

January 25, 2012

Mary Nichols  
Chairwoman, California Air Resources Board

**Subject: California Clean Cars Proposed Regulations**

Dear Chairwoman Nichols:

I am pleased to provide strong support for CARB's proposed update to the Zero Emission Vehicle (ZEV), Low Emission Vehicle (LEV), and Clean Fuels Outlet (CFO) programs. I congratulate you and your staff for developing this comprehensive approach, which will achieve important environmental and economic benefits for California while setting an impressive international precedent. We have provided detailed comments in Attachments A and B.

We strongly support the direction of the California ZEV program, which is critical to meeting clean air and climate change goals, and we appreciate our productive discussions with your staff on a number of issues. We agree with CARB's ZEV upstream emissions accounting proposal in the LEV III greenhouse gas standards, and staff efforts to explore regulatory and non-regulatory options for hydrogen infrastructure deployment. We encourage CARB to cap the potential reduction of ZEV targets through automakers' "overcompliance" with federal GHG standards and to require earlier notifications when they choose this option. We also encourage CARB to end "Neighborhood Electric Vehicles" credit issuance and revise proposed "BEVx" credits.

CARB's continued leadership on the LEV III regulation is critical for addressing public health issues in California and sets an important precedent for the nation and the world. We appreciate CARB staff collaboration with ICCT to explore black carbon and fine particulate issues over the past year and a half, and we are very pleased with the draft staff report in most areas. We encourage CARB to accelerate fine particulate emission standards to achieve greater and more rapid public health benefits. We also encourage CARB staff to adjust the proposed ozone precursor limits for aggressive driving and air conditioning scenarios.

We commend CARB for its continuing efforts on criteria pollutant reductions, advanced technology development and greenhouse gas reductions. Please feel free to contact me if you have any questions or have your staff contact Ed Pike at [ed@theicct.org](mailto:ed@theicct.org) or (415) 202-5753.

Sincerely,



Alan C. Lloyd  
President, International Council on Clean Transportation

**Attachment A:**  
**ICCT Comments on the Proposed Amendments to the California Zero Emission Vehicle  
Program Regulations and Related Passenger Vehicle GHG Accounting**

**1. Continuing Value of CARB Zero Emission Vehicle Program**

The ICCT 2011 Passenger Vehicle Electrification report series made a number of observations and comments regarding the role of the California program in this new global electrification era, including:

- California ZEVs have lower GHG and conventional pollutant emissions than conventional vehicles<sup>1</sup> with the potential for even bigger reductions based on renewable (or other low/zero emissions) energy supplies.
- CARB has found that ZEVs are necessary to meet 2050 GHG goals and CARB's program plays an important role in commercializing ZEVs.
- ZEV technology is advancing rapidly, with major manufacturer investment in vehicle technology development and deployment; nevertheless there is substantial uncertainty regarding commercialization potential.
- Pent-up demand from EV enthusiasts and support from governments and manufacturers will create positive momentum for the "first wave" of EV deployment over the next few years. It is far from clear, however, that the same holds true for the "second wave" of deployment, roughly 2014 through 2018.
- The ZEV program, along with complementary policies, will continue to play a critical role in encouraging long-term technology development.
- The ZEV mandate can now best be viewed as a "floor", providing assurances of continued investment and momentum towards establishing full ZEV commercialization despite some remaining uncertainties about technology and market development.

California 2011 deployment numbers, below in Figure A-1, show that California is a leading market for electric drive vehicles.

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<sup>1</sup> ICCT Vehicle Electrification Policy Study Task 1 Report: Technology Status 2011 p.40 projects 2020 emission rates for battery electric vehicles powered by California power plants at less than 0.020 grams/mile. SULEV30 tailpipe limits of NO<sub>x</sub> + non methane hydrocarbon limits are 0.030 grams/mile under certain test conditions and higher during US06 and SC03 testing (see attachment B for additional information), and will not be required until several years after 2020. The ICCT report also notes a TIAX report that assesses the additional benefits of avoided upstream petroleum fuel production, refining and distribution emissions for both battery electric and fuel cell electric vehicles.

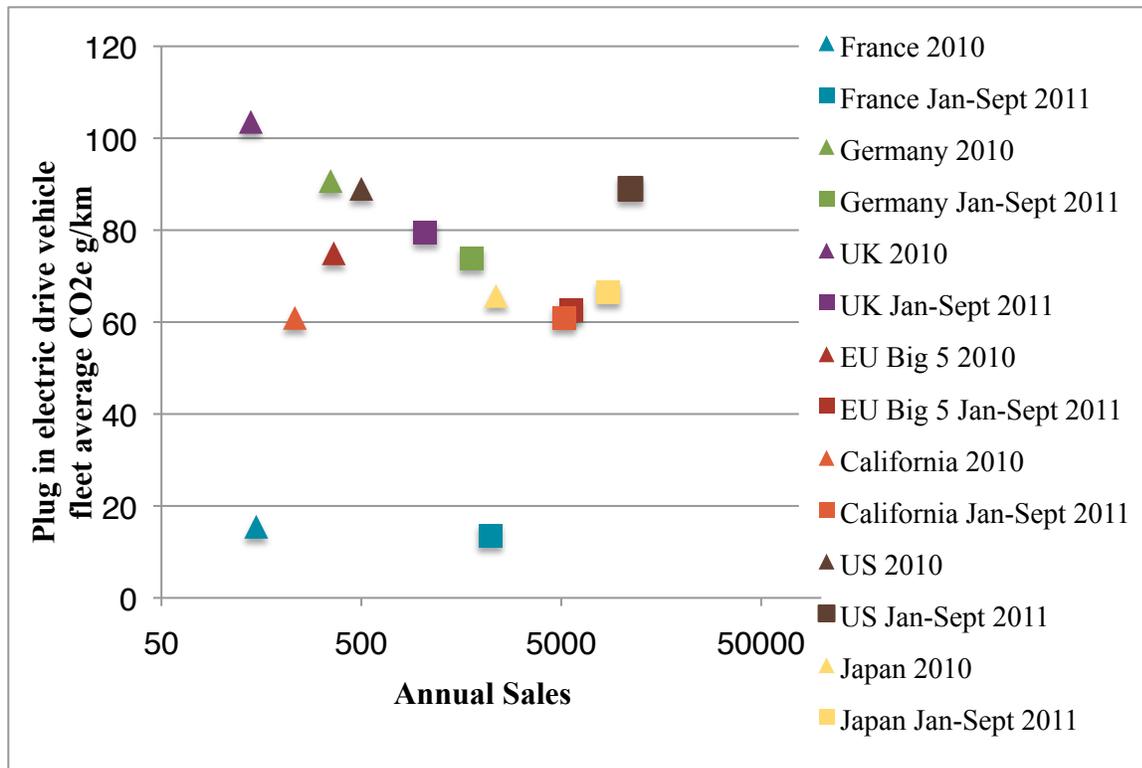


Figure A-1: Plug in Electric Drive Vehicle Sales and Electric Mileage Emissions Profile<sup>2</sup>

## 2. Program Stringency - Vehicle Target

### Required Number of Vehicles

CARB staff has proposed a pure ZEV target for Phase V (2018-2021) increasing from 1.0 to 3.8 percent of sales, and for Phase VI (2022-2025) a target increasing from 4.5 to 6.4 percent of sales. We agree with the need for targets that increase over time, and this trajectory is consistent with feasible technology development trajectories.<sup>3</sup>

### Overcompliance Provision

The proposal would allow “overcompliance” with the proposed federal GHG standards in the prior model year to reduce, in part, a manufacturer's ZEV obligation in the next model year. Provided that certain preconditions are met, this provision can be used to offset 50 percent of a manufacturer's overall ZEV and pure ZEV obligation in model years 2018 and 2019, 40 percent in 2020, and 30 percent in 2021. The overcompliance provision essentially trades off an increase in the fleetwide GHG reduction achieved under the federal standards against a reduction in the number of ZEVs deployed in California and Section 177 states. Based on preliminary analysis

<sup>2</sup>Data sources: California Air Resources Board, California Plug-in Electric Vehicle Collaborative, Japan Automobile Dealers Association, Japan Mini Vehicles Association, International Energy Agency, US EPA. Note: Emissions are for electric powered miles and based on average power plant emission rates; Big 5 emissions based on EU average power plants emissions; vehicle emissions based on NEDC test cycle energy consumption; Japan values not adjusted for nuclear plant shut-downs.

<sup>3</sup> ICCT Vehicle Electrification Policy Study Task 1 Report: Technology Status 2011.

overcompliance appears to be beneficial from a near-term net emissions standpoint; that is, the emission decrease due to overcompliance in the near term is greater than the emission increase due to avoided ZEVs and TZEVs. In absolute terms however the net impact is small due to limited early deployment of ZEVs. The net emissions decrease must of course be balanced against the potential negative impact on longer term climate goals resulting from how ZEV commercialization is affected by reduce early deployment.

Figure A-2 below shows the net effect of the overcompliance option on the number of vehicles required under the staff proposal as compared to the existing regulation and Alternative A from the staff report. Alternative A was rejected by CARB staff because it "could undercut the launch of and resultant commercialization of pure ZEVs (BEVs and FCVs)".<sup>4</sup> Figure A-2 includes four overcompliance scenarios: no use of the overcompliance provision, use by manufacturers accounting for 15 percent of California sales (the lower bound estimated by CARB staff), 50 percent of sales (the upper bound estimated by staff), and 100 percent of sales. The 15 to 50 percent overcompliance usage assumed by CARB would result in a 6 percent to 20 percent reduction in the cumulative number of ZEVs and “Transitional Zero Emission Vehicles”, or TZEVs (primarily plug-in electric hybrid vehicles), required over the four year period.

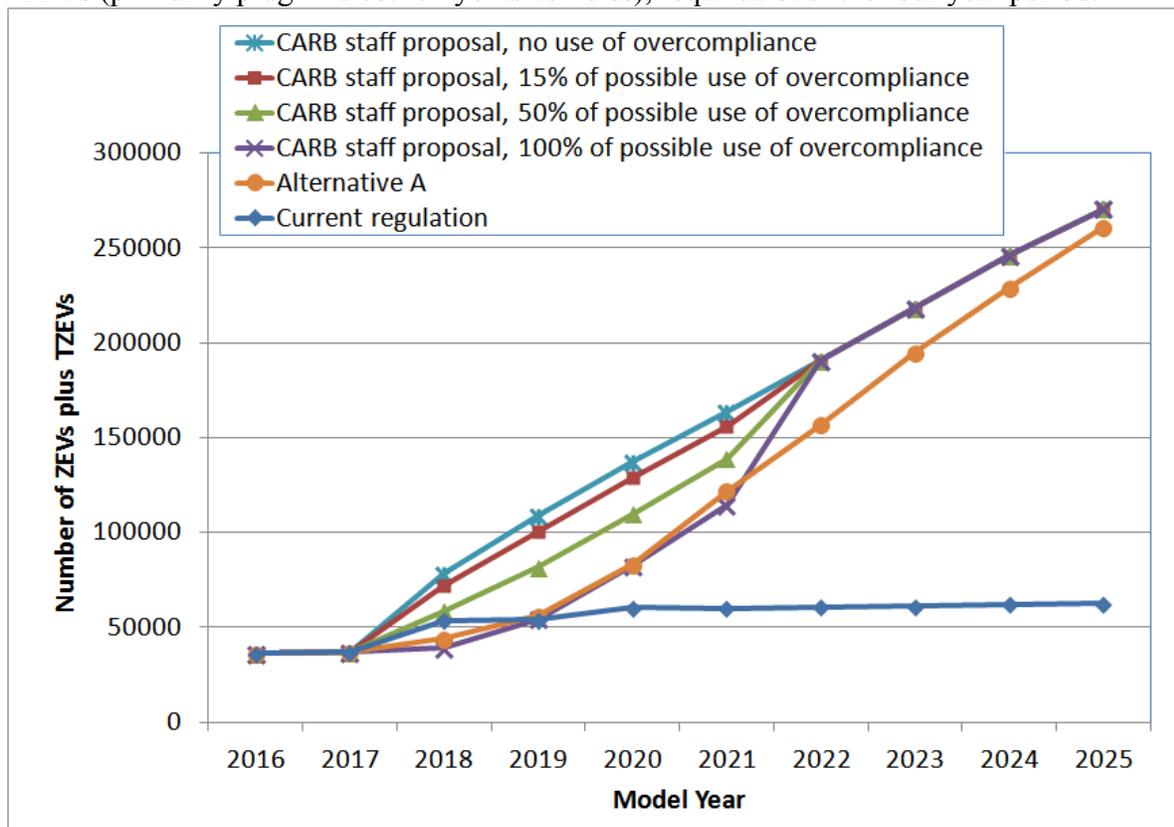


Figure A-2: ZEV and TZEV Targets Under Staff Proposal, Alternative A, and Current Regulation

<sup>4</sup>Alternative A includes a much higher portion of TZEVs relative to ZEVs than the staff proposal. Therefore the impact of Alternative A on ZEV deployment as noted by CARB staff would be greater than the impact of the 100 percent overcompliance scenario.

With the exception of the 100 percent use scenario, the ZEV deployment ranges in the “overcompliance” scenarios shown in Figure A-2 fall within a reasonable deployment ramp-up based on the evaluation in ICCT’s “Passenger Vehicle Electrification Task 1 Report: Technology Status”. In the 50% overcompliance scenario, a significant jump would be required between 2021 and 2022. If all manufacturers opt for the “overcompliance” option it would undercut CARB’s long-term targets, resulting in deployment rates from 2018-2021 similar to the “Alternative A” rejected by CARB staff. Therefore, we recommend that CARB establish a cap on participation in the overcompliance option that is within the range considered likely by CARB staff and no more than 50%.

We also recommend several other improvements to the implementation of the overcompliance system:

- We agree with the proposal to require a commitment from OEMs to opt in for all four years, but encourage CARB to set an earlier date for OEMs to notify CARB of opting in. A commitment from OEMs to exceed regulatory standards would reinforce the technical feasibility of the standards during the mid-term review of the federal GHG/fuel economy program. Thus it should be required in 2017, in time for consideration in the mid-term review due April 1 2018. The proposed regulation sets an opt-in notification date of May 2018 which is after the mid-term review is concluded.
- We understand that CARB staff intend to prohibit the use of hybrid truck and EV “supercredits” to meet the 2 g/mile “overcompliance” benchmark required to participate in overcompliance. We agree that these prohibitions should be included in the final regulation even for manufacturers that otherwise comply with the federal GHG program in lieu of the California GHG program. We also recommend requiring these manufacturers to count ZEV upstream emissions when determining whether they meet the 2 g/mile benchmark.
- We note that federal regulation language may be needed to recognize cancellation of federal PV GHG credits used for “overcompliance”, as it is unclear whether CARB would have binding authority to cancel federal credits.

### **3. Program Stringency – Vehicle Credits**

#### Neighborhood Electric Vehicles

The proposal to extend NEV credits (page A-3-7 of post-2018 regulation) would indefinitely detract from the unique focus of the California ZEV program on development of mainstream zero emission vehicles. Lead-acid batteries are a well developed technology (as vehicle starter batteries and as the primary energy source for over 100 million 2 and 3 wheeled vehicles in China) and are not a pathway to full performance zero emission vehicles. Encouraging NEVs for neighborhood transportation could also be inconsistent with California’s goals of encouraging Vehicle Miles Traveled (VMT) reductions through walking, cycling, and public transit. If CARB staff do include NEV credits, limiting their availability as much as possible would be beneficial.

#### BEV<sub>x</sub>

The “BEV<sub>x</sub>” represents a new option that may be valuable for marketing EVs to consumers. The BEV<sub>x</sub> has a non-ZEV propulsion option that offers extended range and potentially enhanced consumer appeal but also GHG and conventional pollutant tailpipe emissions under certain

conditions. CARB's proposed ZEV regulations<sup>5</sup> require that a BEVx operate all-electric until the battery's lower charge sustaining limit is reached, and that the range on gasoline (or other non-ZEV fuels) cannot exceed the all-electric range. The proposed regulation also contains a warranty requirement, and a minimum 80 mile electric range. BEVx get several benefits: (1) the TZEV (i.e. PHEV) caps that preclude additional credit for ranges over 80 miles do not apply; (2) BEVx can be counted towards up to 50% of the pure ZEV requirement; and (3) BEVx can use the ZEV "travel" option (explained below) similarly to BEVs. The staff proposal extends this option for BEVs to 2017.

ICCT encourages CARB to determine the appropriate regulatory treatment of BEVx based on two fundamental ZEV program purposes: (1) encouraging battery/fuel cell production and electric miles traveled and (2) creating a transition to pure zero tailpipe emission vehicles. ICCT sees the potential for BEVx to contribute toward the first goal by providing an additional option for consumers seeking a vehicle with a large battery pack and a gasoline powered range that is no greater than the battery electric range. ZEV credit values for BEVx range beyond the 80 mile cap imposed on TZEVs are reasonable as they reflect the potential for greater utility of these vehicles and their contribution towards battery production volume. On the other hand, the types of vehicles and applications that would occur under the proposed regulation and their real-world usage patterns are unclear. Thus, we encourage CARB to restrict the proposal to grant the BEVx pure ZEV credits to the 2014-2017 compliance period only, with the option to extend later based on the percent of pure electric driving and total electric miles compared to BEVs and FCEVs with a comparable range. (We address travel below).

#### Travel Phase-out

Section 177 of the Clean Air Act allows other states to adopt California's passenger vehicle standards in lieu of the federal standards. The "travel" provision of the California ZEV regulation allows ZEV credits for certain ZEVs deployed in any Section 177 state to count towards ZEV targets in all section 177 states, i.e. "travel". Under the travel provision manufacturers can target their ZEV deployment to a limited number of states, in particular California, during timeframes when adequate infrastructure is not be available for fuel cell electric vehicles and battery electric vehicles in all states. It is ICCT's understanding that modifications to the travel provision are under active discussion, and we may have additional comments if a revised proposal is published.

Under the staff proposal in its current form the ability of BEV credits to "travel" is extended through 2017 and travel for FCEVs is retained indefinitely--"until there are clear plans for sufficient hydrogen infrastructure in Section 177 ZEV states to support these vehicles". BEVx vehicles are considered ZEVs and thus credits for BEVx could "travel" through 2017. ICCT supports the extension of travel for FCEVs, recognizing the significant effort needed to install necessary infrastructure. Regarding BEVx vehicles, the regulation allows substantial gasoline powered range. Thus BEVx are not subject to infrastructure requirements in the same way as ZEVs. TZEVs with similar refueling patterns do not benefit from the travel provision and thus travel for BEVx vehicles does not appear to be justified.

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<sup>5</sup> Appendix 1 section 1962.1(c)(6)(G), pA-1-18

#### 4. Staff Technical Analysis

##### Accounting for Upstream Emissions

CARB has identified a number of reasons to account for upstream emissions from electric drive vehicles in passenger vehicle GHG standards compliance calculations.<sup>6</sup> This policy creates incentives for improving battery electric vehicle performance, promotes technology-neutral standards, and sets up a system that can be carried forward past 2025 with increasing ZEV deployments. We agree with these principles and strongly support CARB's inclusion of upstream emissions in the compliance accounting mechanism. CARB's ISOR also notes several California-specific reasons to support upstream accounting. The ZEV program already requires ZEV deployment without any "artificial" incentives. The LCFS and Renewable Portfolio Standard provide data on upstream emission rates, while also enhancing the environmental benefits and credit values of electric drive vehicles.

CARB's proposed accounting factors are fixed for the 2017-2025 compliance period and based on compliance with California's 33% renewable electricity requirement for 2020. For instance, the Leaf would get a score of 23 g CO<sub>2</sub>(e)/mile (not including A/C usage). While this is a reasonable approach, CARB may also wish to consider a mid-term review. For instance, if CARB conducted a review in 2017 to make sure that California is on-track for expected electricity emission rates post-2020 or post-2021, then automakers will have several years notification of any changes (which would likely not dramatically affect the significant overall value of ZEVs for generating GHG credits).

CARB also notes its intent to allow manufacturers to comply with the federal program in lieu of the California program including upstream accounting. While this may mean that a different accounting system is used in practice, we agree with the principles set out by CARB staff.

##### Interaction with the National GHG Program

The California GHG tailpipe regulation differs from the federal regulation in its treatment of ZEVs in two ways that indirectly affect the net costs and benefits of the California ZEV program. The federal Notice of Proposed Rulemaking (NPRM) includes "temporary regulatory incentives" to promote the commercialization of BEVs, FCEVs and PHEVs: (1) a GHG compliance value of 0 g/mi for BEVs, FCEVs, and the electric operation fraction for PHEVs, and (2) multipliers that allow such vehicles to count as more than one vehicle in a manufacturer's compliance calculation. Table A-1 summarizes the application of these incentives by year.

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<sup>6</sup> LEV ISOR 2011 p136 et al.

	2012-2016	2017-2021	2022-2025
Zero upstream	Allowed up to cap <sup>7</sup>	Allowed without limit	Allowed up to cap <sup>8</sup>
Multipliers	None	2 for 2017-2019 1.75 for 2020 1.5 for 2021	None

Table A-1: NPRM Regulatory Incentives for Advanced Vehicles

In contrast, the proposed California GHG regulation provides a formula under which ZEV upstream emissions are included for purposes of GHG compliance as noted earlier, and does not include any multipliers. This different approach has implications for the cost and emission benefit analyses. The ZEV compliance cost calculated by CARB staff is based on the California GHG rules that incorporate ZEV upstream emissions and do not include multipliers for ZEVs. Manufacturers are more likely to opt for the proposed federal GHG rules because they grant additional GHG credits for ZEVs. Under those circumstances the amount of conventional technology foregone is greater, which will offset some of the net cost of ZEV deployment. The CARB staff estimate of emission benefits is also based upon compliance using the California rules. To the extent that manufacturers comply using the federal rules, the increased number of ZEVs called for under the revised proposal would actually allow an increase in fleetwide GHG emissions. While the proposed federal rules are not final and could change, ICCT recommends that CARB staff eventually provide an assessment of how the staff estimates of the net cost and emission impact would be affected by compliance under the proposed federal rules once they are finalized.

#### Transition to Fleet Average Approach

From its inception the ZEV regulatory mandate has been viewed as a "jump start" measure to incentivize production to a level that could become self sustaining. The original mandate--10 percent of vehicle sales in California--was intended to push production to the point where larger volumes would be achieved in the open market. ARB staff has previously stated its intent that for 2026 and beyond the ZEV program will be incorporated into the LEV program GHG fleet average, with no technology-specific requirements. ICCT notes that the proposed regulation order does not include any such sunset, but rather continues the 2025 requirement indefinitely into subsequent model years. Although there are indications that longer term sales volumes and technology development as well as GHG and criteria pollutant standards could result in a self-sustaining market, we agree with CARB staff that picking a sunset date is premature at this time. We suggest re-evaluating at the status of these factors and progress towards achieving a self-sustaining market over time at a future date.

<sup>7</sup> Cumulative cap of 300,000 vehicles per manufacturer for manufacturers that produce 25,000 or more vehicles in 2012; otherwise 200,000 vehicles.

<sup>8</sup> Cumulative cap of 600,000 vehicles per manufacturer for manufacturers that produce 300,000 or more vehicles in 2019-2021; otherwise 200,000 vehicles.

## **Attachment B: ICCT Detailed Comments on LEV III Criteria Pollutant Requirements**

ICCT strongly supports CARB's continued leadership on criteria pollutant emission reductions. The staff report estimates that this proposal will reduce nearly 100 tons per day of nitrogen oxides, non-methane hydrocarbons, and fine particulate emissions.<sup>9</sup> These emission reductions are urgently needed in California, and will establish a positive precedent both nationally and internationally. We have reviewed the supplemental federal test procedures and the fine particulate matter standards. While we are broadly supportive of both efforts, we recommend additional improvements. We have not reviewed the other sections of the LEV III criteria pollutant standards.

### **1) Comments on Fine Particulate Matter (PM<sub>2.5</sub>) and Proposed Emission Limits**

#### **A) Importance of Particulate Matter Emissions**

Under a baseline scenario, CARB staff project that statewide emissions of PM<sub>2.5</sub> from light-duty vehicles will increase by about 30 percent over the next thirty years, from approximately 25 tons per day in 2010 to approximately 32 tons per day in 2040.<sup>10</sup> These emissions are associated with an increase in premature deaths due to lung cancer, cardiopulmonary disease and other adverse health impacts among adults and young children. While vehicle emissions of all other criteria pollutants are projected to decline over this period, PM<sub>2.5</sub> is the only pollutant projected to increase. Both the San Joaquin Valley and South Coast Air Districts are currently in non-attainment of the PM<sub>2.5</sub> annual and 24-hour standards, and must be in attainment by the end of the decade.<sup>11</sup> This points to the importance of controlling fine particulate emissions from vehicles.

Surprisingly, CARB staff are reporting that new emissions data collected by US EPA and CARB suggests current port fuel injection (PFI)<sup>12</sup> vehicles emit higher levels of PM<sub>2.5</sub> than previously assumed. This new data has led to a substantial revision of previous emission rates. As a result they have been increased from 1 mg PM<sub>2.5</sub> per mile to between 4 and 23 mg PM<sub>2.5</sub> per mile. This suggests that gasoline vehicles on the road today may be more polluting than previously assumed. This also suggests that more advanced gasoline direct injection (GDI)<sup>13</sup> vehicles entering the market are not necessarily polluting more than the gasoline vehicles currently on the road.

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<sup>9</sup> CARB LEV III Appendix B Executive Summary p6-7

<http://www.arb.ca.gov/regact/2012/leviiighg2012/levappb.pdf>

<sup>10</sup> Appendix T, LEV III Mobile Source Emissions Inventory Technical Support Document p.T-47.

<http://www.arb.ca.gov/regact/2012/leviiighg2012/levappt.pdf>

<sup>11</sup> Attainment must be met ten years from the effective date of designation, which was Dec 14, 2009 according to Federal Register 74(218) p58688.

<sup>12</sup> PFI refers to gasoline-powered vehicles that mix fuel and air before entering the engine cylinder. This is the most commonly used engine design found in gasoline vehicles today.

<sup>13</sup> GDI refers to gasoline-powered vehicles that mix fuel and air in the engine cylinder. This increases fuel efficiency.

## B) Staff Proposal to Address Fine Particulate Emissions and Projected Emissions

We agree with staff that PM<sub>2.5</sub> standards are a high priority. Staff propose to reduce the existing tailpipe emission standard for light-duty PM<sub>2.5</sub> emissions from 10 mg per mile to 1 mg per mile in phases over a twelve-year period beginning in 2017 and ending in 2028. This requires that 10 percent of vehicles sold in 2017 meet a 3 mg per mile standard followed by 20 percent in 2018, 40 percent in 2019, 70 percent in 2020, and 100 percent in 2021. Beginning in 2025, 25 percent of sales must meet a 1 mg per mile standard, followed by 50 percent in 2026, 75 percent in 2027, and 100 percent in 2028. Staff are also proposing an in-use PM<sub>2.5</sub> standard of 6 mg per mile, which applies to vehicles certified to the 3 mg per mile standard during the first phase-in period. Manufacturers would be required to test two test groups per year to demonstrate compliance with the new in-use standard.<sup>14</sup>

Under this proposal, staff project that PM<sub>2.5</sub> emissions would rise to approximately 27 tons per day by 2025 and 28 tons per day by 2040.<sup>15</sup> This represents a 12 percent increase in emissions from 2010 to 2040, about half the increase expected under the baseline scenario. On a regional basis, staff project the current proposal will keep emissions of PM<sub>2.5</sub> constant in the South Coast region at 10 tons per day through 2035, while in the San Joaquin Valley emissions are projected to continue to rise from 2.5 to nearly 3.5 tons per day in 2035. Staff estimate that the proposal will prevent approximately 180 premature deaths from cardiopulmonary disease (with a range of 140-230) between 2010 and 2025 attributable to decreased exposure from both primary and secondary PM<sub>2.5</sub>.

## C) Implementation Schedule Concerns and Alternatives

We strongly support the proposed 1 mg per mile standard, however the proposed phase-in schedule does not force the best available control technology and weakens the overall effectiveness of the standard. The current proposal would give automakers until 2028 to fully implement the 1 mg per mile standard, which the auto industry claims is necessary to meet the standard at zero cost. A zero cost goal is laudable, but the public health costs generated by a longer phase-in time have not been taken into account. We are also concerned that, in this instance, some unnecessary tradeoffs are being made to keep the cost of more fuel-efficient vehicles low at the expense of public health. In principle, we think that staff should be careful to avoid tradeoffs between public health and climate goals.

We strongly encourage staff to explore and adopt a much more accelerated implementation scenario that forces the best available control technology beginning in 2017. A more accelerated schedule would achieve greater cumulative reductions in PM<sub>2.5</sub>, would generate additional public health benefits, and would speed the compliance of certain air districts currently in non-attainment.

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<sup>14</sup> ARB would select the test groups. Manufacturers would also be required to test one high-mileage in-use vehicle per test group.

<sup>15</sup> Appendix T, LEV III Mobile Source Emissions Inventory Technical Support Document p.T-51.  
<http://www.arb.ca.gov/regact/2012/leviiighg2012/levappt.pdf>

We suggest that staff compare the costs and benefits of this accelerated policy scenario against the current proposal, and we suggest that staff include this analysis in their report. In Appendix T of the staff report, an accelerated policy scenario for PM<sub>2.5</sub> is currently missing whereas for other criteria pollutants this is presented. We also suggest that CARB staff evaluate other potential health benefits beyond reductions in cardiopulmonary-related mortality, such as reduced lung cancer and acute respiratory infections based on WHO or US EPA established methodologies. And we suggest that staff evaluate potential health benefits beyond 2025, made possible by modeled emissions data presented in Appendix T. In addition, we suggest that staff include the total estimated health impacts expected under the baseline and policy scenarios in each year, not just the change in impacts as given in the staff report. We recommend that staff assess health impacts out to 2040 for the baseline case, the staff proposal and the best available control technology alternative.

Diesel vehicles and at least some GDI vehicles have the ability to meet the 1 mg per mile standard today.<sup>16</sup> Staff state in Appendix P that, "many existing and newer high mileage vehicles already can meet the proposed standards." Staff project that manufacturers can transition GDI vehicles from wall-mounted fuel injectors to center-mounted fuel injectors to meet the standard. A commercially available vehicle with this engine design is already sold by BMW and has been tested by both CARB and US EPA. In addition, manufacturers can choose aftertreatment devices like the gasoline particulate filter, which is essentially identical to diesel particulate filters used on diesel vehicles sold in California today. Staff have estimated that these cost about \$100, in line with our published estimates.<sup>17,18</sup> Staff suggest engine oil burning can be a significant source of PM<sub>2.5</sub> emissions, so prevention of oil burning may serve as a compliance strategy to support more accelerated phase-in of the PM<sub>2.5</sub> standards.

CARB staff highlight concerns about the sensitivity and repeatability of measurement techniques to certify vehicles to a very low 1 mg per mile standard, and we agree that this issue needs to be resolved. We believe the measurement challenge can be met by focusing on the more precise solid particle number measurement such as in the United Nations Particle Measurement Programme (UN-PMP) as an alternative proxy (but not a replacement) for the gravimetric method.<sup>19</sup> The European emission standards give a particle mass limit based on the UN-PMP protocol, and automakers selling vehicles in Europe already have the capability to collect and report particle number emissions. Given the available lead time, the commercial availability of more sensitive instruments, and established protocols for more sensitive measurement techniques, the evidence suggests there is ample time to address this issue by 2017.

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<sup>16</sup> Appendix P, LEV III PM Technical Support Document, figures 23 and 56.  
<http://www.arb.ca.gov/regact/2012/leviiiighg2012/levappp.pdf>

<sup>17</sup> Appendix T, LEV III Mobile Source Emissions Inventory Technical Support Document p.T-53.  
<http://www.arb.ca.gov/regact/2012/leviiiighg2012/levappt.pdf>

<sup>18</sup> <http://www.theicct.org/estimated-cost-gasoline-particulate-filters>

<sup>19</sup> The UN-PMP is the official measurement protocol used in the European Union to certify vehicles to the EURO 5 and EURO 6 emissions standard. Automakers who sell vehicles in Europe and the United States will have the test capability and data to apply this protocol in the United States. Gravimetric refers to a method that captures and weighs fine particulate.

#### D) Additional Comments and Suggestions

We find some inconsistency between the stated aims of the proposal and emissions modeling data. CARB staff explain that the proposal is intended to encourage the development of GDI engines that achieve PM<sub>2.5</sub> emission rates equivalent to PFI engines. Nevertheless, PM<sub>2.5</sub> emission factors in Appendix T of the report are already reported as equivalent for these engine types. We suggest that staff either differentiate GDI and PFI emission rates in the model or revise the staff report suggesting that they are different.

#### E) Black Carbon

We commend staff for including a thorough review of the black carbon climate science. This is an emerging and very important area of scientific investigation. While the evidence for regulating black carbon as a climate forcing agent is strong, we acknowledge the ongoing research staff must undertake to prepare for future regulation. Based on what staff summarizes in Appendix U of the report, we suggest they include in the full staff report a CO<sub>2</sub>(e) estimate of the climate co-benefits of the proposed PM standard.<sup>20</sup>

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<sup>20</sup> Appendix U, LEV III Climate Change Impacts of Black Carbon Particles: Technical Support Document. <http://www.arb.ca.gov/regact/2012/leviiiighg2012/levappu.pdf>

## 2) Supplemental Federal Test Procedures for NMHC and NOx

We strongly agree with CARB on the need for standards and test cycles representing aggressive driving (using the US06 test cycle) and air conditioning (using the SC03 test cycle) in addition to testing under other conditions. We recommend building on CARB’s impressive proposed standards to reduce emissions under FTP testing by including specific US06 and SC03 standards for each of the six bins.

### A) US06

We note that the variation between the allowable emissions from the standards in Section 1.1 (Section 1.1.2) of the proposed regulation and levels allowed in Section 1.2 (Section 1.2.2.1.1) under the US06 test cycle are relatively small for LEV160 and ULEV125 bins. However a major variation occurs for ULEV70, ULEV50 and SULEV30 as shown below in Table B-1. While CARB may have technical justification for increasing the variation as certification levels get stricter, 1) the US06 levels should be set for each of the six bins and 2) the US06 levels should be reduced for the ULEV125, ULEV75, and SULEV20 certification levels.

Vehicle Emission Category	Durability Vehicle Basis (mi)	Allowable (g/mi) NMHC + NOx		Variation from Section 1.1 to Section 1.2 standards
		Emission standards (section 1.1.)	Emission standards on US06 test (section 1.2)	
LEV160	150,000	0.160	0.140	<0%
ULEV125		0.125	0.120	<0%
ULEV70		0.070		71%
ULEV50		0.050	140%	
SULEV30		0.030	0.050 <sup>21</sup>	67%
SULEV20		0.020		150%

Table B-1: LEV III Standards for PCs; LDTs 8500 lbs GVWR; and MDPVs  
(Source: CARB LEV III Appendix D)

### B) SC03

We note that a similar discrepancy exists for the SC03 air conditioning certification standards. We recommend that CARB set lower specific SC03 air conditioning standards for ULEV70, ULEV50 and SULEV20.

We recommend that CARB address these issues as soon as is feasible. While the fleet average will not drop to the range of ULEV70 levels until 2019/2020<sup>22</sup>, manufacturers may choose to earn credits using the lower bins in the meanwhile.

<sup>21</sup> Excluding Option A

<sup>22</sup> CARB LEV III Appendix D p E-21 <http://www.arb.ca.gov/regact/2012/leviiighg2012/levappd.pdf>