similar except for the simple change of smog score assignments on the

lower axis. Staff realizes that these distributions are for 2007 MY California certifications and will probably look a bit different for the 2009 MY California certifications as vehicle manufacturers continue to certify to higher standards. Therefore, the simplest and best way to assign smog scores that will allow for the continued increase of cleaner vehicles is to select the smog scale that is based on the certification analysis rather than the straight-line analysis of certification data. The certification analysis scale as shown on Table C-5 provides a true 1-10 scoring for the entire range of certification levels and there are no potential for gaps (missing smog score numbers) in the scale.

### B. Global Warming Score

In order to develop a scale for global warming emissions, the expected certification data for global warming emissions from each vehicle model must be known. This information is not required for the 2007 model year by ARB and therefore not all global warming gasses are available for analysis. However, staff was able to access the California certification data base for all 2007 Executive Order (EO) California certifications. After filtering out those vehicles that are not required to get an emissions label, the data contained 368 EO certifications. Of those certifications, 137 certifications voluntarily contained $CO_2$ data and there were no certifications that contained $CH_4$, $N_2O$ or A/C refrigerant data. The 137 certifications that contained $CO_2$ data represent a 37% sample. A 37% sample size is adequate for a statistical analysis of the data as long as the sample size is random. A quick look at the auto manufacturers that provided $CO_2$ data revealed that the sampling did appear to be random as 16 vehicle manufacturers did provide $CO_2$ data and 14 vehicle manufacturers did not.

Since some vehicle manufacturers did not voluntarily provide $CO_2$ data, staff formally requested the voluntary submission of all global warming emissions – $CO_2$, $N_2O$, $CH_4$, and A/C refrigerants – from the manufacturers in order to develop a more complete dataset. The response ARB received from the vehicle manufacturers was minimal. Three vehicle manufacturers voluntarily submitted the information as requested, one of which had already voluntary included $CO_2$ data with the 2007 certification data. However, through this request, ARB staff was made aware of a Federal certification data spreadsheet available to the general public that contained $CO_2$ information. This spreadsheet can be found at: **www.epa.gov/otaq/cert/mpg/testcars/database/07tstcar.csv**.

Staff reviewed the Federal certification spreadsheet and found certification data for HC, CO, $CO_2$, NOx, PM, as well as mile per gallon fuel economy (MPG). The Federal certification spreadsheet provided certification data for both city and highway testing values of these emissions. The Federal certification data did not provide certification data for $N_2O$, $CH_4$ or A/C refrigerants. Prior to developing a $CO_{2Equivalent}$ dataset for either the California or Federal Certification data, staff wanted to look at a direct comparison between the California dataset and the Federal dataset. In doing so, staff found that the information for similar makes and models of vehicles where very close but not identical. Therefore, a $CO_2$ combined dataset was calculated and analyzed for both California and Federal databases using the 55% city and 45% highway driving ratio.

Taking the additional global warming emission information provided by the three manufacturers and updating the California certification dataset; staff was able to increase

the sample size from 37% to 40%. With 40% of the certifications actually reporting $CO_2$, staff was able to statistically evaluate the data with a 90% level of confidence that the sample size available would adequately represent the entire population. Table C-7 represents the data distribution for both the California and Federal $CO_2$ combined certification data.

**Table C-7: California and Federal $CO_2$ Combined Data Distribution**

| $CO_2$ combined (g/mile) | California (with MDPV data) | California (without MDPV data) | Federal |
|---|---|---|---|
| **Minimum** | 130 | 130 | 133 |
| **Maximum** | 874 | 570 | 662 |
| **Range** | 744 | 440 | 529 |
| **Average** | 358 | 355 | 348 |

In Table C-7, the first California column represents $CO_2$ combined data that was voluntarily provided by the automobile manufacturers and includes passenger cars, light-duty trucks and medium-duty passenger vehicles. Staff looked at the certification data available from the Federal database and noticed that the numbers are slightly different. This is because the federal database does not include data on medium-duty passenger vehicles (passenger vehicles from 8,500 lbs. to 10,000 lbs. GVWR). Therefore, staff developed another California dataset for $CO_2$ combined certifications removing the data for all medium-duty passenger vehicles. The second column in Table C-7 above is the result. In comparing the last two columns, staff noticed that the information is extremely similar. The minimum for both California and Federal is almost identical. The maximum is somewhat less in California which indicates that California vehicles are typically cleaner. And the average for the Federal and California certification data is extremely close as well. Based on this comparison, ARB staff reasoned that although California had only 40% of the certification data for all 368 EOs issued, the 40% sample size was adequate to represent the entire population of California certified vehicles.

Staff also tried to look at the contributions of $N_2O$, $CH_4$, and A/C refrigerants based on the limited feedback form the manufacturers to compare the $CO_2$ combined certification values to the $CO_{2Equivalent}$ combined values. Of the three manufacturers that provided addition global warming emissions to ARB, only one manufacturer provided all four ($CO_2$, $N_2O$, $CH_4$, and A/C refrigerant) emissions certification data as requested. This manufacturer, however, only has two California certifications on file for 2007. Another manufacturer provided only $CO_2$ and $CH_4$ emissions certification data and this manufacturer has 19 California certifications for 2007. The last manufacturer provided only $CO_2$ data and staff incorporated this data into the California $CO_2$ dataset.

Because of the lack of data for $N_2O$, $CH_4$, and A/C refrigerants, staff decided there was not enough information to factor these emissions into the development of a global warming scoring system at this time. Therefore, all analyses from this point on are predicated on the

analysis of 2007 $CO_2$ data alone. Table C-8 represents only the California $CO_2$ combined dataset and not the $CO_{2Equivalent}$ combined dataset.

**Table C-8: California 2007 $CO_2$ Combined Certification Data**

| | $CO_2$ Combined (g/mile) |
|---|---|
| Minimum | 130 |
| Maximum | 874 |
| Range | 744 |
| Average | 358 |

This distribution represents a range of $CO_2$ emissions of 744 (g/mile) with a minimum of 130 (g/mile) and a maximum of 874 (g/mile). Similar to the Smog scoring system, staff was able to develop a proposed global warming scoring system using an unbiased, straight line, equitable distribution of scores based on the entire range of $CO_2$ emissions. By taking the range of 744 (g/mile) and equally dividing that range into 10 scores, we can determine the number of increments associated with each score. Since $CO_2$ emission are not certified to specified individual levels, as in the case of smog forming emission, the use of a linear scale may be appropriate. This equates to:

744/10 = 74 increments/score

Table C-9 represents a possible global warming scoring system based on this analysis.

**Table C-9: Possible 2009 Global Warming Scores Based on $CO_2$ Emissions**

| Global Warming Score | $CO_2$ Grams per mile |
|---|---|
| **10** | Less than 205 |
| **9** | 205-279 |
| **8** | 280-354 |
| **7** | 355-429 |
| **6** | 430-504 |
| **5** | 505-579 |
| **4** | 580-654 |
| **3** | 655-729 |
| **2** | 730-804 |
| **1** | 805 and up |

Now applying these scores to the 2007 MY California certifications we can see how the certifications are distributed, Figure C-3 graphically illustrates this distribution.

In Figure C-3, staff realized that the scores are weighted more toward the high end of the scale. This means that the majority of the vehicles will be given scores of 7, 8, and 9. Also, the average global warming emissions of 358 (g/mile) receives a score of 7, which is not intuitive when looking at a scale from 1-10. Most consumers view the average as being in the middle of the scale or achieving a score of 5 on a 1-10 scale. Staff took a closer look at this data to see why the distribution was skewed to the high end of the scale. By breaking down the data set into actual vehicle classifications (i.e., passenger cars, light-duty trucks and medium-duty passenger vehicles), one can see the actual number of certifications in each class. Table C-10 illustrates the actual number of certifications by vehicle classification.

**Figure C-3: Distribution of Global Warming Scores Based on 2007 Model Year Certifications**

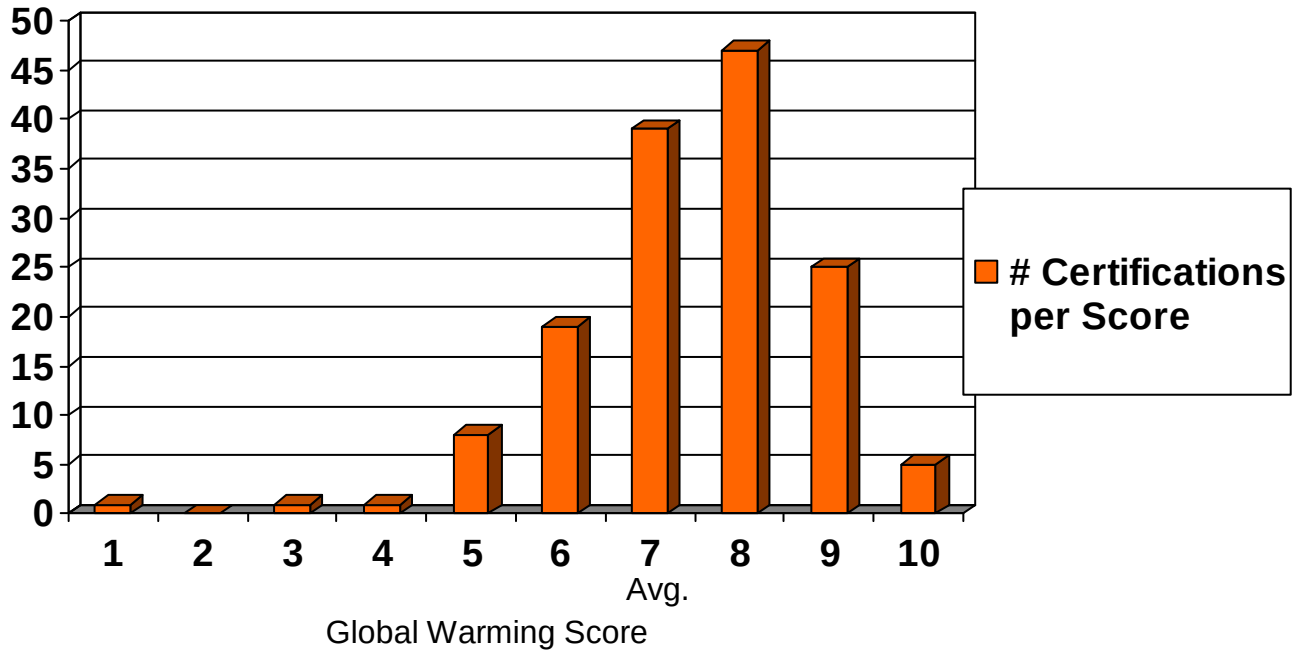
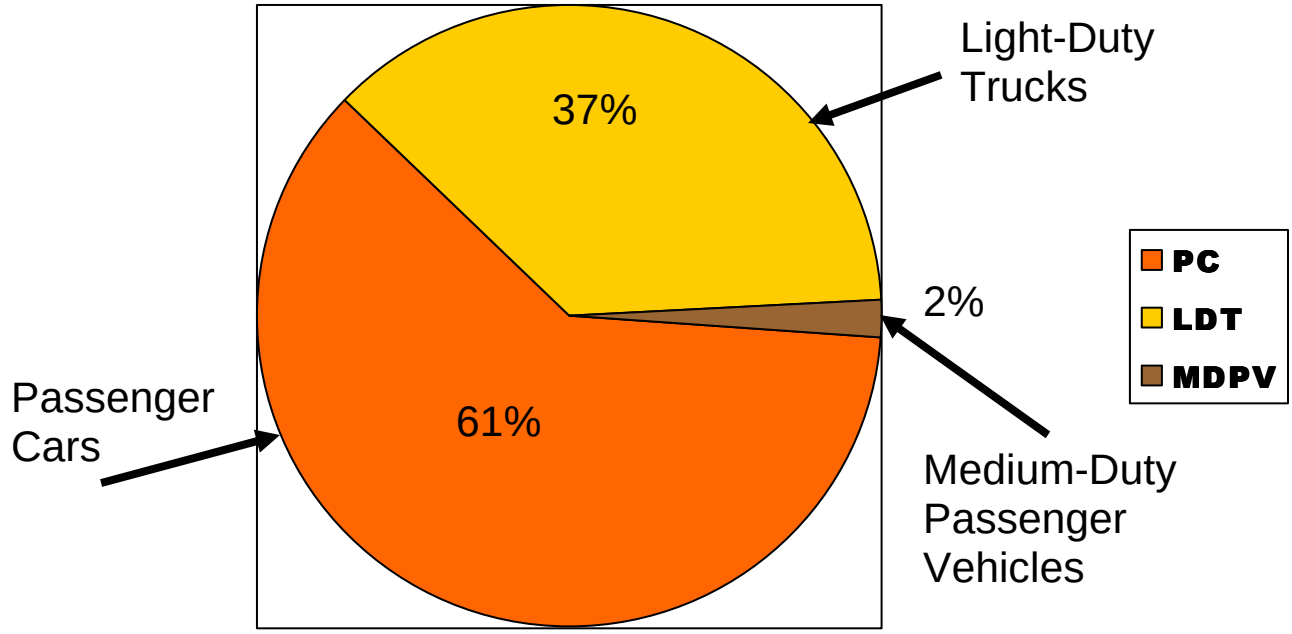



**Table C-10: Distribution of California Certifications Based on Vehicle Classification**

| Vehicle Certification Classification | Number of Certifications | Number of Certifications with Voluntary $CO_2$ data |
|---|---|---|
| Passenger Car | 226 | 94 |
| Light-Duty Trucks | 136 | 50 |
| Medium-Duty Passenger Vehicles | 6 | 3 |
| Totals | 368 | 147 |

From Table C-10 staff realized that of the total 368 Executive Order Certifications on file for the 2007 MY, 61% are passenger cars, 37% are light-duty trucks, and only 2% are medium-duty passenger vehicles, Figure C-4 illustrates this distribution.

**Figure C-4: Distribution of Vehicle Classification Based on California EO Certifications.**




With 61% of all certifications being passenger cars, which typically produce less global warming emissions than light-duty trucks and medium-duty passenger vehicles, staff expected to see higher global warming scores for passenger vehicles. Therefore, with 61% of the certifications receiving the higher global warming scores, staff reasoned that the scale would be skewed to the high end. Figure C-3 justifies this scenario. ARB staff than decided to look at the certification data using a more statistical analysis to see how the data was distributed around the average of 358 (g/mile). ARB staff also wanted to perform a statistical analysis including standard deviations of the $CO_2$ data that was available through the Federal certification database and compare these results. The federal database contained over 700 $CO_2$ values which theoretically should provide a good comparison for the California certification data. Table C-11 represents the two statistical comparisons.

Again, the first California column represents a statistical analysis including standard deviations of all $CO_2$ data that was voluntarily provided by the automobile manufacturers and includes passenger cars, light-duty trucks and medium-duty passenger vehicles. In comparing the last two columns, one can see that the information is extremely similar. The average and the standard deviation for the Federal and California certification data are very close to being equal. The standard deviation only increases significantly when the addition of the MDPV data is introduced. Based on this finding, ARB staff decided to develop a global warming scale that represented a normal distribution of certifications. Realizing that the MDPV data contribution is only 2% of the entire certification dataset, staff decided to use a standard deviation that more closely represented the majority of certifications rather than the minority.

**Table C-11: Statistical Distribution of California and Federal $CO_2$ Data**

| $CO_2$ combined (g/mile) | California (with MDPV) | California (without MDPV) | Federal |
|---|---|---|---|
| **Minimum** | 130 | 130 | 133 |
| **Maximum** | 874 | 570 | 662 |
| **Range** | 744 | 440 | 529 |
| **Average** | 358 | 355 | 348 |
| **Standard Deviation** | 101 | 81 | 76 |

By using the average of 360 (g/mile) and applying a standard deviation of 80 (g/mile) – the standard deviation we would expect to see given a fully populated data set, similar to the standard deviation of the Federal fully populated data set – a scale can be developed based on two standard deviations of the population that will account for 95% of all vehicle certifications. Those falling out side of the two standard deviations would be considered extreme and would achieve the "best" and the "worst" score. In the case of a scale from 1-10, the "best" would be scored a 10 and the "worst" would be scored a 1 and the average would be scored a 5. All other scores would represent an equal division of the remaining range of possible $CO_2$ emissions. This means that the remaining scores (2-9) will fall within two standard deviations of the average and should make up 95% of all certifications. Applying this principle to the dataset we would expect to see a normal distribution. Figure C-5 shows what a normal distribution would look like based on the number of standard distributions away from the average.

Using the average of 360 (g/mile) and going out two standard deviations, 2 x 80 = 160 (g/mile), ARB staff was able to set the extremes at 200 and 520 (g/mile). Therefore, any vehicle certifying to a global warming emissions level of 200 (g/mile) $CO_2$ or less would get a score of 10. Likewise, any vehicle certifying to a global warming emissions level of 520 (g/mile) $CO_2$ or more would get a score of 1. All other scores would be given to vehicle certifications in the range between 520 and 200 which is 320 (g/mile). By taking the range of 320 (g/mile) and equally dividing that range into the remaining 8 scores (i.e., scores 2-9), we can determine the number of increments associated with each score. This equates to:

320/8 = 40 increments/score

Applying this scale to produce a global warming scoring system is illustrated in Table C-12.

Applying this global warming score to the 2007 model California certification dataset yields the distribution of scores as shown in Figure C-6. Staff recognized that the scores are more normally distributed indicating a more precise distribution of global warming scores. The spike at the low end of the scale represents the addition of the medium-duty passenger vehicles to the certification data and should level out over time as those vehicles achieve reduced global warming emissions.

**Figure C-5: Diagram of a Normal Distribution of Scores**

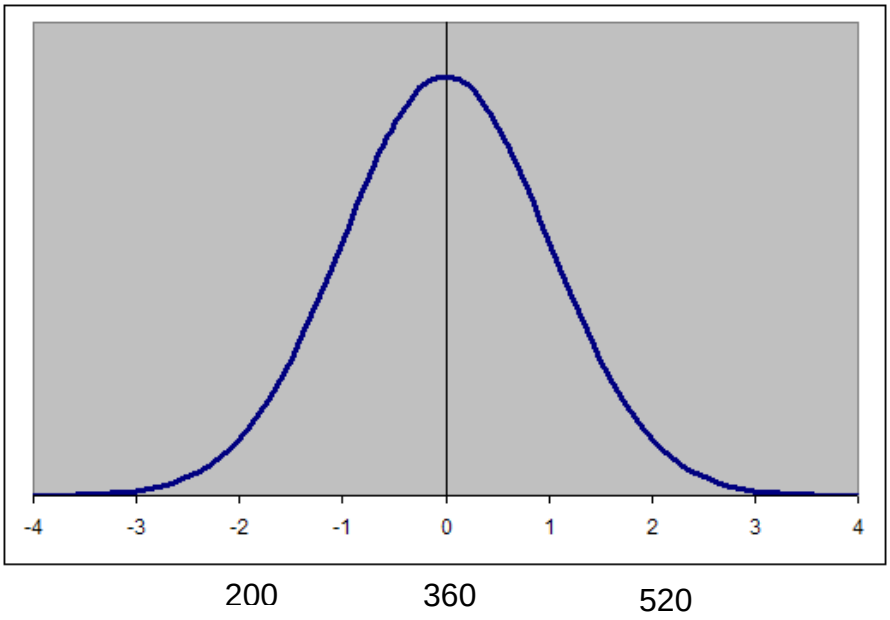
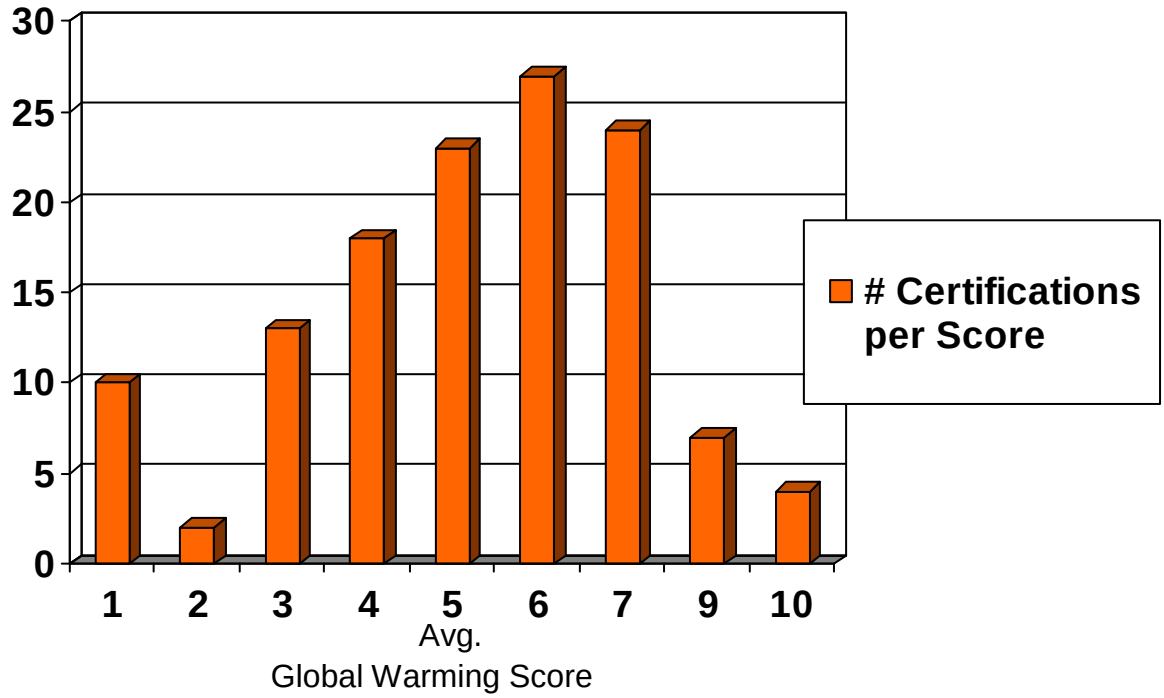



**Table C-12: Possible 2009 Global Warming Scores Based on $CO_2$ Emissions**

| Global Warming Score | $CO_2$ Grams per mile |
|---|---|
| **10** | Less than 200 |
| **9** | 200-239 |
| **8** | 240-279 |
| **7** | 280-319 |
| **6** | 320-359 |
| **5** | 360-399 |
| **4** | 400-439 |
| **3** | 440-479 |
| **2** | 480-519 |
| **1** | 520 and up |

Staff therefore recommends using a global warming score based on a statistical analysis of the global warming certification data. In the 2009 MY, per AB1493 (greenhouse gas regulation), vehicle certifications must include $CO_{2Equivalent}$ combined data from which a global warming score can be assigned. Staff recommends that the values depicted on Table C-12 be adopted for establishing the global warming scores used on the label.

**Figure C-6: Distribution of Global Warming Scores Based on 2007 Model Year Certifications**




### C. Color Printer Economic Impact

This section focuses on the detailed economic impact imposed on vehicle manufacturers to increase the label size and upgrade to color printers. Through site visits and conversations with manufacturers, staff was able to identify the types of printers used for labeling purposes. Staff researched the replacement cost of new color printers and found that the average cost for an industrial laser jet color printer (e.g. HP 9500) is $6,000. In addition, the cartridge replacement cost runs about $1,000 for all four cartridges, because most color printers use multiple (3 color and 1 black) cartridges. Each set of cartridges should print out 25,000 labels before all four may need replacement. Staff also researched the cost of an industrial black ink laser jet printer, comparable to the ones used by vehicle manufacturers today. The average cost of these printers is around $5,000 (e.g. HP 9000). However, the cost of a replacement black ink cartridge is around $270 per cartridge. Like the color cartridges, the black ink cartridges should print out around 25,000 - 30,000 labels before needing replacement.

#### 1. Total Statewide Costs to Comply with Regulation

The estimated incremental cost increase of upgrading existing black ink label printers to color label printers is estimated to be $1,000 per printer. These label printers are only required at the point of final assembly. Staff estimated the total number of final

assembly plants in North America to be 76. However, vehicles that are imported to the United States may have their labels printed and installed at the port.

The State of California has 3 major ports of entry where vehicle manufacturers would most likely chose to import products. These ports are San Diego, Long Beach/Los Angeles, and San Francisco/Oakland. Staff did not account for ports in other states on the west coast or east coast because staff assumes that vehicles sold in California would most probably enter through one of the three major California ports for distribution. Discussions with the manufacturers indicated that typically, only two of the three major California ports are used to import vehicles into the state. Staff however, assumed a worst case scenario of each manufacturer using all three major ports in California. Smaller manufacturers building approximately 1,000 vehicles per year or less would most likely utilize only one, or at most, two port(s) of entry. Applying this scenario, staff than estimated the total number of facilities that print and apply vehicle labels to be 149.

Staff also assumed that a manufacturer would have to purchase two printers for each assembly facility or port to print a label because one printer is typically used as an emergency backup. Likewise, smaller manufacturers building approximately 1,000 vehicles per year or less would most likely utilize only one printer for labeling purposes because the annual production would not justify the need for a backup printer. Therefore, the industry wide total number of printer replacements is estimated to be 286. At the $1000 incremental cost increase per printer, this equates to a total one time capital cost of $286,000 for the industry as a whole. The incremental cost increase per manufacturer ranged from $1,000 to $52,000 with an average cost of $9,533, or rounded up to $10,000.

This cost represents a one-time capital cost to the manufacturers therefore staff applied a capital recovery factor to annualize these costs. Assuming the useful life of a printer to be 3-5 years, staff used a conservative 3-year replacement cycle and a 5% real discount rate to annualize the one-time capital investment. This equates to an annualized statewide cost to upgrade printers of $105,000 for the industry as a whole. The annualized cost per manufacturer ranged from $376 to $19,095 with an average cost of $3,500.

Staff also assumed there is an operational cost difference between black ink and color printers. The differential cost between printers is assumed to be the cost difference between replacement cartridges in going from a black ink cartridge to color cartridges. The difference turns out to be approximately $730 and only occurs after 25,000 prints or 25,000 vehicles. Staff felt that 25,000 prints from one cartridge might be an optimistic value used by the cartridge manufacturer therefore staff used half this amount, 12,500 prints, as a replacement cycle. Applying this replacement cycle to the increased cost for color cartridges ($730), staff was able to calculate a per vehicle cost of 6 cents per vehicle. Therefore, multiplying this cost by the approximately 2 million annual vehicle sales equates to a $120,000 annual operating cost for the industry as a whole. The operating cost per manufacturer ranged from $43 to $62,200 annually, depending on production volume, with an average cost of $4,000.

The total annual cost to implement this regulation is calculated as the annualized capital cost to upgrade existing printers plus the annual operating cost for increasing the label size and using color cartridges. For the industry as a whole this equates to $245,000 per year or $735,000 over a 3-year period. The initial annualized capital cost for a typical manufacturer to implement this regulation is estimated to be $3,500. The annual ongoing cost for increasing label size and using color cartridges for a typical manufacturer is estimated to be $4,667. These cost estimates will vary slightly by manufacturer depending on the actual number of assembly plants, ports of entry, printers required, and vehicles produced.

# Appendix D - Other Vehicle Labels

The United States Environmental Protection Agency (U.S. EPA) in conjunction with the United States Department of Energy (U.S. DOE) has a comprehensive fuel economy rating and labeling procedure in place. These city and highway fuel economy values (in miles per gallon) have been the primary information source available for consumers to compare the fuel efficiency of vehicles they are interested in purchasing.

Over the past several years there have been attempts to develop a label for passenger cars and light-duty trucks to encourage consumers to purchase more environmentally friendly vehicles. There have also been a number of studies using focus groups and market research to evaluate different types of vehicle labeling and ranking programs. Below is a description of some of the labels and ranking systems that have been developed and evaluated along with results of the market research.

The U.S. EPA used focus groups to evaluate their SmartWay certification mark and Green Vehicle Guide rating system[14]. They found that environmental issues other than miles per gallon (MPG) were not key factors in the respondents' purchasing decisions. However, participants were more willing to pay attention to emission labeling programs that include an easily understood rating system comparing vehicles. Another comment was that the label should compare similar vehicle classes in order to have credibility.

Another study used focus groups to evaluate several government web sites that provided environmental information about vehicles[15]. These included the following web sites:

- DOE and EPA web site **www.fueleconomy.gov** provides users with information about fuel economy as well as greenhouse gas emissions and criteria pollutants.
- U.S. EPA web site **www.epa.gov/greenvehicles** offers similar information with the focus on criteria pollutants rather than fuel economy.
- The American Council for an Energy-Efficient Economy (ACEEE) web site **www.greencars.com**, provides environmental, recycling and energy-conservation information.
- The California Air Resources Board's Cleaner Car Buyer's Guide **www.arb.ca.gov/msprog/ccbg/ccbg.htm** lists California vehicles by emissions category.

From the respondents, it was determined that the most useful/meaningful information tended to be in two areas: fuel economy and some overall rating of tailpipe emissions. Respondents tended to understand the issues of GHG or global warming more easily when such issues were correlated with familiar concepts such as fuel economy. The distinction between the impacts of different gases appeared to be difficult for people to understand and seemed somewhat unimportant since the respondents viewed all of the gases as harmful anyway.

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[14] **SmartWay Vehicle Qualitative Interviews - U.S. EPA** *by ICF Consulting and APRR August 23, 2002*

[15] **Providing Consumers with Web-Based Information on the Environmental Effects of Automobiles.** *A Qualitative Research Report Based on Focus Groups in Knoxville, Tennessee and Los Angeles, California - Oak Ridge National Laboratory - June 2003*

Most respondents in this study preferred some kind of overall environmental score that (1) they could have faith in, (2) would be applicable across the country and across all vehicles, and (3) would be displayed on the new car sticker and adopted by magazines such as *Consumer Reports*. Respondents stated that the information needs to be presented in a way that consumers find simple and understandable. Respondents in all focus groups were drawn to the U.S. EPA web site's Green Vehicle Rating system, citing that designations like "superior" and simple 1-10 scale bar charts were easily understood.

Europeans have been studying fuel economy labels for passenger cars[16]. A study by the Austrian Energy Agency produced a draft fuel economy label based on market research. This market research also found that the layout needs to be both simple and understandable. The study developed a draft label that offers a fuel economy comparison in the form of colored bars making up seven classes, well known from European appliance labels. From a wide variety of possible information that could be included on a car label, only information considered critical was included in the proposed design. With this label, consumers caught the core information (i.e., the fuel consumption of the car considered compared to others) at first glance. The consumer test found that the use of colors is very important for the impact of the label. This label would give vehicles an A – G rating depending on how their emissions compare to other vehicles. It is unlikely that manufacturers that receive an “F” on a number of vehicles would support this approach.

Another study, *Final Report on the Green Vehicle Market Alliance Project*, published in March 2004, also evaluates environmental vehicle labeling[17]. In general, the study found that consumers have a good awareness of the existing fuel economy label and have some understanding of fuel economy insofar as it pertains to fuel consumption and driving costs, but they poorly link fuel economy to environmental impacts. Moreover, even when consumers consider vehicle environmental impacts, they tend to assign responsibility for addressing these issues to the government or automakers. In short, environmental factors were not clear to the participants and they did not understand that there were significant environmental differences between new vehicle models.

[16] **Choosing cleaner cars: the role of labels and guides - Department of Transport.** *Lecture Fuel economy labeling for cars - Presentation Stefphan Fickl - Austrian Energy Agency*

[17] **Final Report on the Green Vehicle Market Alliance Project**, *Prepared for Oak Ridge National Laboratory by John M. Decicco, Environmental Defense, March 2004*