

ENERGY EFFICIENCY SOLUTIONS

Richard P. Cateland
Editor



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RICHARD P. CATELAND
EDITOR



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ENERGY EFFICIENCY SOLUTIONS

PREFACE

DOE has missed all 34 congressional deadlines for setting energy efficiency standards for the 20 product categories with statutory deadlines that have passed. DOE's delays ranged from less than a year to 15 years. Rulemakings have been completed for only (1) refrigerators, refrigerator-freezers, and freezers; (2) small furnaces; and (3) clothes washers. DOE has yet to finish 17 categories of such consumer products as kitchen ranges and ovens, dishwashers, and water heaters, and such industrial equipment as distribution transformers. Lawrence Berkeley National Laboratory estimates that delays in setting standards for the four consumer product categories that consume the most energy—refrigerators and freezers, central air conditioners and heat pumps, water heaters, and clothes washers—will cost at least \$28 billion in forgone energy savings by 2030. DOE's January 2006 report to Congress attributes delays to several causes, including an overly ambitious statutory rulemaking schedule and a lengthy internal review process. In interviews, however, DOE officials could not agree on the causes of delays. GAO's panel of widely recognized, knowledgeable stakeholders said, among other things, that the General Counsel review process was too lengthy and that DOE did not allot sufficient resources or make the standards a priority. However, GAO could not more conclusively determine the root causes of delay because DOE lacks the program management data needed to identify bottlenecks in the rulemaking process.

In January 2006, DOE presented to Congress its plan to bring the standards up to date by 2011. It is unclear whether this plan will effectively clear DOE's backlog because DOE does not have the necessary program management data to be certain the plan addresses the root causes. The plan also lacks critical elements of an effective project management plan, such as a way to ensure management accountability for meeting the deadlines. Finally, the plan calls for a sixfold increase in workload with only a small increase in resources. DOE plans to manage the workload through improved productivity.

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Chapter 1

AUTOMOBILE AND LIGHT TRUCK FUEL ECONOMY: THE CAFE STANDARDS*

Brent D. Yacobucci and Robert Bamberger

ABSTRACT

On April 22, 2008, the National Highway Traffic Safety Administration (NHTSA) released a Notice of Proposed Rulemaking (NOPR) that would establish fuel economy standards for model year (MY) 2011 -MY2015 passenger cars and light trucks. The rulemaking is in followup to the Energy Independence and Security Act of 2007 (EISA, P.L. 110-140), enacted in mid-December 2007, which restructured the automotive fuel economy program. It established a corporate average fuel economy (CAFE) standard of 35 miles per gallon (mpg) by MY2020 for the combined passenger automobile and light truck fleet. However, to meet the combined standard, automakers will continue the practice of calculating the CAFE of their car and light truck fleets separately. The proposed rule would establish passenger car fuel economy at 31.2 mpg in MY2011, increasing to 35.7 mpg in MY2015. For trucks, the comparable goals for compliance are 25.0 to 28.6 mpg. Lastly, the design of the program will be “attribute” based; every model of new vehicle will have its own target, based on the vehicle’s footprint.

Manufacturers’ passenger car fleets will be required to come within 92% of the overall standard for a given model year. Above that floor, manufacturers can earn credits for exceeding the standards in one vehicle class and apply credits to boost the CAFE of a different vehicle class that is short of compliance. Additionally, credits may be sold and bought among manufacturers. CAFE credits for the manufacture of flexible-fueled vehicles (FFV) were retained by EISA, but will be phased out by MY2020. Civil penalties assessed for non-compliance will be deposited to the general fund of the U.S. Treasury to support future rulemaking and to provide grants to U.S. manufacturers for research and development, and retooling in support of increasing fuel efficiency. The law also requires the development of standards for “work trucks” and commercial medium- and heavy-duty on-highway vehicles.

An important development bearing on CAFE was the denial in late December 2007 of a waiver to the state of California by the Environmental Protection Agency that would

* This is an edited, excerpted and augmented edition of a Congressional Research Service publication, Report RL33413, dated May 7, 2008.

have permitted California (and other interested states) to set vehicle greenhouse gas standards under the Clean Air Act. Reducing fuel consumption could be one of the major tools for reducing vehicle emissions. A waiver would allow these states to require more stringent fuel economy of vehicles sold in those states than required by the new standards established by EISA. Some have suggested that language in the NOPR pre-empting states from regulating tailpipe emissions would be challenged in court if included in any final rule.

A November 15, 2007, decision by the U.S. Court of Appeals for the Ninth Circuit overturned a final rule issued by NHTSA for MY2008-MY2011 light trucks. The Court ruled that NHTSA had not conducted a sufficiently rigorous analysis to measure whether the standards would have a beneficial effect in improving environmental quality through reduction of greenhouse gas emissions. The analysis accompanying the NOPR for MY2011-MY2015 appears intended to address the deficiencies identified by the Court in the earlier rulemaking.

MOST RECENT DEVELOPMENTS

Corporate Average Fuel Economy (CAFE) standards are fleetwide fuel economy averages that motor vehicle manufacturers must meet each model year (MY). On April 22, 2008, the National Highway Traffic Safety Administration (NHTSA) released a Notice of Proposed Rulemaking (NOPR) that would establish fuel economy standards for MY2011-MY2015 passenger cars and light trucks. The rulemaking is in followup to the Energy Independence and Security Act of 2007 (EISA, P.L. 110-140), enacted in mid-December 2007, which restructured the automotive fuel economy program. It established a corporate average fuel economy (CAFE) standard of 35 miles per gallon (mpg) by MY2020 for the combined passenger automobile and light truck fleet. However, to meet the combined standard, automakers will continue the practice of calculating the CAFE of their car and light truck fleets separately. The proposed rule would establish passenger car fuel economy at 31.2 mpg in MY2011, increasing to 35.7 mpg in MY2015. For trucks, the comparable goals for compliance are 25.0 to 28.6 mpg. Lastly, the design of the program will be “attribute” based; every model of new vehicle will have its own target, based on the vehicle’s footprint. The target fuel economy for a vehicle of a given footprint will increase over time, and will be derived from application of a mathematical function that will relate vehicle attributes to fuel efficiency levels.

Manufacturers’ passenger car fleets will be required to come within 92% of the overall standard for a given model year. Above that floor, manufacturers can earn credits for exceeding the standards in one vehicle class and apply credits to boost the CAFE of a different vehicle class that is short of compliance. Additionally, credits may be sold and bought among manufacturers. CAFE credits for the manufacture of flexible-fueled vehicles (FFV) were retained by EISA, but will be phased out by MY2020. Civil penalties assessed for non-compliance will be deposited to the general fund of the U.S. Treasury to support future rulemaking and to provide grants to U.S. manufacturers for research and development, and retooling in support of increasing fuel efficiency. The law also requires the development of standards for “work trucks” and commercial medium- and heavy-duty on-highway vehicles.

An important development having a bearing on CAFE was the denial in late December 2007 of a waiver to the state of California by the Environmental Protection Agency that

would have permitted California (and other interested states) to set vehicle greenhouse gas standards under the Clean Air Act. Reducing fuel consumption could be one of the major tools for reducing vehicle emissions. A waiver would allow these states to require more stringent fuel economy of vehicles sold in those states than required by the new standards established by EISA. Some have suggested that language in the NOPR pre-empting states from regulating tailpipe emissions would be challenged in court if included in any final rule.

A November 15, 2007, decision by the U.S. Court of Appeals for the Ninth Circuit overturned a final rule issued by NHTSA for MY2008-MY2011 for light trucks. The Court ruled that NHTSA had not conducted a sufficiently rigorous analysis to measure whether the standards would have a beneficial effect in improving environmental quality through reduction of greenhouse gas emissions. The analysis accompanying the NOPR for MY2011-MY2015 appears intended to address the deficiencies identified by the Court in the earlier rulemaking. Whether, if challenged, the Court would find it sufficient, is uncertain. At this point, there would be no reason for NHTSA to resubmit its light truck rule for MY2008-MY2011.

CURRENT CAFE STANDARDS

The Arab oil embargo of 1973-1974 and the subsequent tripling in the price of crude oil brought into sharp focus the fuel inefficiency of U.S. automobiles. New car fleet fuel economy had declined from 14.8 mpg in MY1967 to 12.9 mpg in MY1974. In the search for ways to reduce dependence on imported oil, automobiles were an obvious target. The Energy Policy and Conservation Act (EPCA) established CAFE standards for passenger cars for MY1978. The CAFE standards called for an eventual doubling in new car fleet fuel economy. EPCA also granted NHTSA the authority to establish CAFE standards for other classes of vehicles, including light-duty trucks.[1] NHTSA established fuel economy standards for light trucks, beginning in MY1979. For passenger cars, the current standard is 27.5 mpg. For light trucks, the standard was set at 22.2 mpg for MY2007. The CAFE standards to MY2011 are summarized in table 2.

As noted, on April 6, 2006, NHTSA issued additional rules to further increase light truck fuel economy through MY2011, a rule that was remanded to NHTSA. The MY2008-MY2011 light truck fuel economy standards shown in the table below are included for informational purposes to show the path of the interim standards that were proposed by NHTSA. Given the remanding of the rule, the standard of 22.2 mpg for light duty trucks prevails until raised by a final (and unchallenged) rule.

Compliance with the standards is measured by calculating a sales-weighted mean of the fuel economies of a given manufacturer's product line, with domestically produced and imported cars measured separately. The penalty for non-compliance is \$5.50 for every 0.1 mpg below the standard, multiplied by the number of cars in the manufacturer's new car fleet for that year. Civil penalties collected from 1983 to 2003 totaled slightly more than \$600 million. However, these penalties have been paid mostly by small and speciality European manufacturers, not by the major U.S. or Japanese automotive manufacturers.

Table 1. Fuel Economy Standards for Passenger Cars and Light Trucks: Model Years 2000 Through 2011 (miles per gallon)

Model year	Passenger cars	Light trucks ^a
2000	^b 27.5	20.7
2001	^b 27.5	20.7
2002	^b 27.5	20.7
2003	^b 27.5	20.7
2004	^b 27.5	20.7
2005	^b 27.5	21.0
2006	^b 27.5	21.6
2007	^b 27.5	22.2
2008	^b 27.5	22.2/ ^c 22.5
2009	^b 27.5	22.2/ ^c 23.1
2010	^b 27.5	22.2/ ^c 23.5
2011	^b 27.5	22.2/ ^d 24.0

Source: Automotive Fuel Economy Program, Annual Update, Calendar Year 2001; U.S. Department of Transportation. National Highway Traffic Safety Administration, *Light Truck Average Fuel Economy Standard, Model Year 2004*, Final Rule; and U.S. Department of Transportation, National Highway Traffic Safety Administration. *Average Fuel Economy Standards for Light Trucks Model Years 2008-2011*, Final Rule (remanded to NHTSA in December 2007).

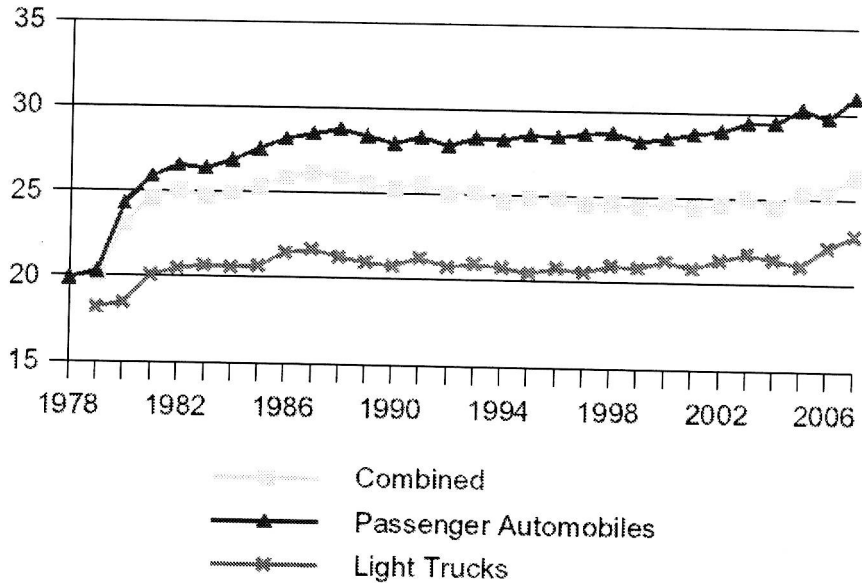
^a Standards for MY 1979 light trucks were established for vehicles with a gross vehicle weight rating (GVWR) of 6,000 pounds or less. Standards for MY 1980 to MY2000 are for light trucks with a GVWR of 8,500 pounds or less. Starting in MY2011, the light truck CAFE program will include medium duty passenger vehicles (MDPVs), trucks with a GVWR between 8,500 and 10,000 pounds that primarily transport passengers (e.g., large SUVs, passenger vans).

^b Established by Congress in Title V of the act.

^c Unreformed CAFE standard. These are standards that were part of the MY2008-MY2011 NHTSA rule that was remanded back to the agency to be redone.

^d Average that was estimated by NHTSA in the proposed rule, based on MY2011 reformed standard.

The effectiveness of CAFE standards since inception has been controversial. Since 1974, domestic new car fuel economy has roughly doubled; the fuel economy of imports has increased by roughly one-third. Some argue that these improvements would have happened as a consequence of rising oil prices during the 1970s and 1980s regardless of the existence of the CAFE standards. Some studies suggested that the majority of the gains in passenger car fuel economy during the 1970s and 1980s were technical achievements, rather than the consequence of consumers' favoring smaller cars. Between 1976 and 1989, roughly 70% of the improvement in fuel economy was the result of weight reduction, improvements in transmissions and aerodynamics, wider use of front-wheel drive, and use of fuel-injection. The fact that overall passenger car fleet fuel economy remained comparatively flat during a period of declining real prices for gasoline also suggested that the CAFE program may have contributed to placing some sort of floor under new-car fuel economy. Recent and historic fleet fuel economy averages are shown in figure 1.



Source: U.S. Department of Transportation, National Highway Traffic Safety Administration, *Summary of Fuel Economy Performance*, March 2007.

Figure 1. Passenger Car and Light Truck Fuel Economy Averages for Model Years 1978-2006 (miles per gallon).

MAJOR ISSUES IN THE CAFE DEBATE

Some of the arguments made on behalf of, or in opposition to, raising CAFE or making significant changes in the program touched on long-standing themes that are also complex. These issues include:

- What is the effect of combining the passenger automobile and light-duty truck fleet for the purpose of calculating manufacturers' average CAFE? During the congressional debate, some contended that it should make no difference whether the average is calculated across one entire fleet or weighted across two if an umbrella standard has to be met for the entire fleet. On the other hand, had the classes been kept separate, there might be differential effects of the standards on different vehicle classes. Opponents of eliminating the distinction between the fleets referred to that policy as "backsliding." Under the CAFE program prior to the enactment of EISA, a manufacturer was required to meet the CAFE standard separately for its fleet of passenger cars produced in the United States and abroad. The CAFE of each could not be averaged across one another. A manufacturer could not earn CAFE credits for one fleet that could be applied to bring its other fleet into compliance, nor could manufacturers buy and sell credits from one another. The two-fleet rule had been crafted originally to protect the diversity of models manufactured in the United States. The United Auto Workers (UAW) argued that eliminating the distinction between foreign and domestic fleets could cost jobs in the industry domestically. The

final bill retained the distinction between the two vehicle classes. The presumption is that this will place greater weight for fuel economy improvement on passenger cars than on light trucks.

- Will higher CAFE standards bring about a loss in jobs? Some argued that higher standards might compel manufacturers to make fewer vehicles that consumers want; as a result, older, less efficient vehicles might be retained longer. Others suggested that any impact on jobs in the industry would be selective — that is, unionized jobs might be more vulnerable if higher standards do affect demand for vehicles.
- What might be the effects of allowing credit trading among manufacturers and/or between passenger car and light trucks fleets? Under the previous structure of the CAFE program, automakers could bank excess CAFE credits for use in future years, but could not trade those credits with other automakers. Manufacturers also could not trade credits between their passenger car and light truck fleets — each fleet had to meet the standards independently. Under the fuel economy program restructure by EISA, credit trading is allowed. Supporters of this approach argued that it may improve the economic efficiency of the system and lower the cost of compliance. Opponents raised the possibility that allowing credit trading could lead to a competitive advantage for some manufacturers, and could affect auto industry employment.
- Do higher CAFE standards have an effect on gasoline price? There are many external and often short-term and cyclical variables that can affect gasoline prices. If higher standards do reduce overall oil demand from a baseline projection, world oil prices may be less volatile when an incident or sequence of events raises uncertainty about the adequacy and security of world supply. However, it is impossible to make any reliable projections given such a large universe of possible scenarios.
- How do attribute-based standards work, and what are the advantages and disadvantages of them? Any system for regulating CAFE will have winners and losers, whether an attribute-based system, or the previous straight-line average. Additionally, the choice of which attribute or attributes on which to base CAFE will also affect individual automakers differently. Under the new system, NHTSA will set a fuel economy target calculated for each new car as a mathematical function of individual vehicle attributes. The final regulations developed by NHTSA may, for example, base standards on vehicle size — or footprint. Under that scenario — and visualized on a graph — each year's standard would no longer be represented by a single line, but appear instead as a curve that would peg a desirable fuel economy target for vehicles based upon their footprint. In successive model years, the curve would be replotted, with the intention of reaching a designated CAFE fleetwide average in some future model year. No individual vehicle would be required to meet a specific fuel economy standard, but the average of the fleet would need to meet or exceed the average of the individual vehicles' size-based targets. (See figure 2 in the detailed discussion below.)
- Are there arguments to be made for and against designating CAFE standards as an expression of both miles per gallon and as grams per mile of CO₂ emissions? One bill (H.R. 2927) included such a provision. Technically, CO₂ emission rates are not measures of fuel economy but of greenhouse gas emissions. However, there may be few ways to reduce emissions other than increased fuel economy. Currently, states

may establish emissions standards under the Clean Air Act, but are preempted from setting fuel economy standards by the Energy Policy and Conservation Act (EPCA). Amending EPCA to establish CAFE standards both in terms of miles per gallon and grams per mile of CO₂ could have a bearing on states' authority to regulate CO₂. On April 2, 2007, the Supreme Court issued its ruling in a case (*Commonwealth of Massachusetts v. EPA*) brought by 12 states and the District of Columbia that challenged the Environmental Protection Agency's (EPA) decision not to regulate greenhouse gas emissions from automobiles. The Supreme Court decision upheld the petition and requires EPA to regulate CO₂ emissions.[2] A ruling of the U.S. Court of Appeals for the Ninth Circuit overturning the final rule promulgated in April 2006 setting light truck fuel economy standards for MY2008-MY2011 was based, in part, on a determination that NHTSA failed to thoroughly analyze the effect of the final rule on CO₂.

HOW THE INTERIM RULE FOR MY2011-MY2015 WOULD WORK

Overview of the Rule

On April 22, 2008, NHTSA released a Notice of Proposed Rulemaking (NPR) that would establish fuel economy standards for model year MY2011- MY2015 passenger cars and light trucks. Under the rule, cars and light trucks would have a fuel economy "target" based on a specific vehicle's "footprint" (the product of wheelbase and track width), with higher targets for smaller vehicles and lower targets for larger vehicles. For a given model year, the targets for a manufacturer's fleet would be averaged to calculate that manufacturer's mandated fuel economy.

The agency's estimate of costs, benefits and net benefits from the proposed rule are shown in table 3. The agency estimates that the total benefits of the proposed passenger car rule would be roughly \$31 billion over the lifetime of the 5 model years. "Societal benefits," the agency notes, includes "direct impacts from lower fuel consumption as well as externalities such as reduction of air pollutants and greenhouse gases." [3] After netting out the \$15.8 billion cost of the rule, the net societal benefit is estimated at \$15.1 billion from the improvement in passenger car fuel economy.

For the proposed light truck standard, the table shows \$57.3 billion in gross benefits, nearly \$31 billion in costs, and a net societal benefit of \$26.4 billion. For both classes of vehicles, the greatest percentage of benefits — an estimated 84-85% percent — is projected to accrue to consumers. The 15-16 percent balance of benefits is attributed to environmental benefits, and a reduction in oil imports.

However, it's important to note that the agency calculations assume a lower gasoline price — of \$2.26 to \$2.51 per gallon — than was being observed when the NPR was released.[4]

**Table 2. NHTSA-Estimated Societal Benefits and Costs From
Proposed CAFE Rule**

Passenger Cars						
	Model Year					Total
	2011	2012	2013	2014	2015	2011-2015
Benefits	2,596	4,933	6,148	7,889	9,420	30,986
Costs	1,884	2,373	2,879	3,798	4,862	15,796
Net Benefits	712	2,560	3,269	4,091	4,558	15,190
Light Trucks						
	Model Year					Total
	2011	2012	2013	2014	2015	2011-2015
Benefits	3,909	8,779	13,560	14,915	16,192	57,355
Costs	1,649	4,986	7,394	8,160	8,761	30,949
Net Benefits	2,260	3,793	6,166	6,755	7,431	26,406

Source: U.S. Department of Transportation. National Highway Traffic Safety Administration. Average Fuel Economy Standards Passenger Cars and Light Trucks Model Years 2011-2015. [Docket No. NHTSA-2008 -0089] p. 292.

To date, the CAFE standards have not applied to vehicles over 8,500 pounds GVW. Vehicles between 8,500-10,000 pounds GVW, which are categorized as medium-duty passenger vehicles (MDPV) would be included under the proposed rule, beginning in MY2011. Before MY2004, these vehicles were considered heavy-duty vehicles for both fuel economy and emissions purposes. For the purposes of emissions standards, starting in MY2004, the Environmental Protection Agency (EPA) first defined MDPVs and included them in the “Tier 2” emissions standards for passenger cars and light trucks. The justification at the time was that these vehicles are used primarily as passenger vehicles, and should be regulated as such. NHTSA reached a similar conclusion, adding that fuel economy standards for MDPVs were feasible, and that standards would save additional fuel — approximately 250 million gallons over the operating life of MY2011 MDPVs.

Under the proposed rule, work trucks (such as long-bed pickups and cargo vans), and trucks described as “multi-stage,” (built in stages by more than one manufacturer) would be excepted from regulation.[5] Work trucks may subsequently come under CAFE regulation, but EISA directed first that the National Academy of Sciences conduct a study on the feasibility of including work trucks, with NHTSA to conduct a subsequent evaluation of its own.

Reformed Standards

Prior to the passage of EISA, one of the key criticisms of the CAFE structure was that increased CAFE standards promoted smaller, lighter vehicles because fuel economy tends to decrease as vehicles get heavier. The concern was that fuel economy standards would be met to a great degree by decreasing vehicle weight. Because larger vehicles tend to offer greater

passenger protection in accidents, and tend to be heavier, a fuel economy program structure that does not factor vehicle size into the setting of CAFE standards could promote the use of smaller, less safe vehicles. A corollary and further criticism of the program was that it favored producers of smaller vehicles that would tend to be more fuel efficient. Some proponents of higher CAFE standards responded by arguing that, through the use of new technology, vehicle efficiency can be improved without affecting size or performance.

Under the proposed rule, fuel economy targets vary with vehicle size, with smaller vehicles required to achieve higher fuel economy than larger vehicles. Under the system in the proposed rule, each vehicle would be assigned a fuel economy “target” based on its footprint, which is the product of a vehicle’s track width (the horizontal distance between the tires) and its wheelbase (the distance from the front to the rear axles). The average of the targets for a manufacturer’s fleet is the CAFE average that the manufacturer must achieve in a given model year. In this way, no *specific* vehicle is required to meet a *specific* fuel economy, but the average fuel economy required will vary from manufacturer to manufacturer.

The Challenge to the Rule and Court Decision

As noted earlier, a November 15, 2007, decision by the U.S. Court of Appeals for the Ninth Circuit overturned a final rule issued by NHTSA in April 2006 establishing fuel economy standards for light trucks, MY2008-MY20 11. The Court ruled that NHTSA had not conducted a sufficiently rigorous analysis to measure whether the standards would have a beneficial effect in improving environmental quality through reduction of greenhouse gas emissions.

Eleven states, the District of Columbia, New York City, and four public interest organizations had petitioned for review of the final rule governing light truck fuel economy for MY2008-MY20 11. In its decision, the Court ruled that NHTSA would have to promulgate a new rule that, among other elements, assessed the costs and benefits from different levels of standards in reducing carbon dioxide (CO₂) emissions. Among the petitioners’ arguments were that the cost-benefit analysis performed by NHTSA assigned no benefit to reducing CO₂ emissions, and that the rule did not establish a floor fuel economy that an individual manufacturer had to achieve in a given model year.

At this point, there would be no reason for NHTSA to resubmit its rule for MY2008-MY20 11 because there is insufficient advance notice to the manufacturers, whose product lines are planned well in advance of their introduction. The analysis accompanying the NOPR for MY201 1-MY2015 appears intended to address the deficiencies identified by the Court in the earlier rulemaking. Whether, if challenged, the Court would find it sufficient is uncertain.

However, there is some prospect of a challenge should NHTSA issue a final rule that maintains, as is expressed in the NOPR, that any state regulation that affects fuel economy, including any state regulation governing tailpipe emissions, is forbidden by EPCA. The text of the NOPR observes (with emphasis added):

For those rulemaking actions undertaken at an agency’s discretion, agencies [are instructed] to closely examine their statutory authority supporting any action that would limit the policymaking discretion of the States and assess the necessity for such action. *This is not such a rulemaking action.* NHTSA has no discretion not to issue the CAFE

standards proposed in this document. EPCA mandates that the issuance of CAFE standards for passenger cars and light trucks for model years 2011-2015. *Given that a State regulation for tailpipe emissions of CO₂ is the functional equivalent of a CAFE standard, there is no way that NHTSA can tailor a fuel economy standard so as to avoid preemption. Further, EPCA itself precludes a State from adopting or enforcing a law or regulation related to fuel economy* (49 U.S.C. 32919(a)).[6]

CAFE AND REDUCTION OF CARBON DIOXIDE EMISSIONS: ADDITIONAL HISTORY AND DISCUSSION

Carbon dioxide emissions clearly figured into the challenge and ruling on the NHTSA MY2008-MY20 11 light truck fuel economy rulemaking. Mobile sources are a key source of greenhouse gas (GHG) emissions in the United States. Transportation accounts for roughly one-third of all U.S. carbon dioxide (CO₂) emissions. Passenger vehicles alone represent roughly 60% of transportation emissions, or roughly 20% of total U.S. CO₂ emissions. Because passenger vehicles play such a significant role in U.S. GHG emissions, there is growing interest in reducing their emissions as part of a strategy to address climate change concerns.

In general, there are three ways to reduce vehicle greenhouse gas emissions. These choices are to: (1) reduce vehicle miles traveled (through strategies such as carpooling, transit, or teleworking); (2) reduce vehicle per-mile fuel consumption (through improved fuel economy) and per-mile non-carbon emissions[7] (through improvements in vehicle systems); and (3) convert to lower-carbon transportation fuels. As a consequence, there is likelihood that any program to reduce GHG emissions will likely raise fuel economy. Conversely, any program to increase fuel economy will lower GHG emissions.

There is some debate whether raising the CAFE standards would be an effective or marginal way to reduce emissions of carbon dioxide. On one hand, improvements in fuel economy should enable the same vehicle to burn less fuel to travel a given distance. However, to the extent that technologies to improve fuel economy add cost to new vehicles, it has been argued that consumers will tend to retain older, less efficient cars longer. Further, improving fuel economy lowers the per-mile cost of driving. To the extent that fuel savings are reduced by additional driving, the reduction in greenhouse gas emissions will also be offset some. This is what is referred to as the “rebound effect.”

Perhaps the most significant current issue regarding automotive fuel economy has its origins in the 2002 decision by the state of California to require carbon dioxide emissions standards for passenger cars and light trucks. Legislation passed by the state legislature that year, A.B. 1498, requires the state to promulgate regulations to achieve the maximum feasible and cost-effective reduction of greenhouse gases from cars and trucks. The regulations, adopted by the California Air Resources Board on September 24, 2004, require a reduction of greenhouse gas emissions of 30% by 2016. The regulation covers passenger vehicles, but would not affect heavier vehicles such as commercial trucks or buses.

Although states do not have authority to regulate fuel economy, under the Clean Air Act California solely may be granted an exemption from restrictions on setting vehicle pollutant emissions standards — subject to the state filing a petition with the Environmental Protection Agency (EPA) and being granted a waiver by that agency. Any state-established standards