

UMTRI-2013-35

OCTOBER 2013

# **A COMPARISON OF CAFE STANDARDS AND ACTUAL CAFE PERFORMANCE OF NEW LIGHT-DUTY VEHICLES**

---

**BRANDON SCHOETTLE  
MICHAEL SIVAK**



A COMPARISON OF CAFE STANDARDS AND  
ACTUAL CAFE PERFORMANCE OF  
NEW LIGHT-DUTY VEHICLES

Brandon Schoettle  
Michael Sivak

The University of Michigan  
Transportation Research Institute  
Ann Arbor, Michigan 48109-2150  
U.S.A.

Report No. UMTRI-2013-35  
October 2013

**Technical Report Documentation Page**

1. Report No. UMTRI-2013-35		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle A Comparison of CAFE Standards and Actual CAFE Performance of New Light-Duty Vehicles				5. Report Date October 2013	
				6. Performing Organization Code 383818	
7. Author(s) Brandon Schoettle and Michael Sivak				8. Performing Organization Report No. UMTRI-2013-35	
9. Performing Organization Name and Address The University of Michigan Transportation Research Institute 2901 Baxter Road Ann Arbor, Michigan 48109-2150 U.S.A.				10. Work Unit no. (TRAIS)	
				11. Contract or Grant No.	
12. Sponsoring Agency Name and Address The University of Michigan Sustainable Worldwide Transportation				13. Type of Report and Period Covered	
				14. Sponsoring Agency Code	
15. Supplementary Notes Information about Sustainable Worldwide Transportation is available at <a href="http://www.umich.edu/~umtriswt">http://www.umich.edu/~umtriswt</a> .					
16. Abstract  <p>In August 2012, the U.S. Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration (NHTSA) announced the final standard governing new-vehicle fuel economy for model years 2017 through 2025. The new standard maintains the current system of incremental increases in Corporate Average Fuel Economy (CAFE) requirements for new light-duty vehicles each model year, based on targeted decreases averaging approximately 5% per year in CO<sub>2</sub> output per mile. This report compares the recent improvements in fuel economy with the projected CAFE performance levels anticipated by NHTSA.</p> <p>Recent trends in CAFE performance, when compared with the performance levels projected to be achieved by NHTSA, indicate that achieved CAFE performance has exceeded these anticipated levels for 2012 and 2013 model years—the two years that the current standard has been in effect. Additionally, achieved CAFE performance has consistently increased annually from model year 2008 through model year 2013. If the current trends in annual improvements continue, future CAFE performance is expected to continue meeting or exceeding the projected performance levels (and desired greenhouse gas reductions) contained in the latest CAFE standards.</p>					
17. Key Words fuel economy, Corporate Average Fuel Economy, CAFE, GHG, greenhouse gas, emissions, light-duty vehicles, achieved CAFE, projected CAFE				18. Distribution Statement Unlimited	
19. Security Classification (of this report) None		20. Security Classification (of this page) None		21. No. of Pages 10	22. Price

## Contents

Introduction.....	1
Method .....	3
Fuel economy data .....	3
CAFE performance calculations .....	3
Results.....	5
Recent achieved CAFE performance .....	5
Achieved CAFE performance versus projected achieved performance .....	6
Conclusions.....	7
References.....	8

## Introduction

In August 2012, the U.S. Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration (NHTSA) announced the final standard governing new-vehicle fuel economy for model years 2017 through 2025 (EPA/NHTSA, 2012). The new standard continues the current system of incremental increases in Corporate Average Fuel Economy (CAFE) requirements for new light-duty vehicles (cars, vans, SUVs, and pickup trucks) for each model year (MY), based on targeted decreases averaging approximately 5% per year in CO<sub>2</sub> output per mile. The strategy of simultaneously regulating fuel economy and greenhouse gas (GHG) emissions of new vehicles was introduced in the current standard, in effect for model years 2012 through 2016 (EPA/NHTSA, 2010). These standards are projected to require average fleet-wide performance levels of 35.5 mpg (250 grams/mile of CO<sub>2</sub>) by model year 2016 and 54.5 mpg (163 grams/mile of CO<sub>2</sub>) by 2025.

These performance levels assume that CAFE targets will be met purely through fuel-economy improvements. However, it is likely that manufacturers will also use alternative credits not related to improvements in fuel economy to assist in reaching these goals. Examples of these credits “include the ability of manufacturers to pay civil penalties rather than achieving required CAFE levels, the ability to use Flexible Fuel Vehicle (FFV) credits, the ability to count electric vehicles for compliance, the operation of plug-in hybrid electric vehicles on electricity for compliance prior to MY 2020, and the ability to transfer and carry-forward credits,” in addition to air-conditioning-improvement credits and/or off-cycle technology credits (EPA/NHTSA, 2012). (Off-cycle technology credits are available “for utilizing new and innovative technologies that achieve CO<sub>2</sub> reductions that are not reflected on current test procedures” [EPA/NHTSA, 2012].)

As a result, NHTSA estimates that the actual CAFE performance levels achieved (without credits) will be lower than the final target values published in the standards (EPA/NHTSA, 2010; 2012). NHTSA refers to this anticipated actual performance (without credits) as *projected achieved*. Figure 1 shows the current CAFE targets along with the projected achieved CAFE performance levels. (Under these standards, the final

target and the anticipated actual performance are both projected values due to uncertainty regarding the final composition of vehicle types in the new-vehicle fleets for future model years.)

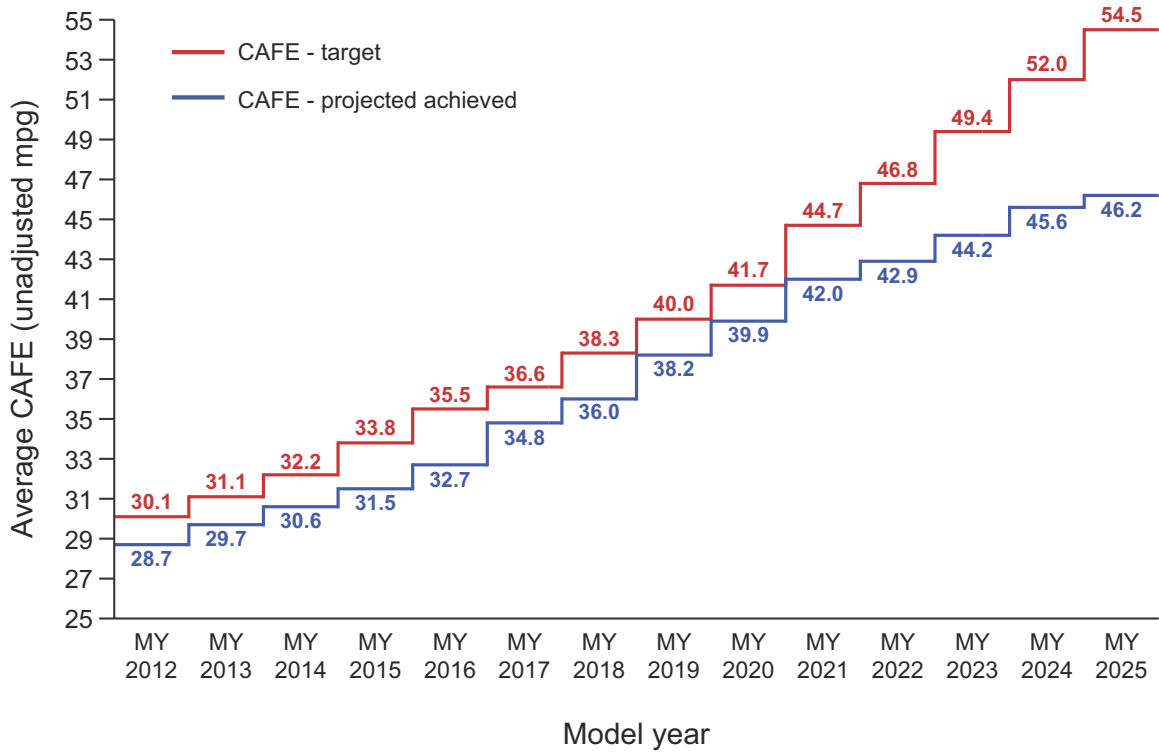


Figure 1. Average fleet-wide CAFE performance targets and the corresponding projected achieved performance levels (without credits) for model years 2012 through 2025 (EPA/NHTSA, 2010; 2012).

As we have documented through our monthly and annual monitoring, a rapid increase in new light-duty vehicle fuel economy has occurred since late 2007. This is the case for both the unregulated average window-sticker value (Sivak and Schoettle, 2013a) as well as the regulated CAFE performance measure (Sivak and Schoettle, 2013b).

This report compares the recent improvements in fuel economy with the projected achieved CAFE performance levels anticipated by NHTSA.

## **Method**

### **Fuel economy data**

The sales-weighted, unadjusted CAFE performance was calculated from the monthly and annual sales of individual models of light-duty vehicles and the unadjusted combined city/highway fuel-economy ratings for the respective models. Data files containing summaries of test data for individual models, including unadjusted fuel-economy ratings, were downloaded from the EPA for each model year (EPA, 2013). (Unadjusted fuel-economy ratings are not directly comparable to the "window sticker" ratings published in the EPA Fuel Economy Guide. The former values are adjusted by the EPA to derive the estimated on-road fuel-economy ratings that are published in the EPA guide and on window stickers.)

### **CAFE performance calculations**

Our ongoing monitoring involves calculating monthly and annual sales-weighted harmonic means. Vehicles purchased from October 2007 through September 2008 were assumed to be model year 2008. Analogous assumptions were made for vehicles purchased in each following model year. Model years 2008 through 2013 were included in the analysis. The unadjusted fuel-economy information was available for 99.8% of vehicles purchased during the period examined.

For cases in which the EPA data file contained multiple unadjusted fuel-economy ratings for a vehicle model, the average of these ratings was used (without regard to sales figures for each specific engine or vehicle-model variant). Additionally, when a vehicle model was sold during a particular model year but it was not listed in that year's EPA data file, the fuel-economy rating from the most recently available year was used. Finally, for very low sales-volume manufacturers (e.g., Ferrari, Rolls-Royce, etc.), all vehicle models for that manufacturer were aggregated and one average, unadjusted fuel-economy rating was calculated. Analogously, the sales figures for each such manufacturer's models were also aggregated each month.

Our calculations do not take into account the various credits and adjustments available to manufacturers when determining final CAFE performance values. Consequently, these values cannot be directly used for assessing compliance with final

CAFE standards because the results may underestimate the final CAFE values. The calculations in this report represent the *actual achieved* CAFE performance for the new-vehicle fleet. Consequently, the results will be compared with the *projected achieved* fleet-wide CAFE performance published by NHTSA (EPA/NHTSA, 2010; 2012).



## Results

### Recent achieved CAFE performance

Figure 2 presents the recent achieved CAFE performance, showing both monthly and model year new-vehicle fleet averages, for model years 2008 through 2013. The two most recent model years (2012 and 2013) experienced an increase of 1.0 mpg and 0.9 mpg, respectively, in average fleet-wide achieved CAFE performance. The largest increase (1.2 mpg) occurred from model year 2009 to 2010. Overall, achieved CAFE performance improved by 4.3 mpg over the six model years examined, from 25.5 mpg to 29.8 mpg.

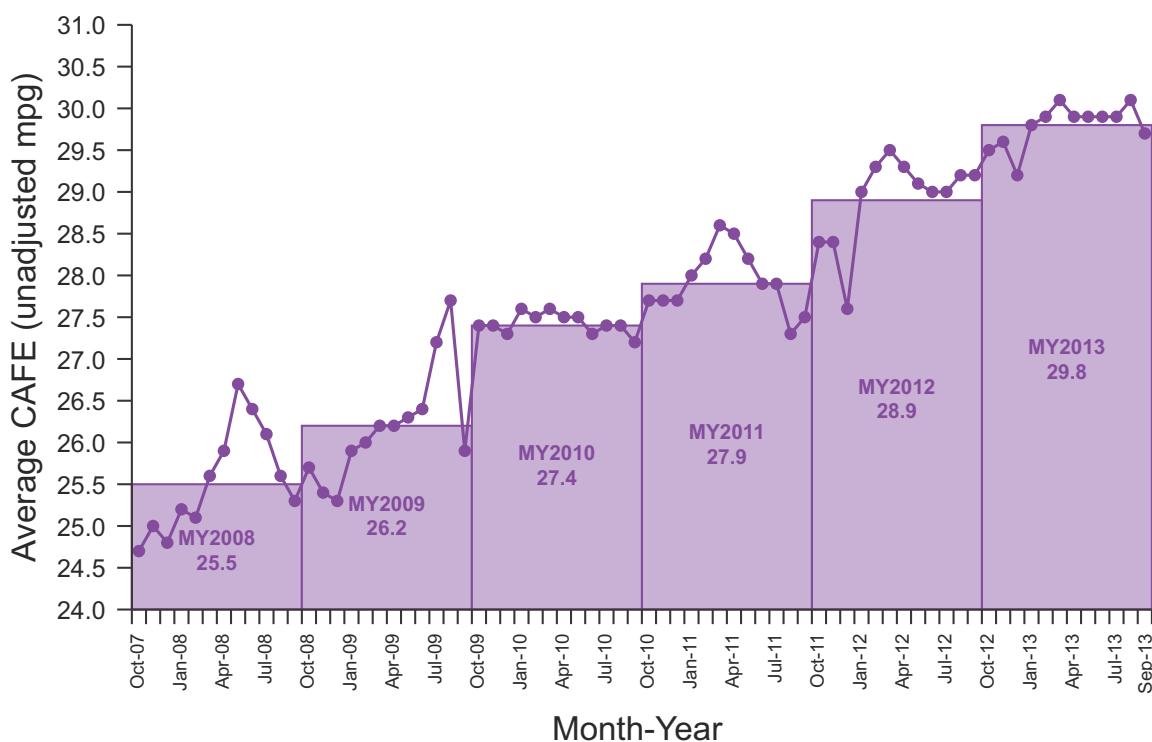


Figure 2. Average monthly and model year fleet-wide achieved CAFE performance levels for model years 2008 through 2013. (The value displayed in the center of each bar represents the model year average.)

### Achieved CAFE performance versus projected achieved performance

Figure 3 presents a comparison of recent achieved CAFE performance and the projected achieved performance levels under the current CAFE standard (applicable for model years 2012 through 2016). For the two model years completed under the current standard (2012 and 2013), the achieved performance levels exceeded the anticipated levels by 0.2 mpg and 0.1 mpg, respectively.

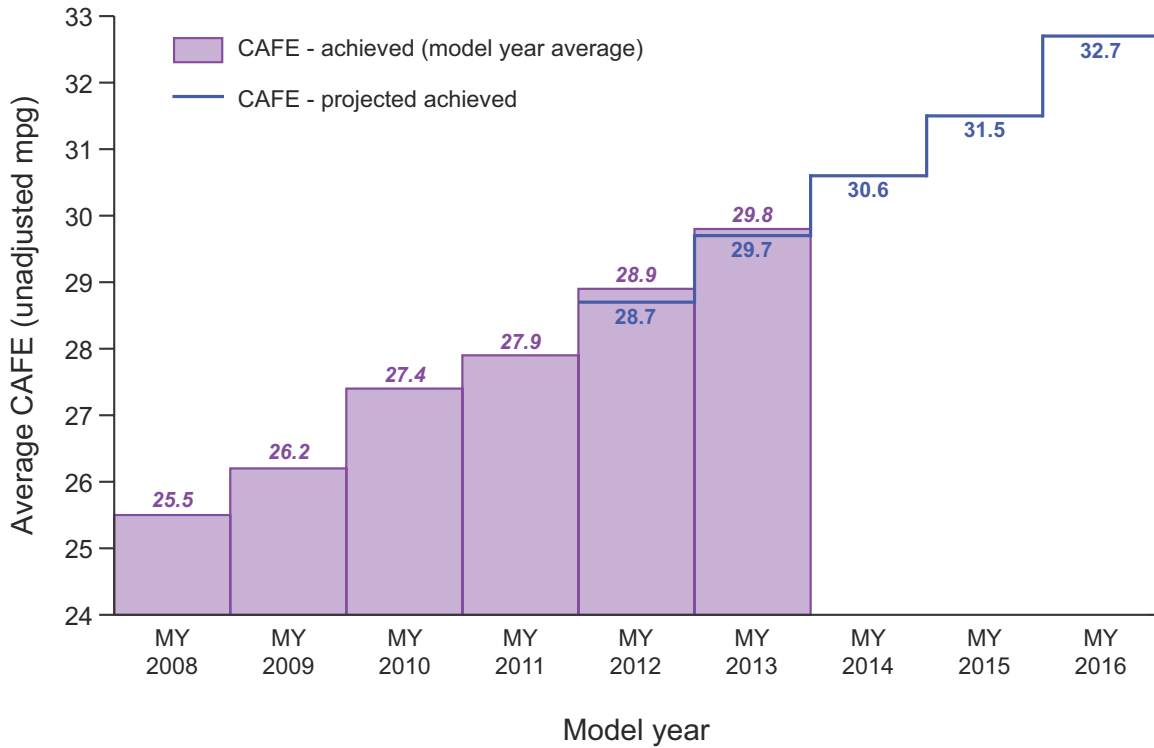


Figure 3. Average monthly and model year fleet-wide achieved CAFE performance levels versus NHTSA projected achieved CAFE levels for model years 2008 through 2016.

## **Conclusions**

Recent trends in CAFE performance, when compared with the performance levels projected to be achieved by NHTSA under the current standards, indicate that achieved CAFE performance has exceeded these anticipated levels for the 2012 and 2013 model years—the two years that the current standard has been in effect. Additionally, achieved CAFE performance has consistently increased annually from model year 2008 through model year 2013. If the current trends in annual improvements continue, future achieved CAFE performance is expected to continue meeting or exceeding the projected performance levels (and desired GHG reductions) contained in the latest CAFE standards.

## References

- EPA [Environmental Protection Agency]. (2013). *Download fuel economy data*. Available at: <http://www.fueleconomy.gov/feg/download.shtml>
- EPA/NHTSA [Environmental Protection Agency and National Highway Traffic Safety Administration]. (2010). *Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule*. Federal Register 75:88 (May 7, 2010), pp. 25324-25728. Available at: [http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cape/CAFE-GHG\\_MY\\_2012-2016\\_Final\\_Rule\\_FR.pdf](http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cape/CAFE-GHG_MY_2012-2016_Final_Rule_FR.pdf)
- EPA/NHTSA [Environmental Protection Agency and National Highway Traffic Safety Administration]. (2012). *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards; Final Rule*. Federal Register 77:199 (October 15, 2012), pp. 62623-63200. Available at: [http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cape/2017-25\\_CAFE\\_Final\\_Rule.pdf](http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cape/2017-25_CAFE_Final_Rule.pdf)
- Sivak, M. and Schoettle, B. (2013a). *Average sales-weighted fuel-economy rating (window sticker) of purchased new vehicles for October 2007 through September 2013*. Available at: [http://www.umich.edu/~umtriswt/EDI\\_sales-weighted-mpg.html](http://www.umich.edu/~umtriswt/EDI_sales-weighted-mpg.html)
- Sivak, M. and Schoettle, B. (2013b). *Sales-weighted unadjusted CAFE performance for October 2007 through September 2013*. Available at: [http://www.umich.edu/~umtriswt/EDI\\_sales-weighted-CAFE.html](http://www.umich.edu/~umtriswt/EDI_sales-weighted-CAFE.html)