

Scientific Information Statement: Attachment A

OVERVIEW

Vermont first exercised its authority under section 177 of the Clean Air Act (CAA) to adopt California's Low Emission Vehicle (LEV) program in 1996. Since then, Vermont has amended its LEV regulations periodically to stay consistent with California's regulations. The proposed amendments, also discussed in Attachment A to the Economic Impact Statement, represent evolutionary changes within the California LEV Program and are focused on lessening burdens or enhancing choices for various stakeholders. The proposed amendments will incorporate by reference: (1) California's revisions to the Zero Emission Vehicle (ZEV) program; (2) California's Environmental Performance Labeling requirements; and (3) California's amendments to Emission Warranty and Recall requirements. These proposed amendments are substantive in terms of their policy effects rather than their expression of new scientific understanding. Thus, the background science pre-dating the proposed changes remains unchanged or tangential rather than central to the amendments.

DISCUSSION

1) Zero Emission Vehicle (ZEV) Amendments.

California's revisions to the ZEV program requirements are being made in response to the Independent Expert Technology Review process periodically required by the California Air Resources Board (CARB) for the ZEV provisions. The adjustments to the ZEV requirements focus not on new areas of physical science but rather on the evolving alternative vehicle market, reducing compliance burdens on manufacturers, and incorporating cost-effective mechanisms to advance clean transportation choices, while synchronizing the LEV Program with larger climate change initiatives.

As noted in Attachment A to the Economic Impact Statement, a key intent of the ZEV amendments is to provide increased flexibility to those manufacturers obligated to supply ZEV vehicles. A CARB staff report explains: "The changes proposed by staff significantly reduce an automaker's cost of compliance, but still provide increased air quality benefits of commercially viable and increasingly available [Advanced Technology Partial Zero Emission Vehicles, e.g., hybrids]. In making these changes, the program will reduce criteria pollutant emissions by 7,000 tons over the life of the affected vehicles."¹

While the proposed amendment revises the numbers of zero emission vehicles required during the various time intervals or phases identified within the requirements, the major focus is on reducing cost for the obligated manufacturers by encouraging development of

¹ CARB, Staff Report: Initial Statement of Reasons – 2008 Proposed Amendments to the California Zero Emission Vehicle Program Regulations, at p. iv, Executive Summary, February 8, 2008.

plug-in hybrid and battery electric vehicles. These are vehicles widely anticipated by consumers, industry, public utilities, air quality and transportation planners, and environmental organizations, and are referenced in state Climate Action plans.

For instance, California has incorporated the LEV Program requirements for zero emission vehicles in its overarching climate action plan, AB 32 Global Warming Solutions Act of 2006.

In similar fashion, the State of Vermont has identified LEV, or the “Clean Cars Program”, with its ZEV provisions as a key strategy in climate change mitigation. Vermont has also identified LEV as important to its efforts to remain in attainment of the National Ambient Air Quality Standards (NAAQS). As a small rural state without significant public transportation, Vermont is heavily dependent on light-duty motor vehicles for transportation. Transportation sources represent approximately 46% of all Vermont greenhouse gas emissions.

Because of the flexibility built in to the ZEV requirements, those “Large Volume Manufacturers” supplying some portion of their fleet as zero emission vehicles will be able to provide pure ZEV or gold vehicles within a range of approximately 0.9% to 3% of that portion of their sales used to calculate obligation. The proposed amendments will permit them to offset or “backfill” Gold vehicles by supplying correspondingly greater percentages of Enhanced Advanced Technology Partial Zero Emission Vehicles or “Silver +” vehicles within a 0 to 2.1% range.

The range of vehicle types earning credits to meet a ZEV obligation, along with additional variables ranging from banked credits, to program provisions providing flexibility in truing-up debits, to options in how annual obligations are calculated, make definitive modeling of benefits a moving target. Nevertheless, CARB staff noted two key points on the environmental impact of the ZEV program amendments. First, the revised ZEV program requirements versus no ZEV requirements within the LEV program would reduce tons per day (TPD) of ozone-forming reactive organic gases (ROG) and oxides of nitrogen (NOx) in the critically-challenged South Coast Air Basin of California by 8% in 2020 and 14% in 2030.² Second, the revised ZEV program requirements would reduce total lifetime climate change emissions, based on a 150,000 mile vehicle life, by 26% during the 2012-2014 Phase III and 27% during the Phase IV 2015-2017 period of the ZEV Program.³

Impacts on Vermont will proportionally mirror those in California. ZEV vehicles will serve to reinforce an evolving advanced technology market, while displacing some measure of imported fossil fuels, and improving air quality. The warranties attached to ZEV vehicles are substantially greater than conventional vehicles, and the potential savings to consumers in operating expenses ranging from fuel costs to maintenance needs to enhanced resale value can be considerable.

² Id. at p.37.

³ Id. at p.38.

A collaborative study by Green Mountain College and the Transportation Center at the University of Vermont, assisted by public utilities and the Vermont Department of Public Service, examined the potential impact on the Vermont electric grid, carbon and NOx emissions, gasoline consumption, and gasoline gallon equivalent costs of significant PHEV deployment.⁴ Major findings of the study included:

- Replacing 50,000 conventional gasoline vehicles with Plug-in Hybrid Electric Vehicles (PHEVs) would lessen carbon emissions by 31 percent assuming a baseline fuel consumption of 27.7 mpg for a conventional vehicle and a PHEV with a 20 mile electric range.
- These 50,000 PHEVs could reduce NOx emissions by 30 percent.
- The electric grid could charge 100,000 PHEVs without increasing peak demand or required generation if the PHEVs were recharged during nighttime low demand times.
- Charging vehicles at night when demand is low could improve the overall efficiency of the grid.
- 50,000 PHEVs could reduce annual gasoline consumption between 11.4 and 12.9 million gallons depending on the mpg efficiency of the vehicle.
- The gasoline gallon equivalent cost for a PHEV in electric mode would be \$1.05 a gallon, or roughly 25 percent of a gallon of gasoline at \$4.20.

Since the ZEV amendments only require Large Volume Manufacturers to supply Gold or combinations of Gold and Silver+ (PHEV) vehicles, the interval in which the Vermont fleet would increase to 50,000 PHEVs without a concurrent unregulated market demand could be lengthy. In Model Year 2007, Large Volume Manufacturer light-duty vehicle sales in Vermont were approximately 26,000 vehicles. In Phase III of the ZEV Program, 2012-2014, the ZEV requirement will be 12 percent of this approximate 26,000 vehicle basis, of which 2.7 percent or 703 vehicles may be Silver+ or PHEVs. During Phase III, a PHEV is likely to earn an approximate 1.0 ZEV credit per vehicle, making total PHEV placements approximately 700 annually, in the absence of additional consumer appetite.

It is thus reasonable to assume that PHEV impacts on the Vermont grid will be insignificant and benign in a scenario involving manufacturers meeting requirements, or in a scenario in which market appetite elevates sales substantially above actual ZEV Program requirements. In any event, Vermont's existing ZEV program requirements and the proposed ZEV amendments will play a paramount role in bringing these vehicles to Vermont.

⁴ Plug-In Hybrid Vehicles and the Vermont Grid: A Scoping Analysis, available at http://www.uvm.edu/~transctr/pdf/Final_PHEV.pdf

Table 1: Summary of Key ZEV Amendment Points⁵

| Goal | Solution |
|--|--|
| Address technology challenges of fuel cell vehicles | Lower required numbers of fuel cells during Phase III and IV (2012 – 2014 & 2015 – 2017) and create Type IV ZEV. |
| Incentivize PHEVs with zero emission mile capability | Allow Enhanced AT PZEVs in Phase III to count for 90% of gold requirement. Establish new calculations for AT PZEV credits to account for new plug in hybrid configurations. |
| Simplify regulation | Create “New Path” to replace two path system. |
| Remove barriers to using Battery EVs for compliance | Remove caps on Type I and II battery EVs; change ratio for use and create Type I.5 ZEV, however maintain higher credits for fuel cell vehicles compared to battery EVs to reflect relative state of development. |
| Fulfill commitment to revisit role of NEVs | Up credit to 0.3 to recognize environmental benefits. |
| Smooth transition for IVMs going to LVM | Create transition period emphasizing AT PZEVs. |
| Program compliance transparency | Release of ZEV production data beginning in 2009 and ZEV credit balances in 2010. |
| Conforming changes | Extend travel provision. |

2) Environmental Performance Labeling Amendments.

California’s Environmental Performance Labeling requirements, which Vermont is proposing to adopt, focus on providing information to consumers on the environmental impacts of vehicle choices. The methodology to rank vehicles relative to each other and provide consumer labeling was developed at the instruction of California Assembly Bill 1229 of 2005.

The Vermont Agency of Natural Resources has a similar interest in providing consumer labeling, and has also been instructed to do so by the Vermont Legislature in Act No. 55 of 2007, now codified at 10 V.S.A. §579. By statute, the Agency is required to “establish, by rule, a vehicle emissions labeling program for new motor vehicles sold or leased in the state with a model year of 2010 or later.” 10 V.S.A. §579(a). The statute further provides: “A label that complies with the requirements of the California vehicle labeling program shall be deemed to meet the requirements of this section and the rules adopted thereunder for the content of labels.” 10 V.S.A. §579(b).

⁵ CARB, Staff Report: Initial Statement of Reasons – 2008 Proposed Amendments to the California Zero Emission Vehicle Program Regulations, at p.41, February 8, 2008.

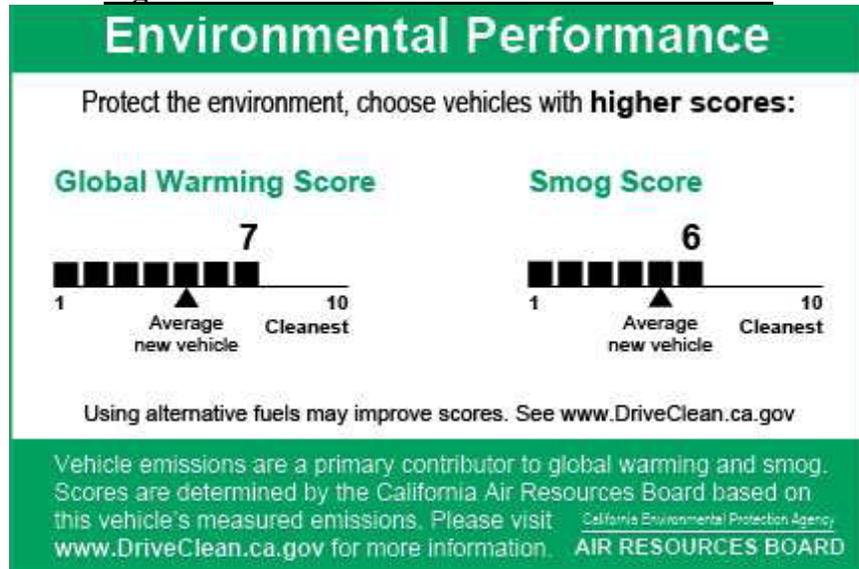
CARB staff estimated the environmental impacts of the Environmental Performance Labeling requirements as follows:

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 are based on a fleet average CO₂Equivalent 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.⁶

California's Environmental Performance Label requirements, which are set forth in Title 13 of the California Code of Regulations (CCR) Section 1965, will replace the existing Smog Index Label requirement. The Smog Index label ranks vehicles on their relative tailpipe emissions of ozone precursor pollutants. The new Environmental Performance label adds a greenhouse gas index, combining the Smog Score and the Global Warming Score in a single format. The new label will be displayed on a window or as an addition to the Monroney Label, the large federally-required label which describes the vehicle configuration, the Manufacturer's Suggested Retail Price, the warranty, and fuel economy.

⁶ CARB, Staff Report: Initial Statement of Reasons – Proposed Amendments to the Smog Index Vehicle Emissions Label, at p.25, May 4, 2007.

Figure 1: The Environmental Performance Label



The design of the new Environmental Performance Label followed market research conducted for CARB staff by outside specialists, prior research by the U.S. EPA, along with input from consumer focus groups.

The label combines a 1-10 Global Warming Score and a similar 1-10 Smog Score, with an average new vehicle weighted at 5 in each scale. The Global Warming Score reflects not only vehicle tailpipe emissions of greenhouse gases, but also the upstream emissions from the production and distribution of the fuel. Vehicle scores from operations also weight the operation of their air conditioning systems through the choice of refrigerant and its global warming potential, and the robustness of air conditioner design in minimizing refrigerant loss. The Global Warming Potentials (GWP) of the major greenhouse gases addressed in the Global Warming Score are illustrated below:

Table 2: Numerical Estimates Of Global Warming Potentials Compared With CO2 (Kilograms Of Gas Per Kilogram Of CO2 -- Adapted From IPCC 2001).⁷

| Climate Pollutants | Lifetime (years) | Global Warming Potential | | |
|--------------------|------------------|--------------------------|------------|-----------|
| | | 20 years | 100 years* | 500 years |
| CO ₂ | ~150 | 1 | 1 | 1 |
| CH ₄ | 12 | 62 | 23 | 7 |
| N ₂ O | 114 | 275 | 296 | 156 |
| HFC-134a | 14 | 3,300 | 1,300 | 400 |

⁷ CARB, Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions from Motor Vehicles, at p.16, August 6, 2004.

While carbon dioxide (CO₂) is the largest greenhouse gas in mass associated with vehicle operation, fuel production and distribution, the global warming potentials of other greenhouse gases highlight the significance in identifying their contribution to individual model vehicle emissions and fuel impacts. While a mathematical relationship between gasoline fuel consumption and the production of CO₂ can be demonstrated, that relationship is not constant for alternative fuels, nor does it reflect the impacts of air condition systems, a key distinction between the California label and an effort by the U.S. EPA to rank vehicles in their SmartWay program based on CO₂ production alone.

Adopting California's Environmental Performance Label requirements will serve to educate the public, reduce emissions through environmental awareness, assist in quantifying State emissions inventories from transportation, and meet the requirements of 10 V.S.A. §579.

3) Emission Warranty Information and Recall Reporting Amendments.

When amending California's Emission Warranty Information and Recall Reporting requirements, CARB staff explained: “[W]hile it is inherently speculative to forecast the future emissions consequences of failed emissions components that fail over time it is beyond dispute that as motor vehicles age and accumulate high mileage, their emission control systems deteriorate and increasingly malfunction, causing emissions from motor vehicles to increase, and for these reasons, the ARB needs to be able to order recalls on the basis of failing emissions-related components, not just on the basis of average emissions exceedances in an affected vehicle group”⁸

Further, as the Vermont Agency of Natural Resources noted in Attachment A to the Economic Impact Statement: “The proposed amendments will more clearly hold manufacturers accountable for their representations made during the certification process that their vehicles can meet applicable emissions limits for their Useful Life, which will protect both the purchasers of their products and those air quality benefits traditionally modeled on those manufacturer statements. While the existing Emissions Warranty Information Reporting (EWIR) and Recall provisions are not thematically different, the current procedures to initiate warranty recalls have in some instances had the unfortunate result of preventing the repair of defective components, to the detriment of consumers' pocketbooks, public health, and air quality.”

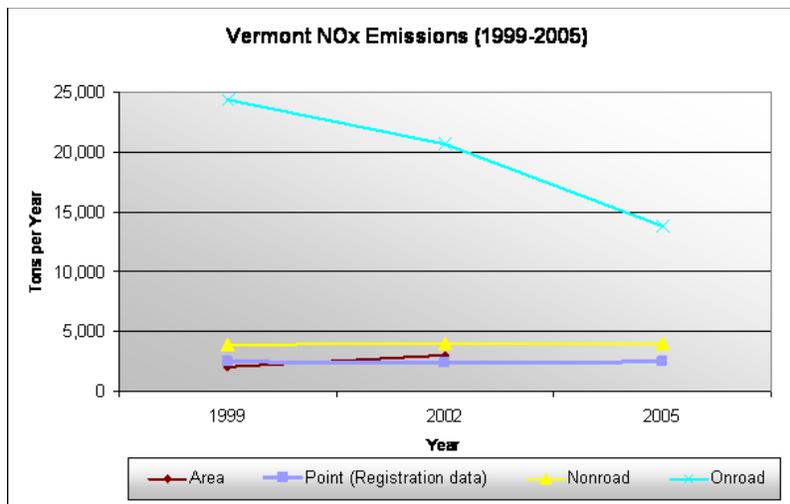
The proposed amendments will help avoid repeat situations attributable to the earlier recall provisions in which known failures of emission devices at a high rate did not result in recalls, with unfortunate impacts. CARB illustrated one such instance in which some 100,000 trucks with faulty catalytic converters were not recalled due to procedural difficulties raised by the existing requirements. The impacts were analyzed from both a

⁸ CARB, Staff Report: Initial Statement of Reasons for Proposed Rulemaking – Public Hearing to Consider Amendments to California's Emission Warranty Information Reporting and Recall Regulations and Emission Test Procedures, at p.15, October 20, 2006.

“best case” and a “worst case” scenario in terms of air quality.⁹ In the best case scenario, 20 percent of the affected vehicles were assumed to have cracked catalyts, resulting in annual increases of Non-Methane Hydrocarbons (NMHC) of approximately 0.6 ton per year, and annual Oxides of Nitrogen (NOx) increases of approximately 54 tons a year. In the worst case scenario, 72 percent of the affected vehicles exhibited deteriorated catalyts, producing annual NMHC increases of 837 tons a year, and annual NOx increases of 1783 tons a year.

In context, while the emissions increases were modeled for California where annual new light-duty vehicle sales total approximately 2 million versus approximately 35,000 in Vermont, the 2009 Vermont inventory projections for light-duty gasoline vehicles contribution of volatile organic compounds (VOC) – analogous to NMHC¹⁰ - is forecast to be 6,445 tons per year. Light-duty vehicle NOx for 2009 is forecast to be 9,595 tons per year, on a downward trend from earlier years as illustrated in Figure 2 below.¹¹ This trend is the result of declining emissions standards for light-duty vehicles, and highlights the significance of maintaining certification levels of pollutants over the useful life of the vehicle.

Figure 2: 2009 Vermont Inventory Projections for Light-Duty Vehicle NOx



Defective emissions control devices can impact inventories to a profound degree. A subset of a vehicle population with a defective emissions control device for which a warranty or recall does not apply can have unfortunate impacts on air quality and consumers’ wallets. The proposed amendments incorporating changes to California’s Emissions Warranty Information Reporting and Recall requirements will help to ensure emissions performance over the useful life of a vehicle and reduce emissions impacts on the environment, while lessening the financial burden to consumers.

⁹ Id., at p.7.

¹⁰ See Conversion Factors for Hydrocarbon Emission Components, EPA420-R-05-015, December 2005

¹¹ Data prepared by Vermont Agency of Natural Resources, Department of Environmental Conservation, Air Pollution Control Division, Planning Section for NEG / ECP Acid Rain Steering Committee, 2008.