Consumer Savings from 2025 Corporate Average Fuel Economy Standards (CAFE)

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1. INTRODUCTION

This report provides estimates of net savings under the latest CAFE (corporate average fuel economy) standards for a typical car and light truck owner. We have evaluated the costs and fuel savings associated with compliance with the 2025 standard--the latest model year (MY) proposed--relative to the existing standards for MY 2016. The costs of compliance are based on assumed incremental technology costs when purchasing a vehicle, as well as associated annual insurance and maintenance costs. Fuel savings are based on forecasts of future gasoline prices and miles driven.

As shown in Table 1, we found that the lifetime net savings (i.e. savings minus costs) for compliance with the MY 2025 standard are $3,000 per car and $4,200 per light truck, under base case assumptions for gasoline prices and technology costs. Under a higher gas price regime, compliance becomes even more attractive, with a typical car saving $5,600 and a truck saving $7,300.

Table 1: Lifetime Net Savings for MY 2025 Compliance (Net Present Value at 3% discount rate)

Gas Prices	Car	Truck
Base Case	$3,000	$4,200
High Case	$5,600	$7,300

The savings estimates for cars and trucks are presented in further detail below. A description of the underlying assumptions is in the subsequent section.

2. NET SAVINGS FROM 2025 CAFE STANDARDS

Owners of new cars and trucks will save significantly when purchasing a vehicle that complies with the 2025 CAFE standards, relative to current standards. The 2025 CAFE standards for cars and trucks are 52.9 mpg (miles per gallon) for cars and 39 mpg for light trucks.[I] This represents a 46 percent increase in car fuel economy and a 42 percent increase for light trucks, compared to the 2016 standards.[2]

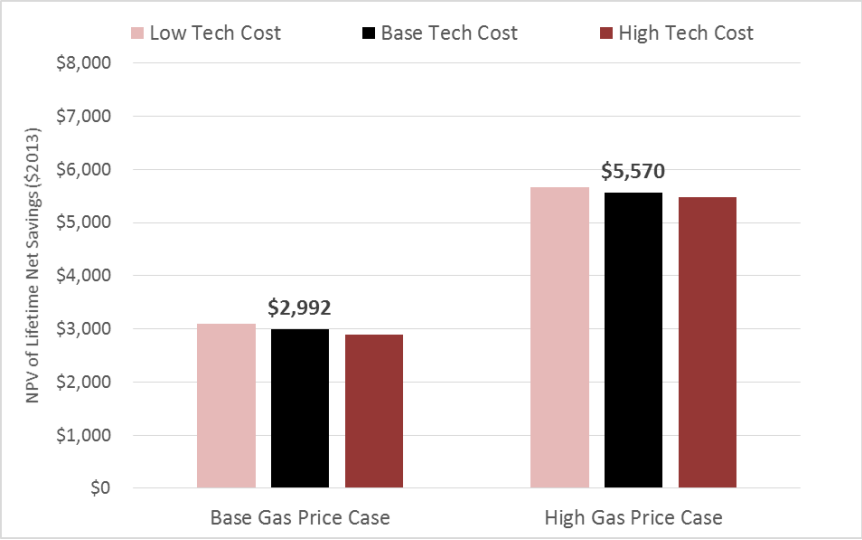
[I] U.S. EPA and U.S. DOT. *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards*, p.62640-1 (Final Rule). Available at: https://www.gpo.gov/fdsys/pkg/FR-2012-10-15/pdf/2012-21972.pdf. These levels represent the "average achieved fleet-wide," which accounts for other means of achieving compliance such as: flexible fuel credits (FFV), credits for electric and plug-in hybrid vehicles, payment of penalties (instead of compliance), and carrying over compliance credits from year to year. This results in an "average achieved" standard of 47.4 mpg for cars and trucks combined. This is different from the commonly reported 54.5 mpg standard for cars and trucks combined, which assumes that compliance can only be achieved through fuel efficiency technology.

[2] 2016 CAFE standards are 36.2 mpg for cars and 27.5 for trucks. Available at: http://www.nhtsa.gov/Laws+&+Regulations/CAFE+-+Fuel+Economy/Model+Years+2012-2016:+Final+Rule

Under base case assumptions for gasoline prices and compliance technology costs, we estimate that 2025 compliance will save $3,000 per car and $4,200 per truck—see Figure 1 and Figure 2 below.[3] These net savings estimates account for both the costs of compliance with the standard and resulting fuel savings—both of which are incremental to existing 2016 CAFE standards.

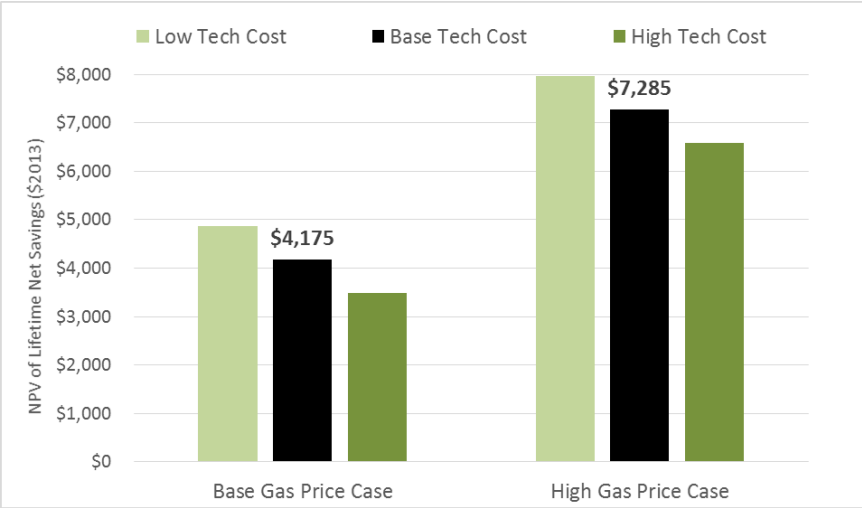
CAFE savings estimates fluctuate—while remaining positive—with variations in compliance costs and gasoline price assumptions. (We discuss these assumptions in more detail in the next section.) Higher gas prices lead to net savings of $5,600 per car (an 89 percent savings increase) and $7,300 per truck (a 74 percent savings increase). Under the most favorable assumptions considered--high gas prices and low technology costs—net savings are $5,700 per car and $8,000 per truck.

Figure 1: Lifetime Savings for MY 2025 Car (Net Present Value at 3% discount rate)



[3] Savings estimates were developed by Synapse using methodology that is consistent with previous EPA and NHTSA estimates. All dollar figures in this report are expressed in 2013 dollars.

Figure 2: Lifetime Savings for MY 2025 Light Truck (Net Present Value at 3% discount rate)



Because most cars and trucks are purchased using financing rather than cash upfront, most car and truck owners will save money immediately. When the compliance costs for CAFE are spread over the term of a typical loan—between five and six years—the annual fuel savings outweigh the annual costs in all years. The bars on Figure 3 and Figure 4 (below) show the annual compliance costs and fuel savings for a car and truck, respectively, under base case assumptions. Costs through year six are mostly from loan payments. After year six, low incremental insurance and maintenance costs persist in each year. The lines on each chart show the cumulative net savings (i.e. saving minus costs) through the vehicle's first ten years of operation. For both cars and trucks, half of the lifetime savings (shown above in Figure 1 and Figure 2) is realized by the ninth or tenth year of operation.

Figure 3: Annual Car Compliance Costs and Fuel Savings (per vehicle, assuming financing)

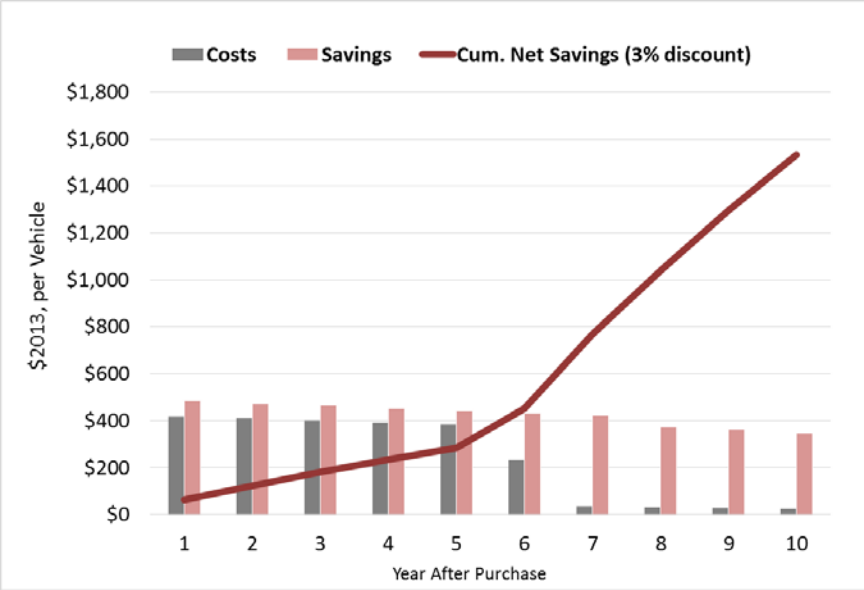
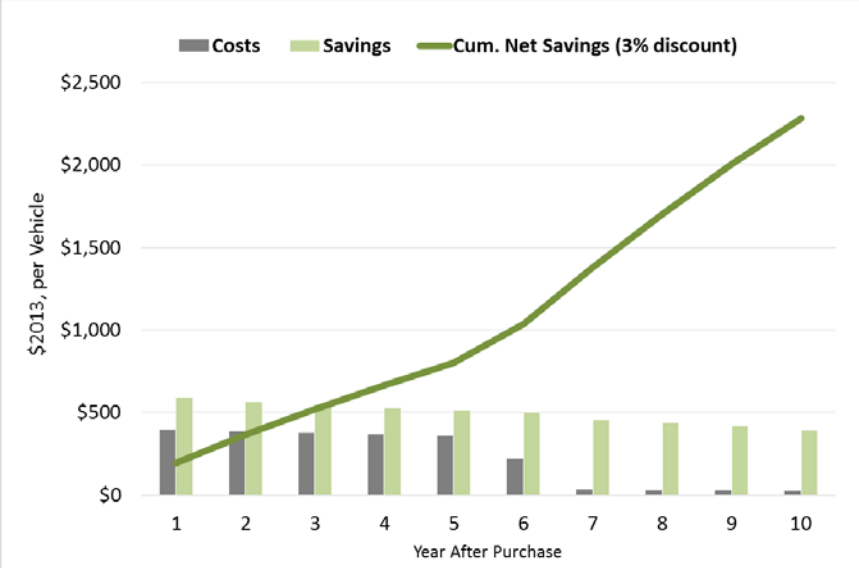


Figure 4: Annual Light Truck Compliance Costs and Fuel Savings (per vehicle, assuming financing)



In the less frequent scenario that the vehicles are paid for in cash, consumers will save slightly more over the lifetime of the vehicle than with financing. However, unlike with financing, owners paying cash will not experience savings immediately. This is merely because the fuel savings in the first year do not outweigh the additional compliance costs if an owner pays for the vehicle in one lump sum. For a car paid for with cash, the "payback" period, or time until there are cumulative net savings from 2025 CAFE compliance, ranges between three and five years (depending on future gasoline prices and compliance

costs). A truck owner paying cash will see net savings starting between two and five years from purchase.

3. METHODOLOGY FOR ESTIMATING NET SAVINGS

Compliance costs for the 2025 standard were based on estimates from the U.S. Environmental Protection Agency (EPA) and National Highway Traffic Safety Administration (NHTSA). The EPA estimates were higher than those from NHTSA for both cars and trucks. Thus we used the EPA estimates as a high cost case, NHTSA estimates as a low cost case, and the average of the two as the base case. This resulted in a mid-range estimate of $1,738 per car and $1,630 per truck. There is significantly more variation in the compliance cost estimates for trucks than there is for cars. This effect is seen when comparing the lifetime savings results between technology cost cases for cars (shown in Figure 1) compared to trucks (shown in Figure 2). Under financing, we assumed that the compliance cost was spread over an average car loan term and was subject to the average interest rate on new car loans.[4]

Table 2: MY 2025 Compliance Cost Estimates

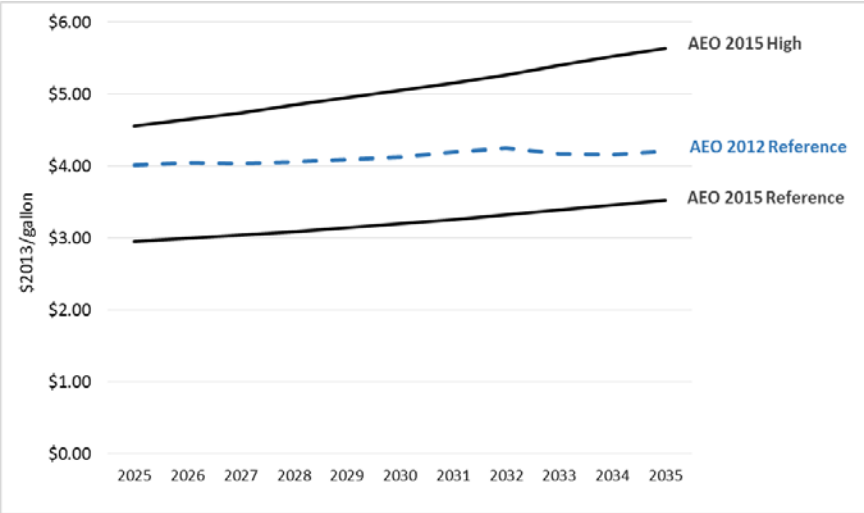
Cost per vehicle	Car	Truck
High (EPA)[5]	$1,816	$2,167
Base (average of low and high)	$1,738	$1,630
Low (NHTSA)[6]	$1,659	$1,094

The most important determinant of net savings is the gasoline price. In this study, we relied on the Energy Information Administration's (EIA) Annual Energy Outlook (AEO) developed in 2015 (the latest version available). Figure 5 shows the AEO 2015 reference gasoline price starting at around $3.00 per gallon in 2025. The "high" case starts at about $4.50 per gallon.[7] Our previous study used the AEO 2012 gasoline price forecast, which was between the base and high cases used in the current study, as shown

[4] Experian, State of the Automotive Finance Market Fourth Quarter 2015. Available at: http://www.experian.com/assets/automotive/quarterly-webinars/experian-auto-2015-q4.pdf. We assumed the reported average loan term of 67 months and average interest rate of 4.63%.
[5] Final Rule, Table I-16. Adjusted from 2010 to 2013 dollars based on Producer Price Index for Motor Vehicles reported by Bureau of Labor Statistics (available at: http://www.bls.gov/news.release/archives/ppi_01152014.pdf)
[6] Final Rule, Table III-25. Adjusted from 2010 to 2013 dollars as noted above.
[7] The "high" case is based on AEO's High Oil Price scenario. All AEO forecasts are available at: http://www.eia.gov/oiaf/aeo/tablebrowser/

in Figure 5.[8] Thus, the base case results presented in this study reflect decreased gas price expectations compared to three years ago.[9]

Figure 5: Motor Gasoline Price Forecasts



NHTSA's fuel economy values were developed under test conditions and have historically been higher than actual vehicle economy, as reported by the Federal Highway Administration (FHWA).[10] Thus, in estimating fuel savings, the miles per gallon targets mentioned previously were tempered with what is referred to as the "fuel economy gap." This adjustment attempts to capture actual performance on the road. As shown below in Table 3, this gap leads to adjusted values of 41.3 mpg for cars and 32.5 mpg for trucks.

Fuel savings is also determined by the vehicle miles traveled (VMT). We relied on previous assumptions for lifetime VMT, including the annual survival rate of cars and trucks over time.[11] The typical car or truck evaluated in this study is a representation of the entire fleet. For example, if 20 percent of the car fleet is off the road by year 11, then the VMT for our typical car in that year is adjusted downward to reflect

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[8] Consumers Union. *A Review of Consumer Benefits from Corporate Average Fuel Economy (CAFE) Standards*, June 2013. Available at: http://consumersunion.org/wp-content/uploads/2013/06/FuelEconomyStandards.pdf Estimates in the previous study were for a combined car/truck compliance vehicle. Therefore, they are not directly comparable to the separate car and truck estimates provided in this current study.

[9] AEO 2015's Low Oil Price scenario, not explored here, projects the highly unlikely trajectory that gasoline prices will stay under $3.00 through 2040. However, even under this extremely low case, the lifetime savings from compliance with the 2025 CAFE standards were $1,800 per car and $2,700 per truck.

[10] U.S. EPA and U.S. DOT. *Joint Technical Support Document: Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards*, Table 4-1 (TSD). Available at: https://www3.epa.gov/otaq/climate/documents/420r12901.pdf.

[11] TSD, Table 4-3. Available at: https://www3.epa.gov/otaq/climate/documents/420r12901.pdf. The survival-weighted VMT in our study is based in part on the proportion of cars and trucks that are expected to remain on the road in each year through their respective lifetimes. These assumed survival rates used by NHTSA are based on historical vehicle registration data.

the remaining fleet. Therefore, the fuel usage for a typical vehicle--and related savings--decays in each year as cars or trucks are taken off the road.

Previous evaluations of the rule also considered the "rebound effect" whereby people drive more (or less) when fuel costs are lower (or higher). In order to be consistent with these methods, we allowed the VMT to vary with fuel costs per mile (from both gasoline price and fuel economy). Thus, vehicles were assumed to travel more miles under base gas prices case than under high gas prices. Likewise, vehicles were assumed to travel more under the 2025 standards than under the 2016 standards.

Table 3: Miles per Gallon and Lifetime Vehicle Miles Traveled (VMT) Assumptions

Fuel economy and usage per vehicle	Car	Truck
Initial MY 2025 mpg[12]	52.9	39.0
Fuel economy gap[13]	22%	17%
Adjusted MY 2025 mpg	41.3	32.5
Lifetime survival-weighted VMT, 2025 vehicle (base)[14]	213,383	227,863

4. CONCLUSION

This study has shown that increased fuel economy with more stringent 2025 CAFE standards will lead to significant net savings for car and truck owners. Under mid-range assumptions, we estimate that the new standard will save $3,000 per car and $4,200 per truck. Assuming the vehicle is purchased using a loan, the compliance costs are immediately outweighed by decreased fuel spending. Under a high-priced gas regime, the net savings almost double for cars and increase by 74 percent for trucks.

This study relies on some assumptions developed before 2012, when the latest rule was drafted. When the EPA and/or NHTSA develop new assumptions for 2025 CAFE compliance, it will be possible to present more fully updated results along with up-to-date forecasts of gasoline prices, as become available.

[12] Final Rule, p. 62641
[13] Final Rule, Table IV-10
[14] We adjusted annual VMT to fluctuate based on costs per mile. Consistent with EPA's methodology, we assumed an elasticity of -.10 for VMT with respect to fuel costs, i.e. a 10% decrease in fuel costs would lead to a 1% increase in VMT.