



STATE OF CONNECTICUT  
DEPARTMENT OF ENVIRONMENTAL PROTECTION



# Exhibit E

## HEARING REPORT

Prepared Pursuant to Section 4-168(d)  
of the Connecticut General Statutes and  
Section 22a-3a-3(d)(5) of the Department of Environmental Protection Rules of Practice

Regarding Regulations for the Abatement of Air Pollution:  
Proposed Amendment of Section 22a-174-36b of the  
Regulations of Connecticut State Agencies

Hearing Officer: Paul E. Farrell

Date of Hearing: August 25, 2005

### Introduction

On July 8, 2005, the Commissioner of the Department of Environmental Protection ("Department" or "DEP") signed a notice of intent to amend section 22a-174-36b ("section 36b") of the Regulations of Connecticut State Agencies ("R.C.S.A.") concerning the second phase of the California Low Emission Vehicle Program. Pursuant to such notice, a public hearing was held on August 25, 2005. The public comment period for the proposed amendment and adoption also closed on August 26, 2005.

On May 10, 2004, the Governor of the State of Connecticut signed into law Public Act 04-84, which the General Assembly adopted on April 22, 2004. Public Act 04-84, amending section 22a-174g of the Connecticut General Statutes ("C.G.S."), directs the Commissioner of Environmental Protection ("Commissioner") to adopt regulations by December 31, 2004, in accordance with the provisions of chapter 54 of the C.G.S., to implement the light duty motor vehicle emission standards of the state of California applicable to motor vehicles of model year 2008 and later. Furthermore, this Public Act directs the Commissioner to amend such regulations from time to time, in accordance with any changes in the standards made by the state of California. California is revised its Low Emission Vehicle ("LEV") standards to adopt green house gas emission standards for passenger cars, light duty trucks and medium duty passenger vehicles commencing with 2009 and subsequent model year vehicles.

### I. Hearing Report Content

As required by section 4-168(d) of the C.G.S., this report describes the regulations proposed for hearing; the principal reasons in support of the Department's proposed amendment and adoption; the principal considerations presented in oral and written comments in opposition to the Department's proposed adoption and amendment; all comments and responses thereto on the proposed adoption and amendment; and the final wording of the proposed adoption and

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amendment. Commenters are identified in Attachment 2.

This report also includes a statement pursuant to C.G.S. section 22a-6(h).

## **II. Compliance with Section 22a-6(h) of the Connecticut General Statutes**

Section 22a-6(h) of the C.G.S., as amended by section 5 of Public Act 03-76, requires the Commissioner to distinguish clearly, at the time of notice, all provisions of a proposed regulation or amendment thereto that differ from adopted federal standards and procedures, provided: (1) such proposed amendment pertains to activities addressed by adopted federal standards and procedures; and (2) such adopted federal standards and procedures apply to persons subject to the provisions of such proposed amendment. In addition, the Commissioner must provide an explanation for all such provisions in the regulation-making record required under chapter 54 of the C.G.S.

In accordance with the requirements of C.G.S. section 22a-6(h), the Hearing Officer made a written statement available upon publication of the public notice and at the public hearing. Such statement, incorporated into the administrative record for this matter, indicated that, as required by C.G.S. section 22a-174g, as amended by Public Act 04-84, the Department is proposing to amend section 36b to reflect changes to California's LEV II program that are incorporating motor vehicle greenhouse gas (GHG) emission standards commencing with the 2009 model year for passenger cars, light duty trucks and medium-duty passenger vehicles, and maintain identical standards with California for all vehicle weight classes as required by section 177 of the federal Clean Air Act. The proposed amendments to section 36b will reduce greenhouse gas emissions from the effected vehicles by requiring the manufacturers of such vehicles to provide only California LEV II certified vehicles into the Connecticut market. The Department is also proposing the adoption of LEV II standards applicable to 2009 and subsequent model year medium-duty passenger vehicles. These standards include tailpipe emission standards, fleet average emission standards and other related elements, including California warranty and recall provisions, and other additional requirements as more fully set forth in section 36b. The Department is also proposing a number of minor technical changes and clarifications to the Connecticut LEV II program in accordance with suggestions made by several automobile manufacturers.

The requirements of C.G.S. section 22a-6(h) are not applicable to the proposed amendment of section 36b as this amendment is being proposed to maintain identical standards with California as required by section 177 of the federal Clean Air Act.

### **III. Summary and Text of the Regulatory Amendments as Proposed**

#### **A. Section 22a-174-36b, Low Emission Vehicles II, GHG emission standards and related provisions.**

As required by C.G.S. section 22a-174g as amended by Public Act 04-84 the Department proposes to amend section 36b to reflect changes to California's LEV II program that are incorporating motor vehicle GHG emission standards commencing with the 2009 model year for passenger cars, light duty trucks and medium-duty passenger vehicles, and maintain identical standards with California for all vehicle weight classes as required by section 177 of the federal Clean Air Act. Further information on the status of the California rulemaking proceeding, including a final statement of reasons issued by the California Air Resources Board (CARB), is available electronically at [www.arb.ca.gov/regact/grnhsgas/grnhsgas.htm](http://www.arb.ca.gov/regact/grnhsgas/grnhsgas.htm). The proposed amendments to section 36b will reduce greenhouse gas emissions from the effected vehicles by requiring the manufacturers of such vehicles to provide only California LEV II certified vehicles into the Connecticut market. The Department is also proposing the adoption of LEV II GHG emission standards applicable to 2009 and subsequent model year medium-duty vehicles. These standards include tailpipe emission standards, fleet average emission standards and other related elements, including California warranty and recall provisions, and other additional requirements as more fully set forth in section 36b. In addition to the proposed GHG emission standards and related requirements, the Department is also proposing a number of minor technical changes and clarifications to the Connecticut LEV II program in accordance with suggestions made by several automobile manufacturers. The text of the regulation as proposed for public hearing is set forth in Attachment 1.

### **IV. Principal Reasons in Support of the Proposed Amendments**

Comments received in support of the proposed amendment from environmental groups and governmental agencies indicated that such action: is required as a matter of state law pursuant to G.G.S. section 22a-174g as amended by Public Act 04-84; will provide GHG emission reductions in accordance with Public Act 04-252, An Act Concerning Climate Change, and the Connecticut Climate Change Action Plan 2005; is cost effective and technically feasible; and is important to protect the health of Connecticut's residents.

### **V. Principal Considerations in Opposition to the Proposed Amendments**

Individual automobile manufacturers, automobile manufacturing trade groups and their consultants submitted voluminous comments in opposition to the proposed amendments. Their principal comments in opposition are summarized as: the Department lacks both state and federal legal authority to adopt the proposed amendments; the proposed amendments are not technically feasible to implement; the proposed amendments will increase air pollution in Connecticut; the underlying analysis performed by the California Air Resources Board (CARB) is technically flawed; California lacks the legal authority to adopt their GHG rules;

## **VI. Summary of Comments on the Adoption of California's Greenhouse Gas Emission Standards**

Comments in support of the Department's proposed adoption are set forth in Section VI. A. Comments in opposition of the Departments proposed adoption of are set forth in Section VI. B.

### **A. General Comments Supporting Proposed GHG Regulations**

**Connecticut Fund for the Environment (CFE) provided the following general comment on section 36b:**

**1. Comment:** CFE supports the adoption of the greenhouse gas emission standards set forth in proposed amendments to section 22a-174-36b of the R.C.S.A. for the following reasons:

- a. The proposed greenhouse gas standards are a cost-effective, practical and necessary approach to addressing the threat posed by global warming. CFE's comments identified numerous threats faced by Connecticut under several climate change scenarios.
- b. CFE acknowledges the State of Connecticut has demonstrated a strong commitment to address the challenges posed by global warming. In support of the proposed rule, CFE cites the New England Governor's Eastern Canadian Premiers Climate Change Action Plan 2001 and the adoption of Public Act 04-252, both of which establish long-term goals for greenhouse gas reductions. CFE also cites to the adoption and subsequent legislative ratification of the Connecticut Climate Change Action Plan 2005 in support of the proposed rule.
- c. The proposed greenhouse gas standards are crucial to reach reduction targets in light of the large contribution of motor vehicles to greenhouse gas emissions.
- d. Adoption of the greenhouse gas emission standards is both a legal and policy imperative.

**Response:** The Department notes CFE's support of the proposed rule. The Department agrees with CFE that the proposed GHG rule, in combination with other actions to reduce stationary and mobile source GHGs being developed and implemented in Connecticut and throughout many portions of the United States as well as in many other nations, represents a significant first step towards addressing the threats posed to Connecticut under the various climate change scenarios presented by CFE.

**The Connecticut Public Interest Research Group (ConnPIRG) provided the following general comment on section 36b:**

**2. Comment:** ConnPIRG submitted along with their comment a copy of a report entitled, *Cars and Global Warming, Policy Options to Reduce Connecticut's Global Warming Pollution from Cars and Light Trucks* (ConnPIRG Report - also available in electronic form at

[www.connpirg.org](http://www.connpirg.org)). The ConnPIRG Report analyzes the contribution of tailpipe emissions to overall emissions of global warming pollutants in Connecticut and discusses several available policy options for reducing such emissions. A key finding of the ConnPIRG Report, is that adoption of the proposed emission standards will result in significant GHG tailpipe emissions reductions.

Connecticut adopted a Climate Change Action Plan in 2005, which commits the state to achieving significant reductions in emissions of global warming pollutants in accordance with the regional plan adopted by New England states and eastern Canadian provinces in 2001. As noted on page 22 of the ConnPIRG Report, the Clean Car standards, of which the current proposed amendments are part, represent a major step towards achieving vehicle emissions reductions sufficient to meet the reductions called for in the regional and state Climate Change Action Plans. ConnPIRG stated their analysis indicates the proposed tailpipe emission standards, in combination with the existing LEV II standards adopted in 2004, will achieve approximately 50% of the reductions required for Connecticut to reach an emissions level 10 percent below 1990 levels by 2020 as called for in the regional Climate Change Action Plan.

While the emissions reductions to be achieved by these standards are a compelling reason to support their adoption, ConnPIRG also supports the proposed amended regulations for the simple reason that Connecticut Public Act 04-84 requires their adoption. That legislation, enacted in 2004, requires DEP to revise its regulations as required to maintain consistency with changes to the California emissions program. Since these proposed regulations reflect such changes to the California program, ConnPIRG believes Public Act 04-84 requires their adoption.

**Response:** The Department notes ConnPIRG's support for the proposed regulations and agrees with ConnPIRG that the provisions of G.G.S. section 22a-174g (Public Act 04-84) require the Department to revise its LEV regulations when California revises its program. California has done so. The California final rulemaking package was approved by the California Office of Administrative Law and filed with the California Secretary of the State on September 15, 2005. The California GHG regulations will become operative on October 15, 2005. Pursuant to section 1961.1(g), Title 13, California Code of Regulations, the California GHG regulations will be effective on January 1, 2006.

**Environmental Defense provided the following general comment on section 36b:**

**3. Comment:** Environmental Defense (ED) recommends adoption of the California automotive GHG emissions program. ED commented that the threats of global warming to New Englanders' health, economy, and environment are real, and Connecticut needs to act now to reduce its contribution to greenhouse gas emissions. Global warming is indeed a global problem, but enacting the proposed regulations will be an important step towards a solution.

ED commented the proposed regulations are an essential part of the 2005 Connecticut Climate Change Action Plan, in which the Governor's Stakeholder Committee on Climate Change (GSC) proposed measures to reduce the State's contribution to global warming as statutorily mandated through Public Act 04-252. The GSC also affirmed Connecticut's commitment to California's auto pollution rules, adopted in 2004 through Public Act 04-84. Public Act 04-84 requires and section 177 of the Clean Air Act authorizes Connecticut's DEP to amend the Connecticut LEV II program when the State of California amends its LEV II program. Maintaining this commitment will be essential to meet new, stricter federal air quality standards, including the recently adopted 8-hour ozone standard and the new standard for fine particulate pollution.

ED further commented these rules are a practical, cost-effective, and consumer-friendly way for Connecticut to take action to curb greenhouse gas emissions. As Environmental Defense stated in comments to California Air Resource Board's (CARB) original proposal, our evaluation of the proposed program is that it is scientifically and economically sound, meeting the requirements of California's requiring legislation (AB 1493), as demonstrated by the careful analysis and assessment reflected in the Initial Statement of Reasons (ISOR) for Proposed Rulemaking prepared by CARB staff to justify the regulations. Finally, Connecticut's actions will encourage innovation and bring existing, but not widely distributed, cleaner technologies and alternative fuel vehicles to the market.

**a. Environmental Defense comments that Connecticut needs to act now to reduce its contribution to global warming:**

ED commented that there is a scientific consensus that pollution from the burning of fossil fuels, deforestation, and agriculture has caused an accumulation of GHGs in our atmosphere that has already altered Earth's climate. The threats posed by increasing temperatures are expected to be much more powerful, and more expensive to manage, the longer we wait to curb greenhouse gas emissions. In 2004, Environmental Defense released a report describing, in detail, the potential adverse effects of global warming in Connecticut: *Bracing for Climate Change in the Constitution State* (ED Report).

According to the ED Report, Connecticut's temperature has been gradually warming. Between 1930 and 2001, the mean annual temperature for the entire state of Connecticut increased at an average rate of 1.7 °F per 100 years (calculated using the climate division area-weighted average for four U.S. Historical Climate Network temperature monitoring stations, and corroborated by temperature profile data from the National Climactic Data Center).<sup>1</sup> In certain areas, particularly along the southern shore, the rate of warming was as much as 3.5 °F per 100 years.<sup>2</sup> The rate of warming was greater than the rate of warming in the rest of New England in the same period, and will likely increase because of climate change.<sup>3</sup>

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1 Environmental Defense, *Bracing for Climate Change in the Constitution State*, 2004, page 5.

2 *Ibid*, page 6.

3 *Ibid*.

Two climate models used in the New England Regional Assessment to characterize potential climate changes for the New England region show that by the year 2030, mean annual temperatures in New England may be expected to rise on the order of 2.5 °F relative to 1993 temperatures. By 2100, mean annual temperatures could increase by as much as 4 to 9 °F relative to 1993 temperatures.

Rising temperatures in Connecticut threaten the state's environmental and economic well-being. Shorter winters with subsequent declines in the number of days lakes are ice-covered, changing precipitation patterns, increased evaporation and transpiration, and salt-water intrusion may adversely affect the reliability of Connecticut's water supply and all of the organisms that rely on it. Reduced water levels in, and the warming of, lakes and streams can accelerate the accumulation of mercury and other toxins in the food chain.

Sea level rise on one side and coastal development pressures on the other will likely increase erosion and flooding of coastal areas and wetlands, decreasing habitat for migratory birds and creating problems for coastal infrastructure. Additionally, sea level rise compounds the risk of flooding created by storms. By extrapolating current sea level trends, Environmental Defense projects that future Category 1 or 2 hurricanes could attain the flood potential of a Category 3 storm today.<sup>4</sup> Vital infrastructure lying close to the shore, and at risk from flooding, includes major transportation corridors such as the Connecticut Turnpike (I-95) and parts of the Amtrak railroad.<sup>5</sup>

Connecticut and its taxpayers may face substantial costs to protect its coastal and transportation infrastructure from rising sea levels, demonstrating that the adverse effects of climate change also threaten Connecticut's economy. As another example, if current rates of global warming continue unchecked, it is possible that water temperatures in the Long Island Sound will become so warm that lobsters will no longer be able to survive there.<sup>6</sup> This would have obviously disastrous economic effects on the area's lobster fishery--Connecticut's most important commercial fishery in Long Island Sound. Before a 1999 die-off of lobsters in the Long Island Sound, which was related in part to stress from high water temperatures, lobster catches accounted for approximately 75% of the total commercial fishery harvests by weight and over 90% of the value of commercial landings in the Long Island Sound.<sup>7,8</sup>

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4 *Ibid*, page 28.

5 *Ibid*.

6 *Ibid*, page 32.

7 *Ibid*.

8 Connecticut State Department of Environmental Protection, "DEP Lobster Data Report." 2000. Online resource, available at: <http://dep.state.ct.us/whatshap/press/2000/mf0210b.htm>

- b. **Environmental Defense comments the proposed regulations are consistent with Connecticut actions and legislation related to air quality and climate change, and with federal air quality legislation.**

The Connecticut General Assembly has statutorily recognized the State's need to reduce its emissions of greenhouse gases. In June of 2004, the Connecticut General Assembly adopted Public Act 04-252, "An Act Concerning Climate Change." This forward-looking act statutorily charged the Governor's Steering Committee on Climate Change (GSC) with the task of creating a Connecticut Climate Change Action Plan to guide the state in meeting the goals of the New England Governors and Eastern Canadian Premiers (NEG/ECP) for reducing emissions contributing to climate change.<sup>9</sup>

According to the 2005 Connecticut Climate Change Action Plan, Connecticut's path to successfully meeting and exceeding the New England Governors/Eastern Canadian Premiers' (NEG/ECP) goals requires the adoption of greenhouse gas (GHG) tailpipe standards. In order to comply with the 2020 NEG/ECP targets, Connecticut will need to reduce its GHG emissions by 17.99 million metric tons carbon dioxide equivalent (MMT<sub>CO<sub>2</sub>e</sub>).<sup>10</sup> The plan describes 55 actions that will bring Connecticut's greenhouse gas emissions in line with the NEG/ECP targets. Connecticut has already approved and begun implementing 38 of the actions recommended in the 2005 Climate Change Action Plan, including: adoption of California's motor vehicle emission standards, adoption of regulations establishing energy efficiency standards for a variety of appliances, and reducing non-farm fertilizer use.

If Connecticut implemented all of the 55 accepted and recommended actions described in the 2005 Connecticut Climate Change Action Plan except for the adoption of California's GHG tailpipe standards, the state would fall 1.3 MMT<sub>CO<sub>2</sub>e</sub> short of meeting the NEG/ECP goals.<sup>11</sup> The GSC found that adoption of GHG tailpipe standards would provide an estimated 2.63 MMT<sub>CO<sub>2</sub>e</sub> reduction by 2020, meeting this critical gap.<sup>12</sup> Further, the GSC found that enacting these regulations would save the state economy \$99 for each ton of CO<sub>2</sub>-equivalent emissions reduced.<sup>13</sup>

In 2004, the Connecticut General Assembly, through Public Act 04-84, required the Department take action to adopt California's motor vehicle emissions standards. The legislation expressly states that the DEP Commissioner "**shall amend such regulations from time to time, in accordance with changes in said standards,**" clearly mandating adoption of the regulations currently under consideration.<sup>14</sup>

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9 State of Connecticut General Assembly, "Public Act 04-252, An Act Concerning Climate Change." June 14, 2004, §2(b).

10 Governor's Steering Committee on Climate Change, "Connecticut Climate Change Action Plan 2005." January 2005, page 9.

11 *Ibid*, pages 8-9.

12 *Ibid*, page 60.

13 *Ibid*, page 62.

14 State of Connecticut General Assembly, "Public Act 04-84, An Act Concerning Clean Cars." May 10, 2004,

Finally, Section 177 of the federal Clean Air Act authorizes, and arguably mandates, adoption of the proposed measures. This section provides that any state containing a designated nonattainment area may adopt and enforce vehicle emissions standards "identical to the California standards."<sup>15</sup> The express intent of this section is to avoid burdening automakers with regulations that would result in a "third vehicle," for example one that would have to meet federal standards for some pollutants, but California standards for others.<sup>16</sup> This would suggest that states adopting some of California's motor vehicle emissions standards are legally required to adopt all subsequent amendments to California's standards, such as the GHG tailpipe standards, in order to maintain compliance with Section 177.

**c. Environmental Defense comments that adopting the proposed standards is important for protecting the health of Connecticut's residents**

Enacting the proposed standards is an essential part of Connecticut's efforts to come into compliance with federal health-based standards for ground-level ozone. Tailpipe and smokestack emissions contribute to the formation of ground-level ozone in warm temperatures, and warming caused by greenhouse gas emissions means more days on which ozone can form. One study found that in the New York-Connecticut-New Jersey metropolitan region, a uniform increase in temperature of 7 degrees Fahrenheit would result in an almost 20% increase in ground-level ozone (smog) concentrations.<sup>17</sup> This temperature increase is within the range of predictions for 2100, as discussed in Comment 3.a.

The potential increase in ground-level ozone concentrations resulting from global warming is of great concern given that the entire state of Connecticut is already out of compliance with the federal health-based 8-hour ozone standard. High concentrations of ground-level ozone can cause acute respiratory problems, aggravate asthma, irritate eyes, and inflame lung tissue. These symptoms especially affect children, the elderly, and those with lung conditions. In addition, communities unable to comply with federal standards for ozone can face significant economic penalties or sanctions from the federal government.

Another important health implication of global warming is that it brings an elevated risk of heat-related illnesses and deaths, particularly among the elderly and the poor. In the Metropolitan East Coast region, heat-related mortality increases significantly on "high-heat-stress days"--days when the temperature tops 90 °F.<sup>18</sup> According to projections based on data from NASA's Goddard Institute for Space Studies for the four U.S. Historical Climate Network stations in Connecticut, there will be on average almost ten more high-heat-stress days per year in the 2050s

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§1(b).

15 42 U.S.C. 7507 §177(1)

16 42 U.S.C. 7507 §177(2)

17 Environmental Defense, *Bracing for Climate Change in the Constitution State*, 2004, page 12.

18 The Metropolitan East Coast Region contains 31 counties in New York, New Jersey, and Connecticut. For a complete list, visit: <http://home.nyc.gov/html/dcp/pdf/census/pl8.pdf>

than there were in the 1990s.<sup>19</sup> Meanwhile, Connecticut's elderly population, one of the most pollution and heat-sensitive groups, is expected to increase almost 50% by 2025.<sup>20</sup> One study found that by 2050, New Haven could experience an 8% to 32% increase in heat-related mortality as a consequence of further warming.<sup>21</sup>

**d. Environmental Defense comments the California's program is technologically feasible and cost-effective in Connecticut**

The Initial Statement of Reasons (ISOR) for Proposed Rulemaking, prepared by CARB staff to justify the regulations, provides a well-grounded assessment of the technological potential for vehicular greenhouse gas (GHG) emissions reduction. The ISOR identifies the numerous options automakers have at their disposal to meet the proposed standards cost-effectively. The technologies and alternative fuel vehicles analyzed by CARB staff represent a practical and affordable set of options that automotive engineers can use to redesign light duty vehicles in order to achieve lower GHG emissions.

Automakers can readily and consistently meet the GHG emissions reduction targets and reduction timetable with the requirements of the proposed regulations. In particular, automakers can meet the reduction targets without restricting consumers' ability to buy sport utility vehicles or any other style of vehicle popular in the market today or over the time horizon covered by the regulation. In fact, the proposed regulations will protect the environment, save consumers money, and expand consumer choice by stimulating the adoption of better technology and low-carbon fuels while inspiring the creativity of auto designers and engineers to provide cars and light trucks that meet market needs.

Automakers have proven over and over again that they are capable of harnessing their innovative powers to provide technologies that benefit consumers in all these ways, oftentimes faster and more cost-effectively than they originally anticipated. Environmental Defense expects nothing less in the case of greenhouse gas emission reductions.

**e. Environmental Defense believes the proposed regulations will stimulate additional innovation.**

In evaluating the proposed GHG regulations and addressing the questions of what design changes it will take to meet them and what will be the impacts on the car market, Environmental Defense notes that the technology assessment CARB used to justify the standards represents an engineering proof of feasibility, rather than a literal prescription of the technology changes to be made in vehicles. An analogy can be made to the assessments used to justify the Low Emissions Vehicle standards promulgated in 1990, when technologies such as electrically heated catalysts had been identified as a justification for ULEV levels. As it turned out, automakers and suppliers

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19 Environmental Defense, *Bracing for Climate Change in the Constitution State*, 2004, page 17.

20 *Ibid*, page 16.

21 *Ibid*, page 17.

developed other approaches for meeting the standards at lower cost. Similarly, the assessment of CO<sub>2</sub> reduction potential is best interpreted as a demonstration of engineering capability, which is in fact likely to play out in different ways -- and probably less costly ways -- as the requirement to cut GHGs creates a new set of design objectives for automotive engineers.

**f. Environmental Defense comments many technologies are available to meet the proposed standards.**

Environmental Defense's review of the CARB ISOR's estimates of maximum feasible GHG reductions by vehicle class indicate that these values are fully in line with the automotive technology assessments in which Environmental Defense has been involved and which Environmental Defense has reviewed.

**g. Based on CARB's analysis, Environmental Defense comments that consumer operating cost savings will more than offset the cost of technology.**

In its analysis of the regulations, CARB also took a conservative approach in evaluating cost-effectiveness for consumers. The technology combinations and alternative fuel on which the proposed standards rely all entail conventional technologies and fuels or refinements of conventional technologies and fuels. The cost values estimated are consistent with the engineering literature. Moreover, CARB's choice of packages that yield net consumer savings over a vehicle's lifecycle goes beyond the cost-effectiveness mandate that would only require emissions reductions to be cost-effective. This mandate would not require either a net savings or zero net cost, but would require that reductions be achieved at a reasonable cost. This indicates that even greater improvements would be cost-effective to consumers. This approach provides a margin of safety in CARB's estimates; arguably, CARB could have set significantly more stringent targets while still meeting reasonable tests of cost-effectiveness. In terms of vehicle functionality, the technology improvements induced by the GHG standards should play out very similarly to what has occurred in response to past air pollution emissions control standards. Connecticut's citizens can expect to see the benefits of reduced GHG emissions even as cars and light trucks continue to improve in other ways, without any appreciable impacts on either consumer acceptance or overall sales. The motor vehicle GHG emission rules are a practical, cost-effective, and consumer-friendly way for Connecticut to take action to curb greenhouse gas emissions.

**Response:** The Department notes ED's support of the proposed regulations. The Department agrees with ED's comment that the California's program is technologically feasible and cost-effective in Connecticut. See also response to comments VI.A.1, 2, and 4.

**Conservation Law Foundation (CLF) provided the following general comment on section 36b:**

**4. Comment:** The Conservation Law Foundation (CLF) strongly endorse DEP's proposal to adopt the revised California Low Emission Vehicle standards to address emissions of greenhouse gasses (GHGs) through the proposed revisions to section 36b to incorporate recent revisions to California's low emission vehicle (LEV II) program to reduce GHG emissions from light and medium duty vehicles.

**a. CLF comments on the global warming threat**

With less than six percent of the world's population, the United States is responsible for over one-third of the total global emissions of pollutants that cause global warming. Transportation is the single largest and fastest growing source of these emissions within Connecticut (39 percent) and New England (25 percent). Emissions from this sector are projected to comprise most of the growth in overall GHG emissions throughout the Northeast over the next decade.<sup>22</sup> Although a national regulatory program might be a more effective way to combat global warming, in the case of the transportation sector the federal Environmental Protection Agency's Tier 2 vehicle emission regulations do not address this critical problem. Nor are their any plans by EPA to add greenhouse gas emissions standards to the Tier 2 program, despite the availability of proven cost-effective technologies to do so. Thus, in order to achieve the goals of the New England Governors and Eastern Canadian Premiers (NEG/ECP) Climate Change agreement, states such as Connecticut must implement their own regulatory programs. CLF believes that this proposed rule is among the most important components of the effort to stop global warming, as it addresses Connecticut's single largest and fastest growing source of greenhouse gasses.

Moreover, there is an urgent need for the proposed rule, not just in Connecticut but also in CLF's home states of Rhode Island, Massachusetts, Vermont, New Hampshire and Maine.<sup>23</sup> Regional temperatures are projected to increase by six to ten degrees Fahrenheit over the next century.<sup>24</sup> With an increase of this magnitude, Boston's climate would resemble that of Charlotte, North Carolina (6° Fahrenheit increase), or Atlanta, Georgia (10° Fahrenheit increase). Rising sea level will accelerate beach erosion, and exacerbate coastal flooding, threatening coastal developments and unique natural habitats. Already seventy-two coastal towns in Massachusetts are affected by sea level rise. Over the last century, Boston has seen sea level rise 3.5 inches. According to a recent federally-funded study by researchers at Tufts University, Boston University and the University of Maryland, property damages in Greater Boston alone due to sea level rise could

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22 See NESCAAF, Reducing Greenhouse Gas Emissions from Light-Duty Motor Vehicles (Sept. 2004).

23 The potential impacts of global warming in our region are well documented in New York State Department of Environmental Conservation's (DEC) Regulatory Impact Statement for its Proposed Amendments to 6 NYCRR Part 218 and Section 200.9, which we hereby incorporate by reference.

24 National Assessment Synthesis Team, U.S. Global Change Research Program, Climate Change Impacts on the United States: Overview, p. ii-iii.

range from \$20-\$94 billion over the next century. Along the southern Massachusetts coast the impact has been more extreme, with seas rising almost one foot in the last century. Every year Massachusetts loses sixty-five acres to sea level rise, with roughly half that loss coming from ten towns.<sup>25</sup> Similar consequences face coastal areas throughout our region and the globe.

In addition to warmer temperatures and sea level rise, climate change will result in increased precipitation and more frequent and severe storms with significant consequences for New England's natural environment, coastal communities and economy. In this sense, we, your neighboring states will share the economic and social losses due to detrimental changes in our forests, agriculture, maple syrup and ski industries, and many others. These impacts could be significant. Using just one example from the at-risk sectors of our economy, roughly 75 percent of the total US maple syrup production is represented in the New England region. The average value of the region's syrup production was \$25 million for 1997-99. In Vermont, the highest volume of maple syrup producing state in the region, the multiplier effect of the industry to related equipment, manufacturing, packaging, and retail sectors equals \$105 million annually and represents approximately 4,000 seasonal jobs.<sup>26</sup> This entire industry is at risk from displacement of trees northwards or disruption of spring temperature cycles necessary to high quality sap production.

CLF is also deeply concerned about public health impacts from vehicle emissions of pollutants that form ground level ozone and contribute to global warming. Increased GHG emissions contribute to conditions favorable for the formation of ground-level ozone, specifically by increasing temperature through global warming. Conditions required to form ground-level ozone include increased temperature, strong sunlight, and the presence of ozone precursors such as oxides of nitrogen (also emitted by motor vehicles and, as a co-benefit, subject to reduction under the proposed rule). Ground level ozone and particulates (another pollutant subject to co-benefit reductions) can inflame and damage cells in the lung lining, aggravating chronic lung diseases such as emphysema and bronchitis, triggering asthma attacks and, with repeated exposure, causing permanent lung damage in children and reduced lung function in adults.<sup>27</sup> Recent studies by the Centers for Disease Control (CDC) show that asthma is reaching epidemic proportions in the U.S., with over 20 million adults infected with the disease. CDC estimates the total cost of asthma to the US economy at \$10.7-12.7 billion dollars, and says it is the leading cause of work and school absences.<sup>28</sup> Five of the seven worst states for asthma are in New England. On average, 8.9 percent of adults in New England are infected with asthma, compared with 7.2 percent nationally. Preliminary CDC data suggest an even more widespread crisis among the region's children, with asthma rates in children twice those of the adult population. Indeed, nearly one fifth of all New England households with children report having a child infected with

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25 See CLF's 2003 white paper, *Heritage In Peril: New England and Global Warming* at 3-4. Copy available at <http://www.clf.org/general/index.asp?id=335>.

26 New England Regional Assessment Group, *Preparing for a Changing Climate: The Potential Consequences of Climate Variability and Change*, U.S. Global Change Research Program, University of New Hampshire, 2001, p.39.

27 See <http://www.epa.gov/airnow/ozone2.html#2>.

28 K. Yeatts et al., *Assessing Asthma and Wheezing Related School and Parental Work Absences* (March 2004).

lifetime asthma.<sup>29</sup>

We would note the direct correlation between increased temperatures, caused by global warming, and high levels of ground level ozone.<sup>30</sup> Attacking the problem of the widespread and systemic health effects of ground level ozone has been a primary mission of automobile air emissions regulation for over three decades – this regulation, attacking a root cause of this problem is simply the latest manifestation of that effort.

**b. CLF comments on the benefits of section 36b**

CLF commented there is a compelling and urgent need to reduce polluting emissions from motor vehicles in the Northeast. Regulatory controls on emissions in Connecticut will have a direct positive effect on the environment, public health and communities in our states and for our members.

CLF commented that the environmental and public health benefits are matched by substantial consumer and industry benefits of the rule. Early efforts to improve vehicle efficiency and reduce global warming pollution relied almost solely upon weight reduction. The lighter the car, the less fuel burned and consequently the less pollution emitted. California's new GHG Standards, however, are based on recent improvements in engine and drive-train technology that are far less expensive to build than super-light vehicles. Many of these new technologies – such as automated manual transmissions, six-speed automatics, cylinder de-activation, variable valve timing and lift, turbo charging, and gasoline direct injection – are already in mass production for 2005 vehicles and are proven to dramatically reduce emissions of carbon dioxide and other gases that cause climate change. Other emergent technologies – such as integrated starters and generators, camless valve actuation and super-efficient, low-leak air conditioning – are scheduled for introduction before model year 2009.

Importantly, these technologies will reduce pollution in all vehicle types. The California Air Resources Board (CARB) estimates that by 2016, heavier vehicles such as pickup trucks and SUVs can reduce emissions by 25 percent. But improvements are far greater in smaller and lighter vehicles: over the same period, CARB estimates lighter trucks and cars can reduce emissions by 34 percent. The same benefits will accrue in Connecticut. If anything, however, CARB's figures are conservative both in terms of timing (Toyota and Honda both exceeded the 2009 standards as early as 2003) and benefits (in 2004, Ford announced that it would improve average fuel efficiency, and thus greenhouse gas emissions, by 80 percent – a figure that dwarfs the impact of the new California standards). Thus, if the trend of early and over compliance continues, and there are strong indications from the market that it will, then the benefits may exceed CARB's estimates. Moreover, given the premium on "green" vehicles in today's market,

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29 New England Asthma Regional Council, *Asthma in New England* (May 2003).

30 See, California ARB 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 20-21 (August 6, 2004) <http://www.arb.ca.gov/regact/grnhsgas/isor.pdf>

companies that comply early will likely benefit through increased sales.

Although the sticker price of a vehicle that meets the new GHG Standards may increase, the savings in operating costs are even greater, meaning that consumers will actually save money by buying more environmentally friendly cars. CARB estimates that compliance with the new emissions standards will result in a cost increase of around \$300 per vehicle in the near-term (2009-2012), and around \$1,000 once mid-term standards fully take effect (2016). Yet, because vehicles that comply with the new greenhouse gas standards are so much more fuel-efficient, total monthly operating costs (car loan plus gas purchases) will decrease. For example, at \$1.74 per gallon, CARB estimates consumers will save an average of \$11 a month in the near term and \$3 a month in the mid-term. With higher gas prices, the savings only increase. The Union of Concerned Scientists reports that with gasoline prices at \$2.00 per gallon, consumers will recoup the added costs of near-term technologies in less than 1.5 years and the cost of mid-term technologies in just over 3.5 years. Moreover, at \$2.00 per gallon, over the lifetime of the vehicle near-term technology will save the average consumer \$2,300 and mid-term technology will save \$3,500.<sup>31</sup> These incidental benefits to consumers are highly positive and support adoption of the proposed rule.

**c. CLF comments on federal Clean Air Act requirements**

Under § 177 of the federal Clean Air Act, states in violation of national ambient air quality standards may adopt the California vehicle emission standards, but only so long as the standards are identical to those in place in California for each model year. See 42 U.S.C. § 7507. Additionally states adopting under § 177 must provide two years lead-time between final adoption to the effective date. Connecticut is an adopting state under § 177.

California's GHG standards are incorporated into its Low Emission Vehicle standards and become effective in Model Year 2009. See Title 13 CCR § 1900 *et seq.* Therefore, DEP must also adopt the proposed rule effective MY 2009 in order to remain identical with California. Importantly, DEP need not and, indeed, given the above timeframes, cannot wait for a decision from EPA regarding a federal waiver pursuant to 42 U.S.C. § 7543(b). The only constraint is that enforceability in Connecticut is contingent upon granting of the waiver. See Motor Vehicle Manufacturers Association v. DEC, 17 F.3d 521, 533-34 (2nd Cir. 1994) (given two year lead time provision, DEC may adopt California standards prior to the EPA's having granted a waiver, so long as the DEC makes no attempt to enforce the plan prior to the time when the waiver is actually obtained). For the same reasons, Connecticut should adopt the proposed rule now and not wait until the legal challenges to the California rule have been resolved.

CLF also believes that should Connecticut fail to keep pace with and remain identical to California, it risks losing credit in its State Implementation Plan for reduction of criteria

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<sup>31</sup> Union of Concerned Scientists, The Consumer Benefits of California's Vehicle Global Warming Law (November 2004).

pollutants. As these credits are not easily replaced, such an event could subject the state to the Clean Air Act's costly penalty provisions. Finally, the California GHG rule uses a carefully calibrated phase-in requirement, early reduction credits, early credit trading, and alternative compliance strategy – all of which are time-date dependent. Thus, in order to adopt identical provisions (and to avoid the difficult and expensive task of creating a comparable phase in and credit program as with the Zero Emission Vehicle rule), Connecticut must stay synchronous with the California program. For all of these reasons, CLF believes that DEP's proposed revisions are timely and appropriate, and we encourage immediate and full adoption.

**Response:** The Department notes CLF's support for the proposed regulations.

The Department agrees with CLF's characterization of the cost issues raised by the CARB GHG rule indicating that while the sticker price of a vehicle that meets the new GHG standards may increase, the savings in operating costs are even greater. CARB estimates that compliance with the new emissions standards will result in a cost increase of around \$300 per vehicle in the near-term (2009-2012), and around \$1,000 once mid-term standards fully take effect (2016). The Department believes that because GHG compliant vehicles will be more efficient, the total monthly operating costs (car loan plus gas purchases) will decrease. The Department understands that CARB utilized a conservative value for the price of gasoline at \$1.74 per gallon and estimated that consumers will save an average of \$11 a month in the near term and \$3 a month in the mid-term. It stands to reason that with higher gas prices, the savings only increase. The Department notes that CLF referenced reports indicating that with gasoline prices at \$2.00 per gallon, consumers will recoup the added costs of near-term technologies in less than 1.5 years and the cost of mid-term technologies in just over 3.5 years. If gasoline prices, which recently exceeded \$3.00 per gallon, were to maintain these levels the payback period would be further decreased.

CLF also raises an interesting implementation issue with respect to their discussion of the federal waiver process under section 209(b) of the federal Clean Air Act (CAA). It is well established that a state may adopt California's exhaust emission standards pursuant to section 177 of the federal CAA. However, a state may not enforce such standards until the Environmental Protection Agency issues a waiver to California under section 209(b) of the CAA. This contingent enforceability provision is described in Motor Vehicle Manufacturers Association v. DEC, 17 F.3d 521, 533-34 (2nd Cir. 1994) (given two year lead time provision, the New York State Department of Conservation (NYSDEC) may adopt California standards prior to the EPA's having granted a waiver, so long as the NYSDEC makes no attempt to enforce the plan prior to the time when the waiver is actually obtained). CLF correctly points out that Connecticut may adopt the proposed rule now prior to the issuance of the required waivers.

**Northeast States for Coordinated Air Use Management (NESCAUM) provided the following general comments on section 36b:**

**5. Comment:** The reduction of GHG emissions is extremely important to Northeast state regulators and governors. In terms of the specific risks of climate change for the Northeast states, modeling suggests that average temperatures in New England could increase by 3.1-5.3 degrees Celsius by the year 2090 given increasing levels of GHGs. A study funded by the U.S. Global Change Research Program noted that global warming at the higher end of climate change modeling projections would raise average year-round temperature in Boston to a level currently measured in Atlanta, GA. Associated impacts on the region could include more frequent and intense storms; increased damage in coastal areas from flooding and erosion associated with sea-level rises; and a variety of stresses on fishing grounds, forests, and coastal ecosystems.

Northeast air quality regulators estimate that approximately 25 percent of total anthropogenic GHG emissions in our region come from passenger cars and light-duty trucks. In order to reduce GHG emissions Connecticut, along with other Northeast states, has committed to reduce GHGs as part of the New England Governors/Eastern Canadian Premiers Climate Action Plan adopted in 2002. The initial goals of the plan are to stabilize GHG emissions at 1990 levels by 2010 and reduce GHG emissions 10 percent below 1990 levels by 2020. Given the transportation sector's contribution to the GHG inventory, achieving the region's climate goals will require effective means to address the motor vehicle component. In that context, the Northeast states have closely monitored the AB 1493 rulemaking and are now moving forward to adopt the requirements.

The Northeast states have an established record of adopting the California's more stringent motor vehicle regulations: several have been enforcing California's Low Emission Vehicle (LEV) standards in lieu of federal standards for over a decade. Seven states in our region have adopted the LEV standards. These states are also the process of adopting the motor vehicle GHG standards. The seven LEV states in the region (New York, Massachusetts, Connecticut, New Jersey, Maine, Vermont, and Rhode Island) together with California make up 25 percent of the nation's vehicle fleet. Thus, implementation of the GHG standards in California and the Northeast will achieve significant reductions in global warming emissions. This is a critically important step in reaching the Northeast states' GHG targets. To assist the Northeast states in developing a viable strategy to reduce motor vehicle GHGs, NESCAUM's sister organization, NESCCAF<sup>32</sup>, conducted a comprehensive analysis to assess the feasibility and costs associated with introduction of technologies to reduce GHGs from passenger cars. The NESCCAF study team used state-of-the-art computer simulation modeling software to evaluate 75 different technology packages on five vehicle types. The study team also conducted a comprehensive cost analysis on the technologies evaluated. The study found that cost effective technologies exist to reduce motor vehicle GHGs for a range of GHG reductions of up to 55 percent. The study was designed to replicate a program that met the California Pavley legislation requirements and restrictions.

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<sup>32</sup> "NESCAFF" stands for Northeast States for a Clean Air Future.

NESCAUM and NESCCAF believe that adoption of the California GHG standards by Connecticut will ensure that significant GHG reductions from motor vehicles are achieved expeditiously while at the same time providing adequate lead-time for manufacturers to meet the standards. The NESCCAF study found that technologies currently in production such as improved air conditioning, variable valve timing and lift, 6-speed automatic transmissions, and cylinder deactivation can be used to reduce motor vehicle GHGs by 25 percent. Much greater reductions - of up to 55 percent - can be achieved through the use of more advanced technologies such as stoichiometric gasoline direct injection, hybrid electric, and diesel vehicles. Most of the technologies evaluated in the NESCCAF study are currently in high volume production (defined as 500,000 units or more sold each year).

Given the gradual ramp-up of the proposed GHG standards and the current availability of technologies, the Northeast states believe the standards are fair and can be met in the timeframe set out in the regulation. Furthermore, the regulations will not only reduce GHGs but will benefit consumers given the significant savings that can be achieved in fuel costs. For example, the NESCCAF study found that consumers will save up to \$2,000 over the life of a lower emitting vehicle, given the cost savings in fuel that will be realized. These savings assume a gasoline cost of \$2.00 per gallon and a vehicle life of 150,000 miles. To conclude, NESCAUM strongly supports Connecticut's proposal to reduce motor vehicle GHGs.

**Response:** The Department notes NESCAUM's support of the proposed regulations and concurs with NESCAUM's comments. See also response to comments VI.A.1, 2, and 4.

**The New Jersey Department of Environmental Protection (NJDEP) provided the following general comments on section 36b:**

**6. Comment:** The NJDEP supports Connecticut's proposal to revise its LEV II program to incorporate CARB's GHG emissions standards for the 2009 and subsequent model year vehicles and to seek greater reductions of ozone precursor emissions by adopting LEV II standards for 2009 and subsequent model year medium duty vehicles.

**Response:** The Department notes NJDEP's support of the proposed regulations. The Department should strive for regionally consistent implementation of the LEV program so as to provide automobile manufactures with the greatest degree of regulatory certainty.

## **B. General Comments Opposing Proposed GHG Regulations.**

**The Alliance of Automobile Manufacturers (AAM) provided the following general comments on section 36b:**

**1. Comment.** AAM submitted voluminous comments accompanied by several attachments and exhibits, which AAM incorporated by reference into their specific comments as noted throughout comments 1 – 6, below.

The AAM recommends that the Department withdraw proposed regulation, and rely instead on the federal motor vehicle control program. In addition, the AAM submitted the following general comments on the proposed rule:

### **a. AAM general comment on environmental benefit**

There is no evidence that adoption of the California greenhouse gas rule in Connecticut would have any effect on the climate of Connecticut. Any claim that the California rule would change the climate of Connecticut or have any related public-health benefit is unsupported on a scientific basis. If the goal of the regulation is to address climate change, the only purpose served by adopting the California rule would be symbolic.

### **b. AAM general comment on legal authority**

The greenhouse gas regulation under consideration by DEP conflicts with state and federal law. AAM comments that that carbon dioxide is not designated as an air pollutant in Connecticut; and the proposed regulation conflicts with federal law, which reserves to the national government the sole power to regulate motor vehicle fuel economy, and to establish policies for the control of greenhouse gases in cooperation with other countries. Finally, section 177 of the Clean Air Act does not require Connecticut to adopt the California greenhouse gas rule.

### **c. AAM believes the proposed rule needlessly injects government into consumer vehicle choice**

The California greenhouse gas rule would needlessly inject the government into consumers' choices about the types of vehicles that best suit their needs. Some supporters of the California rule claim that the rule is beneficial because it will mandate higher fuel economy. That claim assumes, contrary to common sense and experience, that a regulatory agency in California can better define the private economic interests of Connecticut consumers than the Connecticut marketplace. Consumers in Connecticut or any other state who want to buy high-mileage vehicles can do so today without the need for specific regulations that require them to do so.

**Response:** The Department should not adopt AAM's recommendation to withdraw the proposed GHG regulation, relinquish the LEV program and instead rely on the federal motor vehicle control program.

With respect to comment 1.a.: Even though the proposed regulation will result in significant reductions in GHG emissions, AAM asserts that the Department should not proceed because the anticipated reductions will not, of and by itself, lead to improvements in Connecticut's climate. AAM's focus is too narrow given the scope of the climate change problem. AAM fails to recognize that the proposed regulation is but one step in a multi-faceted strategy intended to reduce Connecticut's contribution to climate change. The Connecticut General Assembly as clearly set forth Connecticut's GHG reduction goals in Public Act 04-252. Connecticut has also identified fifty-five recommended actions to reduce GHG emissions in the Connecticut Climate Change Action Plan 2005, see [http://www.ctclimatechange.com/documents/pressreleaseonfinal2005plan021505\\_000.pdf](http://www.ctclimatechange.com/documents/pressreleaseonfinal2005plan021505_000.pdf). In addition, Connecticut's actions must also be viewed in the aggregate with additional anticipated GHG reductions from three West Coast states and up to nine East Coast states.

With respect to comment 1.b.: See the Department's response to Comment VI.B.3. below.

With respect to comment 1.c.: The Department believes the proposed GHG rule is identical to the CARB GHG rule. As such, it is important to note the CARB GHG standards were specifically developed under requirements to not limit consumer choice to type, performance, or weight. The manufacturer obligation is to have their overall fleet mix meet an annual greenhouse gas emissions target, which gradually declines and is set based on the manufacturer with the least developed technology. There is no requirement to develop a specific type of vehicle. Government, in the exercise of its police power, has often set reasonable standards for industry necessary to protect human health and the environment. In the automotive context, these standards have included requirements for seat belts, bumper and side impact performance standards, air bags, catalytic converters, non-venting gas caps, etc. In the face of new standards and technological challenges, many manufacturers have thrived and moved technology forward. Furthermore, AAM continues to mischaracterize the proposed rule as a fuel economy standard and believes there are sufficient "high mileage" vehicles in the market to meet consumer demand. The proposed standards are intended to reduce GHG emissions, not to impose fuel economy standards.

## **2. Comment: AAM overview of the California GHG Regulation**

AAM provided background information on the requirements of California rule, drawn from the CARB rulemaking record and presented technical issues that the Department should address in evaluating the proposal to adopt the California rule in Connecticut.

### a. AAM comments on regulatory background

AAM notes that emissions from a wide variety of sources, including power plants, manufacturing facilities and automobiles, contribute to air quality concerns. In the case of motor vehicles, the principal emissions of concern are unburned hydrocarbons ("HC") and oxides of nitrogen ("NOx"). HC and NOx undergo photochemical reactions in the atmosphere in the presence of sunlight to produce ozone, a respiratory system irritant and the principal ingredient of "smog." Carbon monoxide ("CO") is another pollutant caused by incomplete combustion. Although CO slightly contributes to ozone formation; it is primarily regulated because of its direct effect on human health, which includes increased stress on the cardiovascular system. AAM notes that EPA sets national standards to define the level of these pollutants that EPA has determined to be consistent with the protection of human health and the environment with a margin of safety.

AAM undertakes a lengthy discussion on carbon dioxide ("CO2"). AAM comments suggest CO2 is merely another byproduct of the combustion of carbon-based fuels, such as wood, coal and gasoline. It is a ubiquitous and naturally occurring gas in the air, is part of the respiration process between plants and animals, and is essential to life as we know it. Indeed, carbon dioxide is the fifth most abundant substance in the Earth's atmosphere, after nitrogen, oxygen, water vapor and argon.

AAM notes that carbon dioxide emissions are directly related to fuel consumption. The only method for significantly reducing carbon dioxide emissions from a gasoline-powered motor vehicle is to reduce fuel consumption. The official test procedure used to determine compliance with the federal corporate average fuel economy ("CAFE") standards depends on the measurement of carbon dioxide emissions, which is the primary greenhouse gas emitted from motor vehicles. The combustion of gasoline is the only source of carbon dioxide emissions from motor vehicles, and carbon dioxide emissions constitute the vast majority of gas emissions from motor vehicles.

The CARB standards require a reduction in CO2-equivalent greenhouse gas emissions from passenger cars of more than 30 percent.<sup>33</sup> AAM notes that because carbon dioxide emissions account for nearly 97 percent of the greenhouse gas emissions from passenger cars and light-duty trucks on a CO2-equivalent basis, it will be impossible to meet the CARB GHG standards without relying on higher fuel economy.

AAM comments that the CARB GHG standards, which AAM characterizes as a *de facto* fuel economy standard, are much more stringent than the average fuel economy levels required by the federal fuel economy standards. For example, CARB has set a "mid-term" CO2-equivalent ("CO2e") standard for passenger cars and some light-duty trucks of 205 grams per mile ("g/mi")

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<sup>33</sup> The CARB staff estimated in 2004 that the average CO2-equivalent emissions for passenger cars produced by the largest six manufacturers were 312 g/mi for model year 2002. The 205 g/mi standard applicable in 2016 is 34 percent lower.

CO<sub>2</sub>e. Converted to fuel economy as measured by the federal regulations, that is equivalent to 43.7 miles per gallon ("mpg") for a vehicle that uses a conventional air conditioning system and that is not designed to reduce nitrous oxide (N<sub>2</sub>O) or methane tailpipe emissions. CARB's rule mandates 59 percent higher fuel economy than required under the Corporate Average Fuel Economy ("CAFE") standards for passenger cars, which is 27.5 mpg. Similarly, CARB's 332 g/mi standard for LDT2 vehicles is equivalent to 26.8 mpg for a vehicle with a conventional air conditioning system. This is 21 percent higher than the recently adopted 2007 federal CAFE standard for light-duty trucks of 22.2 mpg.

#### **b. AAM identified issues of controversy**

AAM provided their summary of three issues of particular importance to the proposal under consideration by the Department:

##### **i. Nationwide deployment of the California GHG control technologies**

CARB has assumed that once its GHG rule is implemented, the automobile industry will choose to deploy the technologies needed to meet the California standards on at least a nationwide (if not global) basis. That assumption is critical to CARB's estimates of the costs for compliance with the California regulation in California and in other States that enforce the California rule. If CARB's assumption is incorrect, then the costs of the California rule for consumers in California and other States that enforce the California rule will be much higher than estimated by CARB. Because the costs of new regulations will impact the residents of Connecticut, the Department needs to make an independent assessment of CARB's assumption that the industry will respond to the regulation by producing vehicles that use all the necessary greenhouse gas technologies nationwide.

CARB's assumption that the industry would deploy greenhouse gas control technologies nationwide, to an extent approaching full penetration of those technologies across the country, is certainly not entitled to deference by DEP. As CARB has recognized, the greenhouse gas rule will raise new-vehicle costs and prices, and so will reduce demand for new vehicles. In one regulatory analysis that CARB published prior to its decision to approve the greenhouse gas rules in September 2004, the CARB staff estimated that once the greenhouse gas standards were fully implemented, new-vehicle sales in California would decline by four to five percent. Other estimates predicted larger reductions in sales.

It would be illogical and contrary to their customers' interests for automobile manufacturers to produce vehicles for which there is less demand, in the absence of a regulatory requirement to do so. For that reason, it is unlikely that the industry will try to comply with the California greenhouse gas rule by producing all or even most of the necessary technologies at nationwide volumes. This means that the cost of the regulation for Connecticut consumers will be substantially higher than estimated by CARB. The Department needs to examine this issue in more detail. If the Department agrees with the general view recognized by CARB and others that

the California rule will depress vehicle sales, it should not accept CARB's assumption that the industry would pursue nationwide deployment of the greenhouse gas technologies, and it should develop more accurate estimates of the costs of compliance with the regulation for residents of Connecticut.

## **ii. Credits and alternative compliance mechanisms**

Another issue in controversy involves the portions of the CARB rule that describe the provisions that supposedly add flexibility for the industry in developing compliance strategies. The implication is that the industry can use those features of the California regulation to reduce the costs of compliance with the regulation and ease the burden for Connecticut consumers.

While the AAM does not have access to confidential compliance plans of its members or other manufacturers, it questions the assumption that the inter-manufacturer credit provisions and alternative compliance features of the California rule will play a significant role in compliance with the regulation, either in California or Connecticut. Indeed, the alternative compliance features of the California greenhouse gas rule exist in name only -- they are so stringent that they appear designed to discourage efforts to comply using any means other than the types of fuel economy technologies envisioned in CARB's main regulatory analysis, and they probably could not be used by any major full line manufacturer. If the Department believes that alternative compliance plans will be part of the compliance strategy for manufacturers in Connecticut, it should provide examples of the types of plans that are both economically practicable and approvable under the regulations.

With regard to inter-company trading, it is critical to note that vehicle manufacturers must plan their fuel economy and emissions compliance strategies for a given model year many years in advance. While that planning is under way, a manufacturer has no access to the fuel economy strategy or planning activities of other unaffiliated manufacturers. Given the competitive nature of the industry, the uncertainty that any specific company would have a specific number of credits available to sell, and the lead times required to develop and produce new technologies, it is completely implausible to suppose that any company will be able to include a plan to acquire credits from another company in its CO2 compliance strategy. If the Department believes that the industry will be able to reduce its compliance burdens significantly with inter-company trading, it should explain why.

## **iii. Grid-connected hybrid vehicles**

AAM comments that a more technically complex issue involves the use of a particular type of technology to meet the CARB standards. The relevant technology is called grid-connected hybrid vehicle technology, or "GHEV" technology. The CARB regulation defines a grid-connected hybrid electric vehicle as "a hybrid electric vehicle that has the capacity for the battery to be recharged from an off-board source of electricity and has some all-electric range." Such vehicles can be driven without the use of gasoline to the extent that their batteries are recharged

from the electrical grid and the distance they are driven between recharging is equal to or less than their "all electric range" (i.e., the driving range available from the battery alone). Beyond the all electric range, the combustion engine is used.

Under the CARB rule, the formula for calculating the CO<sub>2</sub>-equivalent emissions of GHEVs is  $[A * E * B * C] + [(1 - A * E * B) * D]$ , where:

A = percentage of the vehicles that are operated on electricity from the grid;

E = 0.9;

B = percent of miles traveled using electricity from the grid;

C = CO<sub>2</sub>-equivalent value when the vehicle is operating on electricity from the grid; and

D = CO<sub>2</sub>-equivalent value when the vehicle is operating on gasoline.

Although the CARB regulation is not clear, it appears that grid-connected HEVs are able use a value of 130 g/mi CO<sub>2</sub>-equivalent when running on battery power (which is the value specified in the regulation for "electric vehicles"). Nothing in the regulation provides guidance on the value of "B." The average value of B will be less than 100% because motorists will not be willing to pay for a combustion engine if it were never used. Nevertheless, a value of 100% can be used to establish a "best case" estimate of the economic feasibility of grid-connected HEVs. One can estimate the battery size required for a grid-connected HEV assuming a relatively short 20-mile all electric range, at 0.34 kWh per mile as the energy requirement for a compact size vehicle. That would require a battery capacity of 7 kWh.

One recent public estimate for the cost of NiMH batteries, provided by the Martec Group, supports an estimate for retail price increase needed to cover the cost of such a battery in a GHEV to be about \$7,400. Combined with a 100 kW motor/generator, inverter, brake-by-wire, electric power steering, electric accessory drive, high-voltage wiring system, and weight reduction measures, the total retail price increase to cover the cost for a GHEV would be approximately \$16,000.<sup>34</sup> This is far greater than the cost of other technologies that CARB has identified as capable of meeting the California standards, and orders of magnitude larger than the increased retail cost to consumers of \$367-\$1,064 contemplated under the Connecticut Climate Action Plan 2005.<sup>35</sup>

The available evidence thus indicates that grid-connected hybrid vehicles will be commercially infeasible for anything other than niche markets that receive substantial public subsidies.<sup>36</sup> If the

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34 In addition to the Martec-based battery cost estimate, this estimate uses variable costs of \$1,225 for a 288v motor/generator, \$1,750 for a inverter, \$500 for a regenerative braking system, \$40 for electric power steering, \$70 for electric accessory drive, \$300 for high-voltage wiring, and \$265 for weight reduction measures. These costs are multiplied by 2.05 to estimate retail price equivalent.

35 See Connecticut Climate Change Action Plan 2005, p. 61, available at <http://www.ctclimatechange.com/StateActionPlan.html>.

36 Others have claimed that GHEVs would provide economic benefits to motorists because they can be used to store electrical energy and sell it back to the utilities during periods of peak demand. However, analyses of this concept

Department believes that GHEVs will be a significant factor in manufacturers' compliance plans, it needs to explain why; if not, it should so indicate. To the extent that the Department believes that GHEVs will play a significant role, the Department should explain why the cost estimates presented above are inaccurate or unpersuasive, or why it believes that there will be sufficient public subsidies to support the use of GHEVs.

**Response:** AAM continues to mischaracterize the GHG emission standards as a fuel economy standard because such characterization would render the CARB rule and its subsequent adoption by other states, including Connecticut, void. Simply restating a GHG emission standard in terms of "miles per gallon" does not create a fuel economy regulation.

With respect to comment 2.b.i: AAM comments that the Department should not defer to CARB's assumption that GHG control technologies will be deployed nationwide thus reducing the compliance costs in California (and Connecticut). AAM asserts that manufacturers will not produce vehicles for which there is "less demand." This argument contradicts normal free market systems by equating "less demand" with "no" demand. It makes no sense to assert that because demand drops from 100x vehicles to 94 or 95x vehicles, that a manufacturer would willingly surrender existing market share. As such, the Department should defer to CARB's findings on this point as stated in the ISOR and FSOR, which are incorporated by reference herein.

With respect to comment 2.b.ii: AAM suggests that, again while lacking its manufacturer-members' compliance strategies, it is extremely unlikely that any manufacturer who voluntarily over-complies with the GHG standards and generate excess credit will engage in inter-company trading. Again, basic economic principles and the Department's own experience in the context of stationary source programs contradicts AAM's claims. At its most basic level, all manufacturers operate to maximize efficiencies. If doing so leads any given manufacturer to over-comply and generate GHG credits, those credits will have economic value. Refusing to realize economic gain from creating value (e.g., GHG credits) is contrary to a manufacturer's self-interest and the interest of its shareholders. Certainly, as with any new market, it will take time to develop. But such a market will develop – especially given that GHG markets will be developed in the stationary source sector.

With respect to comment 2.b.iii: see the Department's response to comment VI.B.1.c.

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have failed to account for the cost of reducing battery life by exposing it to additional charge/discharge cycles. Those analyses also ignore the effect of charging/discharging efficiency, which would further increase the cost. In addition, the fact that periods of peak electricity demand coincide with peak commute periods means that vehicles will be unavailable to sell power back to the grid.

**Comment 3. AAM comments the Department lacks the legal authority to regulate GHG emissions from automobiles and other legal issues presented by the GHG regulation**

AAM submitted extensive comments arguing that the Department lacks the legal authority to adopt the proposed regulations and regulate GHG emissions from automobiles. AAM submitted an analysis of the requirements of Connecticut state statutory and regulatory law (including a review of the legislative history associated with Public Act 04-84); and an analysis of federal legal issues including the Energy Policy and Conservation Act, the Clean Air Act, and the Dormant Commerce Clause provisions of the United State Constitution.

**Response:** The Department consulted with the Office of the Attorney General prior to publication of the public notice for the proposed GHG emission standards. Furthermore, pursuant to C.G.S. section 4-169, the Office of the Attorney General must review all regulations for legal sufficiency before they are finalized. Section 4-169 of the C.G.S. defines legal sufficiency, in relevant part, as the absence of conflict with any general statute or regulation, federal law or regulation or the Constitution of Connecticut or the United States. As such, the Office of the Attorney General, not the Department, will determine whether the proposed regulations are legally sufficient.

**Comment 4. AAM comments on the environmental assessment of the GHG rule in Connecticut**

AAM comments that proposed rule will have no impact on the climate of Connecticut and that the implementation of the California GHG rule could have the unintended consequence of increasing the risks to motor vehicle safety that are sometimes associated with regulations that mandate significant increases in fuel economy. AAM comments that the administrative record for the proposed rule contains no information relating to the environmental benefits associated with the proposal. AAM recognizes that the Department may be relying upon documentation supplied by CARB for a portion of this justification, such documents necessarily relate to California, not Connecticut. AAM requested copies of any information developed by or received by Department concerning the environmental benefits to Connecticut from the proposed rule. Furthermore, AAM requested the opportunity to comment upon such documentation, apparently, regardless as to whether the public comment period for the proposed regulation has closed.

**a. Impact on climate change**

AAM comments again that the Department cannot attribute any significant reduction in global warming, or any other discrete impact on climate, to the implementation of the California greenhouse gas rule in Connecticut. AAM also comments that Connecticut's adoption of the California rule will have little measurable impact on reducing carbon dioxide emissions in the United States. According to the U.S. Department of Energy, the United States emitted 1,832.6 million metric tons of carbon dioxide equivalent "MMTCO<sub>2</sub>e") in 1999.<sup>37</sup> According to the

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<sup>37</sup> See U.S. Department of Energy, Energy Information Administration, Emission of Greenhouse Gases in the United States

Connecticut Climate Change Action Plan 2005, implementation of the California rule in Connecticut will result in the reduction of 2.63 MMTCO<sub>2</sub>e by the year 2020.<sup>38</sup>

AAM comments that the Department is proposing to increase the costs cars to consumers and create risks to motor vehicle safety for a reduction of one-tenth of one percent of the greenhouse gas emissions in this country. Simply put, the costs for such an endeavor clearly outweigh any miniscule benefits that the Department may believe that the State would derive from such action. The State's own numbers demonstrate that the reductions being contemplated by the Department are nothing more than a mere drop in the bucket of carbon dioxide emissions in this country.

#### **b. Safety Issues**

AAM comments that the proposed GHG rule will compromise traffic safety. While commenting that AAM does not know their member-manufacturer's compliance strategies, AAM believes the least-cost method of compliance will result in significant weight reductions in new vehicles.<sup>39</sup> AAM comments that reductions in vehicle weight the past been shown to reduce vehicle crashworthiness. AAM submitted documentation in support of their comment from the National Research Council.

**Response:** This comment advances an industry theme, that despite the GHG standards being specifically developed not to cause vehicle downsizing, manufacturers will nevertheless choose weight reduction as one, but not the exclusive, available reduction technique. The safety reference has been the subject of considerable discussion. Some of the background detail not mentioned by the AAM is that, while a heavy truck-based SUV may cause considerable injury to occupants of lighter vehicles involved in an SUV-PC accident, there is also a disproportionate rate of injury and death to heavy SUV occupants in single-vehicle SUV accidents. The immediate-past head of the National Highway Traffic Safety Administration (NHTSA), Dr. Jeffrey Runge, an emergency room physician, was vocal about the trauma he had seen resulting from heavy vehicles. Honda, whose product line has been nearly exclusively devoted to smaller and lighter vehicles, has been an example of a manufacturer making occupant safety devices standard and not optional on their product line. Others, including GM-owned Saab, Ford-owned Volvo, and Daimler-Chrysler subsidiary Mercedes are also well known for integrating safety features in their products, some of which are heavier SUV-like models. CARB's FSOR comments and responses numbered 191 through 193 provide greater detail on this issue. In general, CARB found that weight and size are often confused, as is the function of design. No one element is a guarantor of safety. The GHG standards neither require nor encourage downsizing.

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1999, available at <http://www.eia.doe.gov/oiaf/1605/gg00rpt>.

38 See Connecticut Climate Change Action Plan 2005, p. 60.

39 An analysis demonstrating why weight reductions would be part of a compliance strategy assuming nationwide deployment was prepared by Sierra Research and filed with CARB in 2004. It is included as an Appendix to these comments. See Appendix D, Attachment C1 17-20.

### **Comment 5. Economic issues raised by GHG regulation – consumer valuation of future operating cost reductions**

The economic assessment of the California rule in the Connecticut Climate Change Action Plan 2005 assumes that the major cost of compliance with the California rule will be confined to the increase in the retail price of a new vehicle, and that future savings from reduced gasoline consumption will exceed the up-front costs for the purchaser of a new vehicle. Also implicit in this economic analysis is an assumption that the only costs incurred by consumers will be reflected in the increased retail prices they must pay for vehicles that meet the California standards. For the reasons outlined below, both assumptions are incorrect and, therefore, warrant careful examination.

In estimating the "pay-back period" over which it predicts that consumers will recover the costs of vehicles designed to meet the California standards, the Connecticut Climate Change Action Plan 2005 assigns a type of private discount rate to the reduced operating costs it attributes to the technologies it identifies. The discount rate assumed by the plan is five percent, the same as in California. If the discount rate is higher than five percent, then the present value of future fuel economy savings would fall.

The peer-reviewed literature indicates that the private discount rate applied in the market for personal-use vehicles is higher than five percent. One of the most detailed empirical studies indicates that "only 35 percent of the present-value cost savings provided by improved energy efficiency is capitalized in the purchase price of vehicles."<sup>40</sup> The discount rate used in some of the fuel economy benefit calculations in the National Research Council study published in 2002 was 12 percent.<sup>41</sup>

In addition, the analysis of the consumer value of the California program appears to assume that Connecticut residents who purchase a new vehicle would retain it for the vehicle's full service life. Such an assumption is certainly invalid for most new-vehicle buyers. Assuming that a new-vehicle purchaser is behaving rationally, the new-vehicle purchaser will not assume when she is ready to sell the vehicle into the used-vehicle market, the prospective purchasers able to obtain credit at the same loan rate that she can obtain in the new-vehicle market. Particularly in the used-vehicle market, "many automobile purchasers are liquidity constrained, therefore face implicit discount rates higher than the market level."<sup>42</sup> She will therefore discount the future value of her vehicle in the used-vehicle market using a rate higher than the prevailing rates in the new-vehicle market, and that rate will be far above five percent.

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40 Howarth, "Fuel Economy Standards," in *Journal of Economic Perspectives*, vol. 18 at 272 (2004), describing Dreyfus *et al.*, "Rates of Time Preference and Consumer Valuations of Automobile Safety and Fuel Efficiency," *Journal of Law & Economics*, vol. 38, at 79-105 (1995). According to Prof. Howarth, Dreyfus and Viscusi calculate implicit discount rates for safety and fuel economy attributes that range from 11 to 17 percent.

41 National Research Council, "Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards," Washington D.C. National Academy Press (2002) at 66. The NRC notes that its calculations and their results "are not recommended fuel economy goals." *Id.* (emphasis in original).

42 Kleit *et al.*, "Increasing CAFE Standards; Still a Very Bad Idea" at 4 (Brookings, June 2004).

Finally, the Connecticut Climate Change Action Plan 2005 recognizes that a 16 year life for a passenger car and a 19 year life for a light truck is probably too long given the harsh weather and road salt to which Connecticut vehicles are subject. Therefore, the Connecticut Change Action Plan 2005 estimates that the life of a passenger vehicle and light-duty trucks in Connecticut is 13 years and the life of a heavier truck is 16 years.<sup>43</sup> Accordingly, costs of compliance with the California rule would be increased by 12% for passenger cars and light trucks and 15% for heavier trucks.<sup>44</sup>

**Response:** As AAM's comments with respect to "pay-back period" were also submitted to CARB, the Department refers AAM to the discussion on this topic in the CARB FSOR, numbers 247 through 250. It is also important to note that CARB utilized a value of \$1.74 per gallon of fuel in their estimates. If the same analysis were performed using today's fuel prices, the payback period would be dramatically reduced.

#### **Comment 6. Opportunity costs and loss in vehicle utility**

AAM comments that the Department needs to account for opportunity costs inherent in lost vehicle utility. AAM comments that the total costs of the proposed rule includes, for example, the value of the foregone purchase a vehicle which may be less fuel-efficient but has other features that a consumer desires more than enhanced fuel efficiency. Such features obviously include vehicle performance, safety, capacity, comfort and aesthetics. AAM comments that consumers who buy a vehicle, but who are forced to purchase technology or other features added or subtracted from the vehicle to meet standards that they would not otherwise prefer, incur costs that are real and quantifiable.

**Response:** AAM submitted the same comment to CARB. See CARB's FSOR response to comments 411-413. It is important to note that the California GHG emission standards were developed under specific direction of California Assembly Bill 1493, which proscribed reduction in type, performance, or weight. As CARB noted in their FSOR, "While it is *possible* that automakers might choose to achieve compliance by making drastic pricing adjustments or reducing existing levels of vehicle performance or drivability, such approaches are highly unlikely. It is more likely, in [CARB] staff's view, that competitive imperatives will motivate auto manufacturers to achieve compliance by integrating improved technologies, while maintaining or improving upon vehicle performance." (FSOR at page 255) Furthermore, the recent increase in the price and availability of fuel should dramatically address many of these concerns.

It is also important to note public statements made by representatives of the automotive manufacturing industry, as these statements call into question whether consumers will truly be

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<sup>43</sup> The Connecticut Climate Change Action Plan 2005, p. 62.

<sup>44</sup> Id.

faced with additional opportunity costs as suggested by AAM. In a September 20, 2005 *Automotive News* article, details of the 2007 Suburban, Tahoe, Yukon and Escalade shared-architecture design were released. As standard equipment nationwide, GM will both increase horsepower and improve fuel economy through the addition of cylinder deactivation and six-speed automatic transmissions, while beefing-up the frame, providing greater insulation and adding numerous power-assisted and electronic comfort features. Robert Lutz, GM Vice-Chairman of Global Development was quoted as saying that “while it is still too early to discuss pricing, GM plans to use its ‘Total Value Promise’ . . . that strategy aims to minimize incentives with a lower sticker price and more standard equipment.” On September 22, 2005, Ford Motor Company announced that by 2010 it will have increased its production of hybrid models by 1000 percent to 250,000 units per year, with more than half of the Ford, Lincoln and Mercury lineup having hybrid design, and initiating a program to offset the greenhouse gases emitted in their manufacture. CEO Bill Ford indicated in an employee meeting at the Ford Scientific Research Laboratory that Ford was focusing on hybrid production and aligning its product line with global efforts to reduce carbon dioxide emissions. He was quoted as saying “Innovation in safety, in the environment, in design and in technological solutions to real world problems is going to be reclaimed as our natural birthright. It will be the lens through which we view our budgets and our capital investments, our people and programs, and the way in which we rank our most essential priorities.” See: [http://media.ford.com/newsroom/feature\\_display.cfm?release=21636](http://media.ford.com/newsroom/feature_display.cfm?release=21636)

There are additional state and federal incentives to promote the purchase of hybrid vehicles. The federal energy policy act of 2005 contains federal income tax credits for the purchase of certain hybrid vehicles. In Connecticut, the purchase of certain hybrid vehicles are exempt from the state sales tax.

**The Ford Motor Company (“Ford”) provided the following comments on the GHG provisions set forth in proposed section 36b:**

**7. Comment:**

Ford does not support Connecticut’s proposal to adopt California’s GHG regulations, for the following reasons:

**a. The proposed regulations are preempted by federal law.** They restrict the amount of carbon dioxide a vehicle may emit, which is directly proportional to the amount of fuel the vehicle consumes. Therefore, this proposal is equivalent to the establishment of new vehicle fuel economy standards for the state of Connecticut. Federal law clearly states that only the National Highway Traffic Safety Administration is authorized to regulate fuel economy. Congress recognized that a patchwork of state-by-state rules would not be a workable approach for regulating fuel economy. Likewise a balkanized approach is not an effective means to address a matter of national or international character such as climate change.

**b. The proposed regulations would impose significant costs on society, particularly consumers, dealers, and manufacturers, with no measurable positive impact on air quality, health issues, or global climate change.** A system aimed at increasing each manufacturer's corporate average fuel economy, such as this proposal, puts a disproportionate burden on full line manufacturers and manufacturers of specialized vehicles, such as medium-duty passenger vehicles, work vehicles and performance vehicles. Manufacturers will be eventually forced to limit the availability of certain vehicles, which will harm Connecticut's dealers and reduce consumer choice. In exchange for these costs, Connecticut residents would see no perceptible environmental benefits.

**c. Connecticut's background documents for this regulation suggest that opt-in states like Connecticut must adopt California's vehicle greenhouse gas regulations in order to keep the California Low Emission Vehicle (LEV) rules.** But this is not the case – Connecticut is not required to take California's greenhouse gas program. This is because the California program for controlling smog-forming vehicle emissions can be segregated from the greenhouse gas program and still be fully functional and enforceable, thereby complying with the "identity" requirement of the Clean Air Act. Other states have chosen not to adopt the zero emission vehicle program, or "ZEV mandate" portion of the California LEV program, but they continue to administer the rest of the LEV program. Like the ZEV mandate, the greenhouse gas regulations are severable from the LEV program, and their adoption is not necessary for Connecticut retain the LEV standards for tailpipe pollutants.

Ford commented that they chose not to submit a more detailed analysis of the costs and benefits of various fuel economy technologies, and the impact of attempting to apply those technologies to Ford's fleet of vehicles because the Department, in accordance with Connecticut Administrative Procedures Act (C.G.S. section 4-168 et. seq.) cannot accept confidential information and maintain its confidentiality. Ford commented that this position is not conducive to gathering all of the relevant facts, especially in the context of developing highly technical rules to be applied to a highly competitive industry and notes that other states have procedures in place to accept and review confidential information in the context of a rulemaking proceeding.

Ford noted that they are a member of the Alliance of Automobile Manufacturers (AAM) and participated in the development of the AAM's comments along with the other members: BMW Group, Daimler Chrysler, General Motors, Mazda, Mitsubishi, Porsche, Toyota and Volkswagen. This document incorporates the Alliance comments by reference.

**Response: a.** The Department's response to comments on its legal authority to adopt the proposed GHG emission standards are set forth in part VI.B.3. The Department does not agree with Ford that the proposed GHG emission standards, that may be adopted by as many as 12 states representing 30% of the United States automotive market is a "balkanized" approach to regulating motor vehicle GHG emissions.

**b.** The Department notes Ford's mischaracterization of the proposed GHG emission standards as

an attempt to regulate fuel economy and has responded to this comment above. See response to comments VI.B.1-6. Furthermore, the Department finds Ford's assertion that "manufacturers will be eventually forced to limit the availability of certain vehicles" not to be credible given recent public statements made by Ford. See response to comment VI.B.6, above.

c. As stated earlier in this report, the Department is required, by the express terms of C.G.S. section 22a-174g to amend its LEV regulations from time to time in accordance with changes adopted by the State of California. The Department is authorized by CAA section 177 to adopt CARB's emission standards and if a state chooses to do so, its standards must be identical to California's emission standards. Ford's interpretation of CAA section 177 is not supported.

The Department agrees with Ford regarding the submission of confidential information in the context of a rulemaking proceeding. However, the Department is constrained by the provisions of the Connecticut APA and FOI statutes. The Department could not legally withhold from public disclosure the documents that Ford sought to submit. Resultantly, Ford chose not to submit such information. The Department should support a change to the Connecticut APA that would allow it to accept confidential information and maintain its confidentiality in the context of a rulemaking proceeding.

**General Motors (GM) provided the following comments on the GHG provisions set forth in proposed section 36b:**

**8. Comment:** GM notes that many of the comments in their submission were previously provided to CARB in the course of its rulemaking process, as well as to other states considering adoption of the California regulation. GM commented that it is important for DEP to make an independent assessment of the issues presented by the CARB rule, because there are many flaws in the California regulation as well as the technical analysis that was performed by CARB to justify that regulation. Several of these flaws are so severe that they put the regulation in violation of federal law, as well as in violation of California law, and these violations are being challenged in court. This submission also includes new information developed subsequent to the California rulemaking and adapts certain comments to conform to circumstances specific to Connecticut.

GM commented that they strongly oppose adoption of the proposed rule for the reasons noted below and in the comments submitted by the Alliance of Automobile Manufacturers (AAM). GM supports and incorporates by reference the AAM's comments. GM also commented that they agree with the conclusions concerning the environmental effects of the California rule in Connecticut that are presented in the separate comments filed with DEP by Sierra Research, Inc. GM also incorporates the Sierra Research, Inc. comments into their comments by reference.

GM believes the proposed regulation will impose substantial costs on Connecticut consumers that far exceed any perceived benefits, and will not improve the quality of the environment in Connecticut or elsewhere. Among the regulation's many additional flaws, it will create gross

competitive inequities that advantage certain automobile manufacturers while penalizing GM and the other domestic manufacturers, and it fails to comply with the requirements of federal law. Adoption of this regulation by Connecticut will result in restrictions in the number and types of new vehicles that GM will be able to offer their dealers for sale in Connecticut. Product restrictions and higher vehicle prices will lead to large U.S. employment losses. Consequently, GM urges the DEP to use its discretion under the Clean Air Act and not adopt the separate and severable California GHG regulation.

**a. GM comments on the regulatory background**

GM believes that adopting the California regulation would place Connecticut and any other State adopting the California rule in the business of regulating motor vehicle fuel economy. GM noted their support of voluntary, consumer-oriented programs intended to address the issue of greenhouse gases, but not regulatory programs like that adopted by California, which conflict with federal regulation. GM pointed to a voluntary agreement with the Canadian government as a potentially promising voluntary program to reduce GHGs. GM provided additional information on the Canadian voluntary agreement.

**b. GM comments on fuel economy and carbon dioxide**

The primary greenhouse gas emission from motor vehicles is carbon dioxide. GM commented that regulating carbon dioxide at the levels of stringency required by the California rule is tantamount to regulating fuel economy. GM notes that fuel economy is measured most precisely by measuring tailpipe emissions of CO<sub>2</sub> and calculating the amount of fuel burned based on a carbon balance equation. As such, GM believes that the California greenhouse gas emissions standards are preempted under federal law.

**c. GM comments of federal CAFE regulations**

The Corporate Average Fuel Economy (CAFE) program established by the Energy Policy and Conservation Act of 1975 (EPCA) requires the National Highway Traffic Safety Administration (NHTSA) to set maximum feasible fuel economy standards when setting annual truck CAFE standards and when amending the car CAFE standard set by Congress. The regulatory process to establish CAFE standards is required under EPCA to consider technical feasibility, economic practicability, and the impact of other regulations and the need of the nation to conserve energy. Impacts on traffic safety and U.S. employment are also evaluated. An extensive process accomplishes these goals through careful consideration of detailed submissions by automobile manufacturers and an appropriate period for public comment. GM believes that DEP should be concerned that, given this process and NHTSA's 30 years of experience with fuel economy regulations, CARB's evaluation of "maximum feasible" fuel economy levels is so radically different than evaluations over many years of "maximum feasible" levels by the U.S. government.

Unlike some of its foreign competitors, GM has always complied with federal CAFE standards and has therefore never paid a fine for CAFE noncompliance. However, as gasoline prices declined in the mid-1980's, compliance became very difficult and costly for CAFE constrained manufacturers that produced vehicles for the full range of market segments. Because GM was historically especially successful in segments for larger cars as well as larger trucks, CAFE became most constraining on GM. Even though we lead in more model-to-model fuel economy comparisons of comparable vehicles than other manufacturers, our sales mix often leaves us with fleet average fuel economy uncomfortably close to the CAFE standards.

For example, in model year 2004, GM had higher fuel economy in 39 of the 60 passenger car model-to-model comparisons in which GM had a similar model competing against other manufacturers, representing higher fuel economy in 65% of the direct comparisons of similar vehicles. In the light truck segments in which GM competed, GM had the best 2004 model-to-model fuel economy in 38 out of 62 comparisons, winning 61% of the matchups. Despite this, GM's domestic passenger car CAFE of 29.0 mpg and light truck CAFE of 21.2 mpg were below the industry averages, based on the most recent reports from NHTSA (NHTSA Summary of Fuel Economy Performance Report, March 2005).

While GM notes their struggle to maintain CAFE compliance, GM believes that manufacturers who previously specialized in smaller vehicle segments were given a competitive advantage that they exploited aggressively. Aided by this competitive advantage, these manufacturers expanded rapidly into larger vehicle segments. GM believes this dynamic will be repeated in this rulemaking, to the detriment of employment in Connecticut and elsewhere in the U.S. The California greenhouse gas standards are grossly unfair to GM in particular, because GM continues to have the heaviest fleet average weight due to the mix of vehicles purchased by our customers, coupled with the much more lenient standards applied by California to certain of our competitors, as described below.

For perspective, GM notes that larger light duty trucks (above 4,900 lbs. curb weight but below 8,500 lbs. GVWR) represented 40% of their truck sales in 2002 model year, and GM had a 55% market share in this category. In that year, GM notes that 100% of their light duty trucks were assembled in North America, with an average domestic content of 90%, which was the highest in the industry. Although foreign-based competitors have exploited CAFE advantages to expand into larger vehicle segments somewhat, and although they have established some U.S. manufacturing facilities, dramatically higher fuel economy standards such as those created by the California greenhouse gas regulation would repeat the mistakes of the past by disadvantaging domestic producers and harming overall U.S. employment.

**d. GM favors collaborative voluntary programs such as that noted in the Canadian Memorandum of Understanding (MOU)**

As indicated above, the California rule stands in sharp contrast to collaborative, government-industry voluntary programs that deal more realistically with the issue of greenhouse gases. On

April 5, 2005, GM and other companies in the Canadian automobile industry voluntarily signed a MOU with the Government of Canada that is intended to reduce GHG emissions in the auto sector by 5.3 million tons of CO<sub>2</sub> equivalent in 2010, compared to the "reference case" forecast of national greenhouse gas emissions in 2010 that the Canadian government estimated in 1999. The agreement includes all greenhouse gases from vehicles, including carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>) and hydrofluorocarbons (HFCs).

GM commented that the MOU differs in important respects from the California regulation. It builds upon a long history of many successful, similar voluntary Canadian industry-government programs. The MOU is voluntary, nationwide and auto industry wide, and it is consistent with other voluntary auto industry efforts to reduce GHG emissions. In contrast, the California regulation creates sharply different regulatory obligations for different manufacturers, and brings myriad regulatory burdens associated with a regulatory program.

GM also notes that the specific elements of the Canadian MOU are suited to the Canadian market. The MOU meets the government's target for auto sector emissions needed for compliance with the Kyoto Protocol, which Canada has ratified. Because of its unique attributes, it does not lend support to the California regulation or to more stringent U.S. CAFE standards. Indeed, Canada considered vehicle greenhouse gas regulations in Parliament in 2005 and rejected the regulatory approach.

While continuous and voluntary improvements in fuel economy are one component of the agreement, and a variety of factors already leads to a more fuel-efficient sales mix in Canada, the agreement is not expected to require vehicle fuel economy increases beyond the rate of increase in the U.S. market. This rate of increase is far less than would be required by the California regulation. The 1999 Canadian "reference case" forecast that forms the baseline for the MOU was developed using assumptions that were described as "conservative" -- where "conservative" means that the reference case forecast tends toward high emissions estimates. The industry is believed to be on track to outperform those forecast assumptions in Canada, but the California standards far exceed industry technical capabilities. The MOU is not expected to require vehicles in Canada that are different from vehicles sold in the U.S., nor is it expected to require major changes in vehicle pricing or sales mix, including the cancellation or restriction of certain vehicle models in Canada. In contrast, the California regulation is expected to result in each of those adverse outcomes.

#### **e. GM comments on regulatory compliance issues**

Although GMs' comments to CARB opposed the adoption of the greenhouse gas rule, GM noted they also offered extensive information to CARB on specific regulatory issues and problems that were created by their regulation. Because CARB made no adjustments to correct these problems, this section is repeated for DEP so that it can understand the compliance issues.

#### **i. Differential Treatment of Manufacturers**

The California regulation applies stringent requirements on the six largest automakers beginning in 2009 model year (MY), but would delay any requirements on small and mid-sized manufacturers, with annual California sales under 60,000 vehicles, until seven years later, in 2016 MY. The requirements that would be imposed on these smaller manufacturers in 2016 would remain much less stringent than the regulations that apply to larger manufacturers, with the mid-sized manufacturers given a choice of meeting the standard that had applied to comparable vehicles from their larger competitors in 2012 or, if easier, meeting a percentage improvement target applied to their 2002 baseline fleet average

The companies that currently fall under the 60,000 vehicle threshold based on California sales include major global competitors such as Volkswagen and BMW that have no inherent weaknesses that would justify this degree of regulatory preference. In addition, new entrants are expected in the U.S. automobile market from emerging economies such as China and India. These new entrants would be handed a huge competitive advantage to help them become established in the U.S. market. The seven-year holiday from greenhouse gas standards coupled with permanently less demanding requirements provide an overwhelming competitive advantage and are grossly unfair to GM and the other domestic manufacturers.

## **ii. Equity Ownership Provision**

The California regulation requires that automobile manufacturers be grouped together for compliance purposes in cases where one company has at least a 10% equity ownership interest in the other, or in cases where a third party owns at least 10% of the equity in two or more automobile manufacturers. This provision would affect several GM business relationships. The 10% threshold is far below the level that would normally be considered necessary to give any significant degree of management control in a company. Yet the experience with federal CAFE regulation has shown that tight control of product design decisions, pricing, production scheduling and many other areas of business decision making is required to manage fleet average fuel economy.

Indeed, comprehensive coordination with these companies in some areas such as the numbers of vehicles offered for sale in Connecticut and product pricing could potentially be unlawful. Yet comprehensive coordination would be necessary to manage fleet average emission levels.

In addition, publicly owned corporations have no control over investor trading in their own shares which could trigger the third party provisions of the regulation. Because of these equity ownership provisions, sudden, unexpected situations could develop that put manufacturers out of compliance with the regulation through developments that are not within the control of the manufacturers.

The 10% threshold is so low that a situation could be created where multiple automobile manufacturers would be required to include the vehicles from another manufacturer in their

fleets. This situation could develop, for example, if two large manufacturers each owned over 10% of a third manufacturer. The equity ownership provisions apply a huge penalty to any smaller automaker in which GM invests. This creates a significant barrier to GM's ability to create normal business alliances and collaborations worldwide, to the detriment of GM's ability to compete in all markets worldwide and to meet the needs of our customers.

### iii. Commercial Vehicles

California makes no realistic provision in its regulation for continued availability of commercial vehicles. Initially, the CARB justified this omission with the claim that sales of commercial vehicles are "a small portion of the light duty fleet". GM believes this is untrue. In a subsequent action, CARB clarified that vehicles in the Option I LEV II NOx category are exempted from the greenhouse gas regulation. In its commentary, CARB stated, "this post-hearing modification clarifies the original intent of the proposal, which is to exempt light-duty work trucks from greenhouse gas emissions requirements." (p. 14, October 19 CARB Proposed Modified Text)

GM has never produced a vehicle in this category and, to our knowledge; the only vehicle ever produced in the Option I LEV II NOx category has been a single low volume variant of the Ford F-Series pickup. This near absence of vehicles in that category is inherent in the design of the criteria for the category -- vehicles must be LDT2 trucks having a base payload of 2,500 lbs. or more, yet not exceed 8,500 lbs. Gross Vehicle Weight Rating. This implies that the unloaded, curb weight of those trucks cannot exceed 6,000 lbs. (8,500-2,500). Yet trucks built sturdy enough to carry a load of at least 2,500 lbs. usually weigh more than 6,000 lbs. curb weight. It should be noted that 2,500 lbs. payload is a heavy payload, so that only a small proportion of the current sales of pickup trucks provide such high capability, and these trucks are all classified as medium duty vehicles that are typically exempted from the greenhouse gas regulation without the use of the Option I LEV II NOx exemption. But the vast majority of light duty trucks, as well as passenger cars, that are currently used in commerce receive no exemption or special consideration whatsoever in the California regulation.

Because the Option I LEV II NOx exemption applies to virtually no current work trucks, CARB's claim that it exempts work trucks from the greenhouse gas regulation is false. In order to fit into this category, the curb weight of current medium duty trucks would need to be reduced below the 6,000 lbs. curb weight threshold (if possible without sacrificing payload), which would violate the mandate of the California law that the regulations not require "a reduction in vehicle weight" (as well as CARB's claim that they do not require weight reductions).

In addition, the Option I LEV II NOx provisions limit the vehicles in this category to 4% of a manufacturer's LDT2 truck fleet sales. Even if the aforementioned problems with this exemption did not exist, this 4% restriction on sales volume is sufficient to nullify the claim that work trucks are exempted from greenhouse gas regulations by the Option I LEV II provision. Customer usage and customary industry practice would indicate that far in excess of 4% of current LDT2 sales warrant the term "work truck".

GM believes it is highly misleading for CARB to claim that work trucks are exempted from the greenhouse gas regulations when virtually no current or past vehicles would qualify as work trucks under their definition, and no more than 4% of full-size, light-duty truck sales would ever be allowed to be classified under the CARB work truck exemption.

#### **iv. Alternative Compliance Mechanisms**

California's motor vehicle greenhouse gas law (AB1493) expressly requires regulations that "provide flexibility, to the maximum extent feasible". It is sensible to pursue perceived environmental benefits at the minimum cost possible. In interpreting this provision, however, CARB created flexibility mechanisms that are sharply limited in order that they would play a "minimal role". Connecticut proposes copying that approach. The same philosophy of sharply limited potential availability was applied to early action credits. From a realistic standpoint, this provides essentially no compliance flexibility to protect the Connecticut automobile market from costly and disruptive market distortions.

#### **v. Greenhouse Gas Emission Test Vehicle Selection**

CARB created an approach for selecting test vehicles for determining the CO<sub>2</sub> equivalent emissions (CO<sub>2</sub>E) fleet average that is based on testing worst-case vehicle configurations. As a result, a manufacturer's CO<sub>2</sub>E fleet average will be over-estimated by a wide margin. To achieve a CO<sub>2</sub>E fleet average representative of the true average, a manufacturer would need to test all vehicle configurations. The result is that hundreds more vehicle tests would be required at GM annually beyond current testing requirements. Furthermore, CARB based its standards on a "maximum feasible" analysis of data based on representative vehicles (using the NHTSA CAFE database, which has the high volume configurations), so that requiring manufacturers to comply using worst case vehicles creates a condition whereby the standards automatically are beyond CARB's estimation of maximum feasibility unless all vehicle configurations are tested.

**Response: a. and b.** With respect to comments 8.a. and b.: see the Department's response to comment VI.B.3. above.

**c.** The commenter offered a very detailed explanation of federal fuel economy standards and the commenter's compliance status with respect to such standards. The statement did not contain any comments directed to the Department on the adoption of the proposed regulations.

**d.** The commenter offered their support for voluntary GHG emission reduction programs akin to the recent agreement entered into with the Canadian Government. The statement did not contain any comments directed to the Department on the adoption of the proposed regulations.

**e.** Response to GM's regulatory compliance issues. (i) With respect to GM's concern over differential treatment of manufacturers, the Department is only authorized to adopt California's

emissions standards and cannot address specific applicability issues. GM, as a large volume manufacturer, will be treated similarly to all large volume manufacturers. It is interesting to note that GM expresses concern about potential new foreign automakers from countries like China – that recently adopted their own GHG emission standards. (ii) With respect to equity ownership provisions, GM’s concerns seem unwarranted since this provision is used to define “intermediate volume manufacturers” and GM is a large volume manufacturer. See also, CARB’s response to this issue, comment 537 in the FSOR. (iii) With respect to commercial vehicles, the Department understands GM’s comment to mean that since GM has never produced a vehicle that would qualify for the CARB commercial vehicle exemption, the CARB exemption is misleading and unworkable. The Department is unable to address GM’s concern in this instance. (iv) With respect to GM’s concerns about alternative compliance mechanisms, see the Department’s response to comment B.VI.2.b.ii. (v) As it is unlikely that the Department will require vehicle specific testing in Connecticut to determine CO<sub>2</sub>E emissions, the Department should not address the vehicle-configuration methodology adopted in California.

## **9. Comment: GM comments on CARB's Analyses**

### **a. Overview**

GM noted that they have evaluated strategies for compliance with the California regulation in view of the short lead-time until the first requirements in 2009-2011 model year and the rapid rate of increase in the stringency of the standards through 2016. Technical and financial resource cadence constraints mean that a manufacturer can only update 16 to 20% of its product lines in a single year, and engineering lead times require that work on 2009 model products already be underway. These evaluations show that, even with an immediate crash program to implement the most expensive and cost-ineffective technologies, compliance with the California regulation requires severe restrictions in the product lines provided to dealers in the states subject to this regulation, both in the initial years of the rule and in later years.

The vast disagreement between GM compliance planning and CARB's determinations comes about through a variety of flaws in CARB's engineering and financial evaluations. GM offered the comments below to CARB on the CARB engineering and financial analysis in their Initial Statement of Reasons (ISOR), which provided the technical justification for the regulation. GM follows their comment with a critique of technical analysis released by CARB in which two GM vehicles, a Buick LaCrosse and Chevrolet Silverado, are specifically evaluated for their fuel economy improvement potential.

To the extent the DEP's proposed adoption of the California GHG rule is predicated on these fatally flawed CARB findings, as discussed in the next section, the DEP proposal for Connecticut is similarly flawed. Accordingly, the DEP proposal should be withdrawn, and Connecticut should align itself with the federal regulatory programs related to emissions and fuel economy.

## **b. Retail Price Equivalent**

CARB initially relied on an interim report by the Northeast States Center for a Clean Air Future (NESCCAF) issued in March 2004 as the basis for its financial and technical analysis, although CARB made significant adjustments to the NESCCAF estimates. (Note that the final NESCCAF report released in September 2004 did not materially change from the interim report, and the following discussion based on the interim draft therefore still applies.) CARB inappropriately used the NESCCAF report with the result that significant degradations in vehicle performance in the NESCCAF computer simulations were overlooked, significant categories of costs were omitted, and the costs to consumers of the California regulation were significantly underestimated.

The NESCCAF report explains its cost estimates, compiled by the Martec consulting group, as follows (NESCCAF, p. II-17):

"As noted at the outset of this section, Martec's cost estimates do not attempt to capture all costs to the manufacturer of incorporating new technologies, nor do they include estimates of cost impacts at the consumer level as reflected in the purchase price of a new vehicle. Additional manufacturer-level costs that were not captured in this analysis but that could be associated with the use of new technologies include:

- Engineering costs, including advanced R&D, vehicle design and development engineering for integrating new technologies and software development;
- Warranty and possible recall costs;
- Factory capital costs associated with vehicle-level technology changes;
- Manufacturing costs for powertrain or vehicle assembly.

The costs described by Martec represent an estimate of the cost to the manufacturer for the hardware needed to incorporate a given GHG-reducing technology on a high-volume production vehicle. Associated system-level material content such as wires, control module drivers, etc. are included in these estimates - if purchased from a supplier, these all represent a variable cost to the automaker. However, the estimates do not necessarily capture the complete set of variable costs that might be associated with the introduction of new technologies - for example, applying some technologies might require body and chassis redesigns that would in turn incur additional costs."

This cost methodology is also described in discussing mobile air conditioners:

"In accordance with the costing methods for other portions of this study, alternative A/C system costs include only the high volume variable costs of

components and do not consider the fixed costs of system introduction (e.g., engineering, and any incremental production, manufacturing, or assembly plant costs)." (NESCCAF Appendix D-20)

These descriptions make clear that important whole categories of cost have been excluded from the estimates supplied to NESCCAF by the Martec consulting group. More precisely, the Martec assessments comprehend the price that an automobile manufacturer such as GM would pay to a component supplier to purchase the component hardware to implement these technologies. However, the costs to an automobile manufacturer to implement a technology only begin with the purchase of component hardware. There is usually additional assembly labor and related costs in our powertrain factories and our vehicle assembly factories -- costs that are specifically mentioned in the NESCCAF report as not comprehended (NESCCAF p. II-17). In addition, there are often significant vehicle integration costs specific to each technology/vehicle combination that involve engineering the technology onto the vehicle, and possibly modifying other hardware on the vehicle. In essence, the analysis on which CARB and DEP rely to justify the adoption of the greenhouse gas rule is inherently flawed, and it grossly underestimates the cost of that rule to Connecticut citizens.

Furthermore, the technologies analyzed in these studies cover a wide range of dissimilar items, and one cannot generalize with precision about their specific implementation cost structures. A program to evaluate implementation by an automobile manufacturer would always involve much more specific attention to the details of implementation of each technology onto a specific engine or transmission, in a specific set of powertrain factories, applied to specific vehicles with their own unique implementation/integration issues, etc. Warranty costs would be estimated based on experience and expectations for each technology on a case-by-case basis. In short, there would be specific engineering and financial attention to the cost categories that were ignored in the NESCCAF and CARB analyses.

Without offering an analysis, NESCCAF and CARB apply a "retail price equivalent" (RPE) mark-up of 40 percent" (NESCCAF p. II-24, ISOR p. 80) to convert the Martec supplied costs into the price paid by consumers. This 40% RPE factor is of tremendous importance to this analysis since it must account for all the engineering, investment, labor, material, overhead and other manufacturing costs not comprehended by Martec, as well as service and warranty costs, automobile manufacturer profit to achieve an adequate return on investment, costs and profits in the distribution network, especially the dealership markup, and any other items.

As justification for its 1.4 RPE factor, CARB cited two studies: 1) USEPA "Progress Report on Clean and Efficient Automotive Technologies Under Development at EPA: Interim Technical Report", January 2004; and 2) "Comparison of Indirect Cost Multipliers for Vehicle Manufacturing", Vyas, A., Dan Santini, Roy Cuenca, Argonne National Lab, April 2000. CARB stated that 1.4 is between the RPE factors of 1.26 in the EPA paper and the factors of 1.5 and above in the Argonne (ANL) paper (ISOR, p. 80).

Examination of these sources reveals that the EPA paper offers no justification for the 1.26 RPE factor, simply asserting that it is used "when implementing new emissions regulations" (ISOR, p. 65) and "in regulatory development, EPA uses a retail price equivalent mark-up factor of 1.26 to adjust a manufacturing price increase to a retail price increase. This factor accounts for manufacturer overhead and profit" (p. 63). An examination of GM's cost structure reveals that 1.26 is far too low to fill that role.

The ANL paper offers an analysis of RPE factors from three sources, ANL, Energy and Environment Analysis (EEA), as quoted in a 1995 report from the U.S. Office of Technology Assessment, and a 1996 presentation by an automobile company executive, Chris Borroni-Bird, at a technology conference. The ANL RPE's derived from these sources are as follows:

Multiplier for	ANL	Borroni-Bird	EEA
In-House Components	2.00	2.05	2.14
Outsourced Components	1.50	1.56	1.56

The difference between the "in-house component" RPE and "outsourced component" RPE is that, for the case of outsourced components, ANL removed from the RPE costs for freight, warranty, amortization and depreciation, and engineering. ANL assumed that, for outsourced components, the supplier would incur these costs. However, the Martec cost estimates that form the basis of the NESCCAF and CARB analyses do not include these costs in the underlying technology cost estimates -- costs such as warranty and engineering are specifically mentioned as excluded, as are large pieces of the required capital investment that forms the basis for depreciation and amortization. Therefore, the RPE's of approximately 1.5 calculated for outsourced components are not applicable to the cost estimates provided by Martec, even if the components were ultimately outsourced. The higher RPE's of 2.0 or above would apply, in this ANL analysis, to a cost basis that did not include warranty, etc., with the difference between 1.5 and 2.0 covering these categories of cost.

Based on an analysis of GM cost structure and supported by the ANL study, ARB should have used a retail price equivalent factor of not less than 2.0 for this analysis. This would increase CARB's cost assessment by approximately 50% and would change their estimates of the economically feasible emissions standards significantly. CARB's use of a 1.4 RPE results in the omission of significant categories of manufacturer costs, and substantial underestimation of consumer costs related to the proposed regulation.

NESCCAF released to CARB its final report on September 23, 2004 at the CARB hearing to approve the greenhouse gas regulations. NESCCAF's final report uses the same 1.4 RPE factor, but cites the 2002 National Research Council's report on "Effectiveness and Impact of Corporate Average Fuel Economy Standards" (NRC p. 41). The NRC report, in turn, cites a 2001 report by Energy and Environment Analysis, Inc. as the basis for the 1.4 RPE number. (The report is "Technology and Cost of Future Fuel Economy Improvements for Light Duty Vehicles".)

However, the value of 1.4 cannot be found in the EEA document cited. Indeed the EEA report supports use of higher RPE factors than 1.4. (EEA p. 2-5)

Further, the EEA report lays out in detail its cost methodology, which makes clear that the RPE factors it presents are intended to be applied to a cost basis that already includes detailed assessments of major categories of cost such as engineering expense, tooling, and facilities expenses. The EEA report also describes the tiers of costs going from suppliers to automobile manufacturers through the auto dealers (p. 2-5). NESCCAF and CARB's analyses omit major categories of costs by taking an RPE developed to be applied on top of a broad cost basis, and then applying it to a narrow cost basis that omits many of the major cost categories. Also, NESCCAF and CARB apply the RPE to supplier costs (Tier 1 of EEA p. 2-5), and ignore the automobile manufacturer's costs laid out in EEA Tier 2. The cost numbers supplied by Martec to the NESCCAF study clearly are not prepared on an accounting basis that would justify use of an RPE so low as 1.4.

GM comments that DEP must make an independent assessment of the CARB and NESCCAF analyses, and cannot simply "rubber stamp" those analyses. To the extent that DEP concludes that those analyses have any merit, DEP must fully explain why it is choosing to rely on the CARB and NESCCAF analyses, and any reasons it may have for not accepting the points outlined above demonstrating why those analyses are not entitled to support or use by DEP.

### **c. Cost Omissions**

GM notes that the cost estimates used in the NESCCAF report were given with numerous caveats, as noted in Attachment B of the NESCCAF interim report. For example, an upgrade to a 42-volt electrical system is noted as needed for electric power steering for large trucks and electromagnetic camless valve actuation. Upgraded batteries are needed for the motor assist and start-stop hybrid systems. Increases in transmission torque capacity are noted as potentially needed but not specifically modeled for diesels and turbocharged engines. Modifications to base engine components are excluded for direct injection systems and noise vibration and handling (NVH) modifications are excluded for cylinder deactivation.

Automated manual transmissions are noted to have no North American capacity. This is an important caveat in view of the major investment and other costs associated with changing over capital-intensive transmission factories. The CARB report states a belief that "transmission suppliers would absorb the bulk of investment costs, not the vehicle manufacturers" (ISOR, p. 85), but this overlooks the reality that all expenditures are ultimately borne by consumers. It is noted that continuously variable transmission (CVT) costs are based on a competitive component sourcing environment without major licensing cost additions and high volumes -- none of which are realistic assumptions given the status of this technology. In addition, there are numerous instances of additional costs for vehicle integration that would be expected for these new technologies that are not specifically noted by NESCCAF.

The presentation of this list of cost omissions and simplistic assumptions in Attachment B of the NESCCAF report reveals that the authors were aware that important cost issues were being excluded from the analysis. Yet not only did CARB not compensate for these omissions, CARB added the unrealistic assumption that the NESCCAF costs for several "emerging technologies" would be reduced another 30%. The NESCCAF report states, "Martec assumed that at least three high-volume automakers would use each technology at volumes of at least 500,000 units per year and at least three competing suppliers were available to supply each automaker for each technology. This would create a highly competitive purchasing environment that would drive prices and costs to competitive levels" (NESCCAF p. II-18). The Martec estimates reflect "fully learned, high volume production of current technology designs" (NESCCAF p. II-18). Thus, learning curve effects are already incorporated in the NESCCAF costs. The NESCCAF report only allows, "to the extent that basic scientific advances in design or manufacturing do occur, future costs may be lower than estimated" (NESCCAF p. II-18). Yet costs in the relevant time frame would not be "fully learned", they would be at much higher levels reflecting introductory conditions for new technologies. Costs would reflect transitional investment and cost issues that have been omitted from the ARB analysis.

It is likewise unrealistic to factor in a 30% reduction beyond the fully learned, high volume levels based on a possibility of "basic scientific advances in design or manufacturing" (NESCCAF, II-18). Basic scientific advances are by nature not predictable and usually develop and progress toward implementation over long time frames. Reliance on basic scientific advances is in conflict with the technologies being available in the near or mid terms. Furthermore, given the pace of new technology introductions and replacement laid out by CARB in its technical justification, it is questionable whether maturation of technologies to "fully learned" levels might ever occur. The expected rate of change is simply too fast and disruptive, and expected product lifetimes too short, with new technology packages forced across the fleet in four year waves moving from the near term technologies in 2009-2012, to mid term technologies in 2013-2016 to, presumably, long term technologies described in the CARB technical analysis in 2017. Indeed, the shortened product lifecycles implied by this progression are not consistent with normal cost levels or rates of return, where powertrain technologies such as new engines or transmissions need useful economic lives of 10-20 years to be economically justifiable. Such premature obsolescence is a major cost of government regulations for a capital-intensive industry such as automobile production; it is often overlooked in the financial analyses of proposed government regulations, to the detriment of the industry, its consumers, suppliers and employees.

#### **d. Incorrect 2009 Baseline Forecast**

NESCCAF shows a 2009 forecast that continues with OHV engines as the "dominant" technology for large trucks and minivans, among the five segments analyzed (Table II-4, p. II-7). While this representation is a simplification, it accurately reflects that OHV engines will continue to exist in large penetrations in 2009, especially among trucks. However, CARB's technology packages require conversion of all engines to overhead camshafts. CARB's cost adjustment for this change is far too low.

GM commented that CARB incorrectly applied anticipated fuel economy improvement factors to vehicles that either already have the technologies in the 2002 baseline, or which are not applicable for the technology. An example is to apply a fuel economy improvement factor for improved automatic transmissions to all vehicles, even though significant numbers of vehicles have manual transmissions that cannot be improved in this fashion or to this degree.

#### **e. Mobile Air Conditioning**

GM commented that CARB inappropriately incorporated possible mobile air conditioning (MAC) improvements to increase the stringency of the GHG standard based on a mistaken view of the applicability of the flammable alternative refrigerant R-152a. GM commented that they have been a leader in exploring alternative refrigerants through the Society of Automotive Engineers Alternative Refrigerant Cooperative Research Program as well as independent research with our suppliers. It is not clear to GM whether R-152a will be judged acceptable. Neither is it a simple drop-in replacement for R-134a (contradicting the NESCCAF analysis Appendix D-20). GM believes that R-152a faces significant development issues, especially regarding its safety. If implemented, it would add costs for the required safety modifications.

CARB's assumption that manufacturers "will be converting to HFC 152a systems in the mid term" (ISOR, p. 107) is unwarranted and unduly speculative for a technology that is still at R-152a's stage of development. CARB should not have relied on a technology that has not even been demonstrated to any significant degree in test fleets as the basis for setting regulatory standards.

#### **f. Fuel Economy Technology**

CARB substantially overestimated the fuel economy improvements that would be expected to result from many of the technologies included in its technical justification. In order to better understand the results, we conferred with the analysts from the AVL engineering consulting group that performed the technology simulations for NESCCAF that CARB, in turn, used as the basis of much of its analysis. Following are some perspectives resulting from those discussions.

##### **i. Vehicle Integration**

GM comments that integrating fuel economy technologies into a vehicle involves a balance of all the performance attributes (tailpipe emissions, acceleration drive quality, noise and vibration, steering feel and response, ride and handling). In many cases, simultaneously meeting all vehicle performance requirements results in deteriorated fuel economy benefits and higher costs for a fuel economy technology. Benefits of a technology described in the public literature, by component suppliers, or produced by sub-systems simulations typically do not consider the integration and balancing issues required to completely integrate a technology into the vehicle. A major reason for CARB's overestimation of vehicle fuel economy potential is a disregard for this

critical issue. Some examples include: the acceptable range of operation for cylinder deactivation to meet noise and vibration requirements, the additional exhaust and other noise canceling treatments needed to offset higher engine noise of a deactivated engine operating under high load or a downsized turbocharged GDI engine running at higher engine speeds.

## **ii. Automated Manual Transmissions**

The use of automated manual transmissions with dual wet clutches (AMTs) is nearly universal in the configurations that were used by CARB to set the standards. So the standards are highly dependent on the results projected for these types of transmissions. There are some significant issues with both the benefits analysis and the applicability of these types of transmissions:

- All of the AMT benefits are miscalculated due to the omission of important transmission losses. The June 2004 draft of the ARB report briefly described AMT technology, but did not go into any detail regarding clutch design. The analysis done by AVL assumed manual transmission efficiency values and only an added 15-Watt electrical load meant to represent gear-shifting-actuator loads. Neither transmission spin losses nor clutch actuator losses were accounted for in the AVL analysis. AVL has indicated that their analysis was specifically for dry clutch AMTs. However, in the August 2004 ISOR, the AMT description (but not the analysis) was revised to include dual wet clutch designs in the AMT technology. Such a clutch design includes a hydraulic actuator pump that consumes significant energy, and according to LuK (AVL's source for AMT information) would result in a 4-6% lower drive cycle efficiency (ref. LuK presentation at SAE's Emerging Transmission Technologies TOPTec in August 2003) than the dry clutch configuration analyzed by AVL. This loss is not included anywhere in the analysis, and its omission contributes significantly to the benefit claimed for transmission technology used to determine the standards.
- Some vehicle segments have seamless transmission operation as an important marketable requirement. These types of transmissions are simply not smooth enough for those market segments. Yet they are assumed to be applied in every vehicle segment.
- Single-clutch AMT's are not an acceptable alternative in the U.S. market. With an additional dry clutch to increase acceptability, dry dual clutch transmissions can only handle maximum torque of approximately 400 N-m. This torque level is approximately that of a V6 midsize car. At higher torque levels, a hydraulic system is required, accompanied by additional pump losses, mass, and increased electrical loads. Even hydraulic systems might not work on heavier trucks given extreme loads and durability concerns.
- The actual implementation of AMT transmissions into nearly all of the vehicle fleet (which is what the standard assumes) would require retirement of almost every North American investment in light-duty transmission manufacturing capacity and the addition of an equal amount of new AMT capacity somewhere in the world.

## **iii. Turbocharged Engines**

The use of aggressively downsized (41-52% smaller), highly turbocharged, intercooled, direct-injected engines with dual cam phasing is used to set the standard in all but one of the vehicle segments. So the standards are very dependent on the results projected for these types of engines. There are some significant issues with both the benefits analysis and the applicability of these types of engines:

- The projected benefit for the turbocharged, downsized, direct-injected, camphasing engines is based on very aggressive assumptions about the specific output that is possible for these types of engines. The most unlikely of these assumptions is that the engines will use premium fuel instead of regular fuel (as discussed in more detail below). All of the AVL analysis for these engines appears to be based on premium fuel. Without premium fuel, the specific output possible from these engines will be significantly reduced and the engine sizes will be overly optimistic due to selection of very low engine displacements driven by unrealistic BMEP (Brake Mean Effective Pressure) curve assumptions that depended on high boost levels and premium fuel usage.
- Typical turbocharger installations require an intercooler, which increases vehicle drag.
- There are significant discrepancies between the benefits projected by AVL for downsized turbocharged MPFI engines and downsized turbocharged GDI-S engines. AVL has indicated through a direct comparison of turbocharged MPFI versus turbocharged GDI-S DCP engine maps that engine fuel consumption differences between these two technologies are as much as 12% at typical Federal Test Procedure engine operation conditions. Such large differences in fuel consumption are unexplained by the relatively minor physical differences between the engine technologies. This discrepancy affects a technology package used to justify the emission standard in four of the five vehicle classes.
- AVL has confirmed that the application of aggressively downsized turbocharged engines did not include consideration of vehicle launch, drive quality, and transient engine/transmission/ turbo response. The simulation results provided by AVL indicate that the vehicles configured with these engines will have serious drive quality problems. General Motors believes such deteriorations in performance are not acceptable, and they demonstrate that not enough verification of "equal performance" was done. Demonstration of sufficient vehicle launch, drive quality, and transient performance should be required prior to consideration of this and other "torque-modifying" new powertrain technologies.

#### **iv. Premium Fuel**

Portions of the analysis done by AVL appear to have included the assumption of premium fuel usage. AVL states that regular fuel was assumed for all of the engine configurations that used some form of variable valve actuation, but engine specific output levels taken directly from AVL output results match exactly with other premium fuel AVL work on variable valve actuation. Further investigation of this issue by AVL indicated that in most, but not all, cases their assumptions fell within very aggressive regular fuel specific output levels. Whether through an assumption of premium fuel usage or an overestimate of what is possible with regular fuel, the

result is an overestimate of the specific output possible with each of these technologies, which enables unrealistically aggressive engine downsizing – and fuel consumption reductions – to be simulated while maintaining equal performance. This discrepancy contributes to an over assumption of the specific output capability (and thus the chosen engine size) of every DCP, DVVL, and CVVL engine in the AVL analysis.

#### v. Simulation Issues

The AVL study used a computer simulation tool and consistent methodology. However, AVL has described their study as a generic study whose results can be used to compare relative differences between groupings of technologies, not for projecting specific consumption targets for specific vehicles. As a generic study, the AVL work did not cover some important details and constraints that are a reality for vehicle manufacturers:

- All of the engine maps used in the simulation study were based on AVL's most optimistic, upper-limit projections of the full capability of the engine technologies, assuming full application of technology without sufficient constraints which reflect real-world combustion system dilution tolerance, airflow capacity, piston-to-valve clearances, oil system capacity at low speeds, idle speed control techniques, and Noise, Vibration and Harshness (NVH) concerns. The AVL engine maps assumed a best case for all of these aspects of engine design, and in several cases their "best-in-class" results were a smoothed composite of results from multiple engines – no individual engines represented the engine maps used for setting the standards. A study like this does not provide a quantitative target value that is suitable for setting fuel consumption regulations. The maps used by AVL to represent DCP, CCP, DVVL, and CVVL all had significant fuel consumption improvements at light loads where, in the real world, the improvements would be limited by combustion system dilution tolerance versus airflow capacity tradeoffs and by piston-to-valve clearance constraints.
- AVL has indicated that all of the vehicle/powertrain configurations chosen for the standard were chosen to maintain equal performance. However, seven of the ten configurations used for setting the near-term standard have worse 50-70 performance than their baseline cases; four of those cases (large truck 04, large truck 05, small truck 04, and minivan 04) are significantly worse and would be considered unacceptable when compared to the baselines.
- AVL did not consider any gradeability or drive quality metrics when choosing engine sizes. In nine of the ten configurations used for setting the near-term standard, the gradeability calculated by AVL was worse than the baseline gradeability; five of those cases (large truck 04, large truck 05, small truck 04, minivan 04, and minivan 05) showed significant degradation in gradeability to the point where they would likely be considered unacceptable. AVL made no explicit calculations concerning drive quality (the typical response to accelerator pedal inputs required by the driver) so it is impossible to quantify the impacts. Drive quality issues are frequently prevalent when the calculated gradeability is poor and when aggressive engine downsizing is attempted, so it is expected that there would be drive quality problems with several of the chosen

configurations. Since the standards set by ARB were almost entirely based on configurations where drive quality problems are likely to occur, the standards should not be considered feasible unless more analysis validating acceptable drive quality is performed.

- The method used by AVL to input transmission shift patterns and torque converter lock patterns was explicit and well defined. However, the actual shift patterns and lock/unlock patterns were not chosen in a reproducible, consistent manner. There was no explicit test of the shift points to ensure that they were not too early (which would hurt drive quality, cause shift busyness problems, and exaggerate fuel economy benefits) or not too late (which would help drive quality at the expense of fuel economy), and there was no consideration for the number of shifts per test cycle and the acceleration disturbance level during shifts (or any other indication of acceptable drive quality).
- The method used by AVL to adjust their baseline simulations to actual test vehicle performance and fuel economy results was to first “tweak” drivetrain efficiencies to dial-in vehicle 0-60 performance, and then “tweak” transmission shift and lock patterns to dial-in vehicle fuel economy. While a method such as this might produce a simulated fuel economy number that equals the test data, it does not result in a reliable baseline simulation. If, for example, the quoted engine power for the baseline engine was higher than actual (resulting in a “fast” 0-60 simulation result), the AVL method would artificially reduce the baseline drivetrain efficiency to match performance. Then, in order to match fuel economy numbers (assuming everything else about the simulation is in order), the AVL method would have to artificially make the shift/lock points too early. The result would be a baseline simulation result with unrealistic drivetrain efficiencies and shift/lock points.
- Given the observed degradations in gradeability and the well-defined but unvalidated transmission shift/lock methods used, it is inappropriate and overly optimistic for ARB to assume in Table 5.2-4 that all vehicles would benefit from additional aggressive shift logic and early torque converter lockup. The CARB report states, “driveability and acceleration concerns must be accounted for carefully in these alterations of shifting schedules.” This is true, but it was not done by AVL or CARB. The CARB report states, “... care must be exercised to ensure smooth, responsive driveability and low noise, vibration, and harshness. AVL was conservative in its modeling of these features to ensure good driveability and minimum vibration.” As described above, no systematic aggressiveness test was performed. The Table 5.2-4 adjustments are not justified. CARB had access to a full-featured simulation at AVL, but chose not to use simulation results, instead multiplying an unsimulated, unrealistic adjustment by the AVL results.

## vi. OHV Engines

Four of the ten vehicle configurations used to set the near-term standard were combinations of OHV engine technologies that are unlikely to be applied in the real world. Minivan 04 applied CVVL along with CCP. Small truck 05, large truck 04, and large truck 05 all applied DeAct plus DVVL plus CCP. The application of either CVVL or DVVL to OHV engines is not realistic as

the mechanisms that might provide such function (especially in combination with DeAct and CCP) do not exist and are not being considered for development. Two major roadblocks preventing the combination of these technologies are (1) the fact that DeAct technology already uses a dedicated valve lifter and lifter housing that would preclude adding a new mechanism in the lifter valley and (2) the strict packaging requirements currently met by OHV engine designs would be violated if a large new CVVL or DVVL mechanism were added to the top of the cylinder head. Because these technology combinations have not been demonstrated in any realistic form, they violate the statement by CARB that "the technologies being explored are currently available on vehicles in various forms or have been demonstrated by auto companies and/or vehicle component suppliers in at least prototype form."

#### **vii. Hybrids**

The AVL results for hybrid vehicles differed significantly from CARB's estimates. AVL's results for hybrids (which were based on analysis of simulation results) had significantly lower fuel consumption improvement than the CARB results (which were based on scaling of one production hybrid vehicle with performance significantly worse than that of any of the baseline vehicles).

#### **g. Degraded Vehicle Performance**

GM commented that as they examined the CARB analysis, it became very evident that the vehicle fuel economy computer simulations used to develop the standards did not maintain current or adequate levels of vehicle performance. Instead, they relied on technologies that would severely degrade vehicle performance, contradicting the claim by CARB that vehicle performance was maintained at current levels.

One prominent result of the analysis was that a large fuel consumption reduction was shown for downsized turbocharged engines. In fact, the downsized turbocharged powertrains served as a standard-setting configuration for all of the vehicle segments except one in the near-term calculations.

GM comments that there are serious concerns with the methodology used to arrive at the chosen set of downsized turbocharged powertrains related to the real-world driveability performance of such powertrains. GM identified vehicle "launch" performance (initial acceleration) and the transient response and driveability capabilities of the downsized turbocharged powertrains. GM believes that if CARB addressed these concerns, they would reduce the aggressiveness with which engines were downsized. The resulting fuel consumption benefits from downsizing/turbocharging would be reduced significantly because the vast majority of the claimed benefit comes from engine downsizing, ranging from a 41% to 52% displacement reduction.

GM submitted an analysis to demonstrate their launch and driveability concerns associated with downsizing/turbocharging. GM noted the limits of their analysis as it was only based on customer acceptance in the AVL simulation analysis was 0-60 mph acceleration time.

GM requested that AVL answer questions regarding their analysis and perform additional analyses on the vehicle configurations used for CARB standard setting. The same AVL personnel and the same AVL methods were sought to perform these additional analyses. A portion of those results is summarized here.

The plot in Figure 2 shows the simulated acceleration response of the 2002 baseline minivan configuration compared with the simulated response of minivan case 4 (the downsized turbocharged case, which was one of the configurations used to set the California near-term standard). The simulation analysis was performed using AVL CRUISE, and it exactly matches the analysis done for CARB.

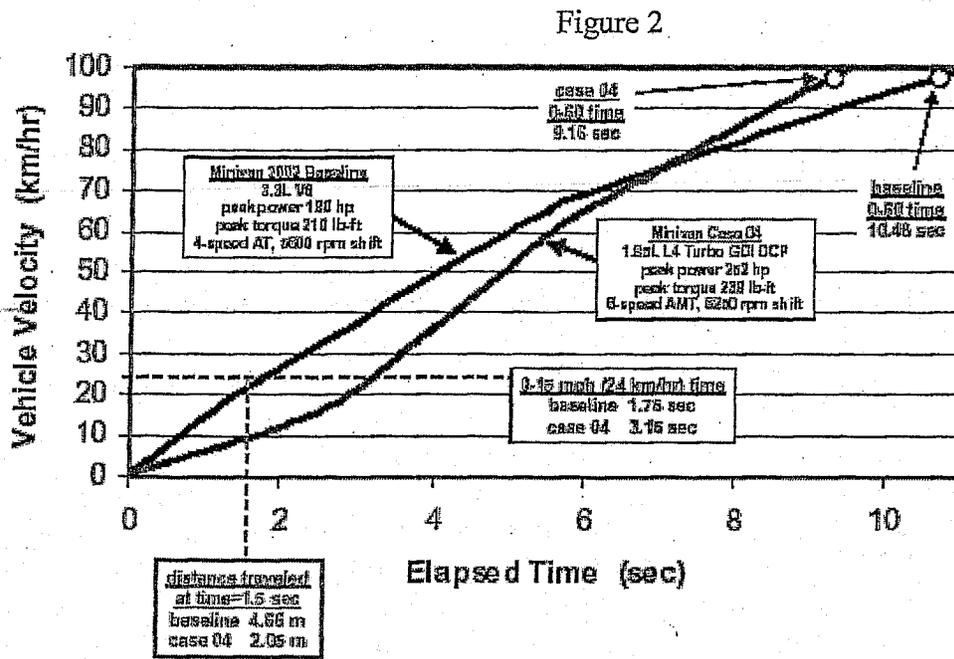


Figure 2: AVL simulated acceleration results for minivan vehicle segment, showing baseline and case 4 (the downsized turbocharged case)

GM comments that Figure 2 demonstrates the launch and early acceleration response of the downsized turbocharged powertrain for minivan case 4 is much worse than the baseline powertrain in terms of capability. Even though the 0-60 acceleration of case 4 is faster than that of the baseline, the performance lags when the vehicle is below 47 mph (75 km/hr). In case 4 it takes an engine with 252 horsepower to match the 0-60 time of the baseline 180 horsepower minivan engine. The unrealistically high horsepower value required for a baseline minivan

engine is an indication that the balance of low-end torque and peak power for the powertrain is not realistic. Since the baseline case was chosen to be representative of the minivan class of vehicles, it is fair to state that the performance expectation for minivan customers for launch and early acceleration is not being met by minivan case 4.

GM comments that Figure 2 also highlights some typical metrics regarding launch performance: 0-15 mph time and distance traveled at 1.5 seconds. Various manufacturers and powertrain developers use their own metrics, which may be slightly different, but those shown in Figure 2 are representative of launch. Clearly, minivan case 4 suffers from poor launch.

Launch is an important vehicle performance criterion because it is a positive indicator to the driver that the vehicle has sufficient capability to move from zero speed in a predictable manner. Turning on to a 2-lane highway, making a left turn in traffic, accelerating across an intersection, and starting up a hill are all very common examples of vehicle maneuvers where a certain level of "launch feel" is expected by customers. North American customers have become accustomed to a comfortable level of launch capability, enabled by engines with good low-end torque, properly ratioed transmissions, and torque converter-equipped automatic transmissions (this fact was observed in the AB1493 report). Some vehicle manufacturers have experienced significant negative customer reaction and lost sales as a result of inadequate vehicle launch capability. Sufficient launch capability is a requirement that must be met in the competitive marketplace.

Figure 3 shows launch and acceleration characteristics of the other downsized turbocharged powertrains used to set the California standards. These powertrains were applied to all vehicle segments except large trucks, so they make up a substantial volume (and represent huge production volumes) in the vehicle fleet envisioned in the CARB analysis. As can be seen in Figure 3, each vehicle with a downsized turbocharged powertrain travels significantly less distance during launch when compared to the baseline. In practical terms, when the baseline vehicle has made it through the intersection, the downsized turbocharged vehicle has only traveled halfway through the intersection. It is important to note that the baseline vehicles used here are exactly those chosen by AVL and CARB: vehicles representative of what is saleable in the competitive marketplace. Any degradation from these baselines – let alone the huge degradations shown here – is a degradation in performance and contradicts the CARB assertion that vehicle performance was maintained.