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Prospects for Meeting the Corporate Average Fuel Economy Standards in the U.S.

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Abstract

In 2013, the transportation sector accounted for 34% of the United States' greenhouse gas emissions, with no significant change from prior years. Efforts to improve vehicle transportation efficiency and curb associated environmental emissions had led to the Corporate Average Fuel Economy (CAFE) standards for passenger cars and light trucks initially introduced in 1975. The National Highway Traffic Safety Administration has phased in new standards recently that require an average combined fleet-wide fuel economy of 35.1 - 35.4 mpg by 2017, 40.3 - 41.0 mpg by 2021, and 48.7 - 49.7 mpg by 2025. The new legislation has the potential to reduce overall U.S. emissions by close to 6% should the 2025 goals be attained. To reach these targets, compliance levels set to begin in 2017 will require a fine to be paid for every 0.1 mpg a manufacturer's fleet average is below the compliance target. The goal of this study was to assess the potential for CAFE to achieve the desired average fleet fuel economy goals set forth in the U.S., and evaluate its past effectiveness at reducing actual on-road fuel consumption. The possibility of the 2017-2025 CAFE standards to be more or less successful than the 2011-2016 standards at meeting fuel economy goals were evaluated together with strategies that auto manufacturers would most likely use to meet the 2017 - 2025 CAFE standards. The study analyzed past transportation efficiency trends and future projection models, and explored the industry and consumer-side impacts of the CAFE standard within the proposed timeframe. The possibility of automakers adapting to presented changes quickly to meet the increasingly strict CAFE standards and keeping up with improving the average fleet fuel economy seem difficult at best. While the effectiveness of allowances and credits similar to a cap and trade mechanism has prevented a major shortfall between CAFE standards and average fleet fuel economy to date, it is likely that most manufacturers will not be able to adapt in time to avoid facing fines moving into the future.

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1. Introduction

The National Highway Traffic Safety Administration (NHTSA) will begin enforcing updated standards based upon the preexisting CAFE requirements in 2017. These standards require an average combined fleet-wide fuel economy of 40.3 - 41.0 miles per gallon (mpg) by 2021 and 48.7 - 49.7 mpg by 2025. These new guidelines update those presented in the 1975 Energy Policy and Conservation Act; the first attempt in the U.S. at encouraging increased fuel economy and reduced dependence on foreign energy supply. Within the decade following the Act, fuel economy of passenger vehicles doubled between 1975 to 1984, while light truck fuel economy increased by 50% [1]. Still, the U.S. lags behind other developed countries in terms of average fuel economy. According to the United Nations Department of Economic and Social Affairs, in 2014 Europe had an average fleet-wide fuel economy of 50 mpg, China had 38 mpg, while the United States stood at 32 mpg [2]. Despite technological and legislative developments following the Energy Policy and Conservation Act, fuel economy in the United States has remained unchanged for the past 15 years [3].

According to EPA, the transportation sector was responsible for 27% of total emissions in 2013 [4]. Of the total energy used by the transportation sector, 58% was associated with light-duty vehicles [5]. Increased fuel economy will continue to be a necessary component in reaching the emissions goals that were agreed upon at the 2015 Paris Agreement to Combat Climate Change, where the U.S. has committed to greenhouse gas reductions of 26-28% from 2005 levels by year 2025 [6-7]. Making adjustments to increase average fleet fuel economy would be the primary way for automakers to avoid the high fines imposed by CAFE and contribute positively to the United States' carbon emissions goals.

The goal of this paper was to assess whether CAFE is an effective policy for meeting U.S. greenhouse gas emissions goals in comparison to other available policies. The past effectiveness of CAFE from 1975 until today at reducing actual on-road fuel use was evaluated, and the possibility of the 2017-2025 CAFE standards to be more or less successful than the 2011-2016 standards at meeting fuel use reduction goals were assessed. Also, strategies that auto manufacturers would most likely use to meet the 2017 - 2025 CAFE standards and their potential success in terms of actually meeting U.S. fuel use reduction goals were investigated.

2. Factors Influencing Total Fuel Consumption

There are a variety of variables influencing the fuel usage of passenger vehicles and light-duty trucks. These factors include vehicle size and weight, vehicle efficiency and performance, consumer driving behavior, vehicle purchasing behavior, fuel prices, fuel types and alternative fuel technology, differences between on-road fuel economy versus tested values, and methods used to track fuel use and emissions. Relationships between these listed factors and total fuel consumption are discussed in this section.

Vehicle Size and Weight: Weight and power have risen in vehicles across the globe, enough to counteract any improvements made in technological efficiency in the United States from the mid-1990s [8]. Still, U.S. cars and light trucks are ranked as being the heaviest of any nation. In other developed countries of Europe, Sweden was found to have the heaviest cars while Italy had the lightest--this is thought to be due to taxation and existing car policies in the respective countries [9].

Engine Efficiency and Performance: Engine efficiency has increased over the past several decades, insinuating that fuel economy should have seen improvements far higher than what has been observed. However, a simultaneous increase in vehicle size, weight, and power has counteracted any such performance improvements, as was mentioned previously [8].

Driving Behavior: It is important to understand the relationship between fuel prices and driving behavior. Consumers respond in a predictable way to higher fuel prices, by decreasing mostly the amount of unnecessary, as well as the most fuel-intense, miles they drive. However, the long-term impacts of an increase in fuel price are less straightforward, although more important to determine trends. For example, it is necessary to understand how fuel prices influence a multi-car family's decision on which car to drive, and how those increased fuel prices influence car manufacturers in developing more fuel-efficient vehicles [8]. A study focusing on the European Union (EU) market identified that increased fuel prices were more effective at reducing fuel use than incentive programs for fuel-efficient cars [10].