Issue Brief

September 27, 2016

Midterm Evaluation of Fuel Economy Standards Provides Opportunity to Expand Use of Advanced Fuels, Promote Driverless Technologies, and Strengthen U.S. Energy Security

Summary

- In 2012, the U.S. National Highway Traffic Safety Administration (NHTSA) and the U.S. Environmental Protection Agency (EPA) together finalized a rulemaking establishing fuel economy standards for cars and light-duty trucks for model years 2017 through 2025. The agencies estimated that the extension of the National Program would result in an average fleet-wide level of 163 grams per mile of carbon dioxide tailpipe emissions in model year 2025, equivalent to 54.5 miles per gallon if achieved only through fuel economy improvements.

- The 2012 rulemaking required that the agencies conduct a Midterm Evaluation (MTE) of standards for MY 2022 through 2025 to determine whether they remain appropriate. Released in July, the Draft Technical Assessment Report is the first of three steps of the MTE process, which will be followed by a Proposed Determination in 2017 and then a Final Determination no later than April 1, 2018.

- Improved light-duty fuel efficiency has been critically important in lowering the oil intensity of the economy, which in turn strengthens U.S. economic and national security by insulating businesses and consumers from oil price volatility.

- Conditions in the global oil market have changed substantially since EPA and NHTSA released the final 2012 rule. Largely driven by surging American oil production, but alongside slower-than-expected demand growth and the outcome of OPEC's November 2014 meeting—at which Saudi Arabia and its allies decided to go against historical precedent to sustain production levels and ultimately Saudi Arabia in fact flooded the market with some of its spare capacity—prices plummeted to multi-year lows by January 2015. At the time the MY 2017 through MY 2025 light-duty vehicle (LDV) standards were issued, EIA's most recent gasoline projection was $3.85 per gallon in 2015 (average) and $4.19 per gallon in 2025 (average). In fact, gasoline averaged just $2.51 per gallon in 2015, approximately 35 percent lower. Gasoline is currently projected by EIA to average $2.97 per gallon in 2025.

- The structural imbalance in the oil market is perfectly consistent with the longer-term elements of the Saudi strategy—including sharply reduced investment in developing new non-OPEC oil supplies, reduced competition to oil in transportation, and potential structural shifts in oil policy in the United States and other oil-consuming countries. In effect, these (uncertain and ever-changing) trends will reduce the market's already limited capacity to respond flexibly as prices rise, requiring significantly higher prices to balance the market.

- In the 2012 rule, EPA and NHTSA assumed that in 2025, 66 percent of LDV sales would be cars and 34 percent would be trucks, such as pickups and SUVs. Last year, however, the government was projecting that by 2025, 52 percent would be cars and 48 percent would be trucks. This sales mix translates to a fleetwide mpg-e of 50.8, equivalent to 36.0 mpg on-road fuel economy (the TAR Reference Case). Notably, even this fleet mix is far more heavily weighted towards cars than today's sales mix. Accordingly, the National Program may fall far short of its oil savings goals if the fleet continues to skew more heavily toward trucks.

- SAFE continues to support the National Program. SAFE also encourages the agencies to carefully consider several other issues as part of the MTE. These issues include extending the incentive multiplier for advanced fuel vehicles (AFVs), examining the future role of autonomous and connected vehicle technologies, exploring the emerging role of carsharing, ridesharing, and other new mobility business models on vehicle usage patterns and fuel savings, and adjusting the energy security analysis.

- In its 2006 report, *Recommendations to the Nation on Reducing U.S. Oil Dependence*, SAFE, under the auspices of its Energy Security Leadership Council, recommended that increased fuel economy standards serve as the centerpiece of a series of policies to enhance the nation's energy security. This culminated in the passage of the Energy Independence and Security Act of 2007, which, to a significant extent, incorporated SAFE's recommendations. Most importantly, it required that beginning with MY 2011, fuel economy standards be increased to reach a combined average of 35 miles per gallon (mpg) by 2020.

Fuel Economy Standards for MY 2017-2025 Light-Duty Vehicles

In 2012, the U.S. National Highway Traffic Safety Administration (NHTSA) and the U.S. Environmental Protection Agency (EPA) together finalized a rulemaking establishing fuel economy standards for cars and light-duty trucks for model years (MY) 2017 through 2025.[1] The agencies estimated that the extension of the National Program would conserve approximately 4 billion barrels of oil over the lifetimes of MY 2017 through MY 2025 light-duty vehicles (LDVs).[2] They projected that compared to a continuation of standards for MY 2012 through MY 2017, the standards for MY 2017 through MY 2025 would yield net benefits to society of between $372 billion and $507 billion.[3]

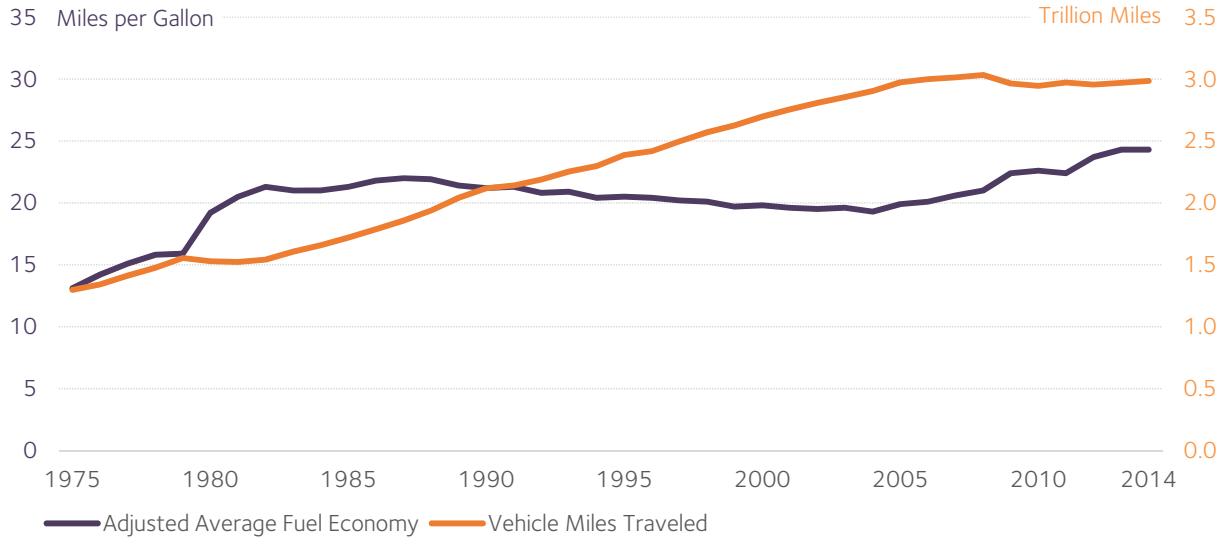
The standards were projected to result in an average fleetwide level of 163 grams per mile of carbon dioxide tailpipe emissions in model year 2025, equivalent to 54.5 miles per gallon (mpg) if achieved only through fuel economy improvements.[4] The standards vary based on vehicle footprint value

[1] NHTSA, "Obama Administration Finalizes Historic 54.5 mpg Fuel Efficiency Standards," August 28, 2012.
[2] NHTSA, *NHTSA and EPA Set Standards to Improve Fuel Economy and Reduce Greenhouse Gases for Passenger Cars and Light Trucks for Model Years 2017 and Beyond*, at 2.
[3] Id.
[4] EPA, *EPA and NHTSA Set Standards to Reduce Greenhouse Gases and Improve Fuel Economy for Model Years 2017-2025 Cars and Light Trucks*, at 1, August 2012.

(related to the size of the vehicle). For example, 'compact car' standards were projected to reach 61.1 mpg in model year 2025 while 'small SUV' standards were projected to reach 47.5 mpg.[5]

The National Program offers automakers a variety of credits and other incentives in order to provide compliance flexibility.[6] These include incentives to encourage the development of advanced fuel vehicles (AFVs) like plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs). They also include "off cycle" credits for improvements to air conditioning efficiency, for example, and other features that improve vehicle fuel economy or reduce greenhouse gas (GHG) emissions but are not adequately captured in current test procedures.

FIGURE 1 • HISTORICAL LIGHT-DUTY VEHICLE FUEL ECONOMY AND VEHICLE MILES TRAVELED



Source: EPA and AFDC

Draft Technical Assessment Report

The 2012 rulemaking required the agencies to conduct a Midterm Evaluation (MTE) of the standards. EPA's requirement is to determine if the standards remain appropriate and to make any necessary adjustments to the rule. Once the MTE is complete, one of three things will happen: the EPA standards will remain unchanged, will be made more stringent; or will be made less stringent. For NHTSA, the process is different. Because NHTSA can only make rules in five year increments, the agency needs to complete a new rulemaking process for vehicle model years 2022 through 2025.[7] In addition, the California Air Resources Board has joined EPA and NHTSA in harmonizing that state's regulations to create one national standard. California is participating in the MTE but the results of the Evaluation ultimately do not affect California's ability to regulate cars and trucks in that state. Released in July, the Draft Technical Assessment Report (TAR) is the first step (of three steps) of the MTE. The TAR will be followed by a Proposed Determination in 2017 and then a Final Determination issued no later than April 1, 2018.[8]

[5] Id., Table 2, at 6.
[6] Id., at 7-9.
[7] If NHTSA is, for some reason, unable to complete its rulemaking, the EPA standards will remain in force.
[8] EPA, Midterm Evaluation of Light-duty Vehicle GHG Emissions Standards for Model Years 2022-2025.

The TAR presents the two agencies' analyses about a variety of topics relevant to the standards for MY 2022 through 2025 for public comment. The three primary conclusions of the agencies' independent analyses were that:

- A wider range of technologies exist for manufacturers to use to meet the standards at similar or lower costs than projected in 2012;
- Gasoline vehicle technologies will continue to be the most predominant, with only modest levels of hybridization and very low levels of electrification needed to meet the standards;
- The standards were designed to yield improvements by vehicle class independent of trends in consumer purchasing decisions. The annual improvements as designed are being met.[9]

The agencies also highlighted that automakers are, on average, over-complying with the standards for MY 2012 through 2014.[10] The TAR identifies more than 100 passenger car, SUV, and pickup truck models available today that already meet the standards for MY 2020 or later.[11]

The Importance of Fuel Economy

Almost 40 percent of total U.S. primary energy demand is met by oil, giving it an economic significance unmatched by any other fuel.[12] The transportation sector accounts for more than 70 percent of total U.S. oil consumption, of approximately 19 million barrels per day (mbd).[13] This sector relies on oil for 92 percent of its total energy consumption—97 percent when including ethanol blending—and has no readily available substitutes.[14] There are approximately 240 million registered LDVs in the United States accounting for more than 60 percent of transportation sector oil consumption.[15]

Oil is a globally traded commodity, meaning that prices are affected by events in oil-producing and oil-consuming countries and regions around the world. The key consequence of this dynamic is that changes in oil supply or demand anywhere tend to affect prices everywhere. In fact, U.S. gasoline prices are more closely correlated with global crude streams than the U.S. crude oil benchmark, West Texas Intermediate (WTI). Because there are no readily available substitutes to oil in the U.S. transportation sector, the primary and near-term impact of changes in crude oil and petroleum product prices on the U.S. economy—and the economies of other oil-consuming countries—is through the amount of oil consumed, not the amount of oil produced or imported. Therefore, lowering oil intensity will best protect the U.S. economy from the vagaries of the global oil market.

The global oil market is also frequently subject to unpredictable—and sometimes anti-competitive—behavior from oil-producing countries that supply it, most notably from members of the Organization of the Petroleum Exporting Countries (OPEC). For example, the organization's November 2014

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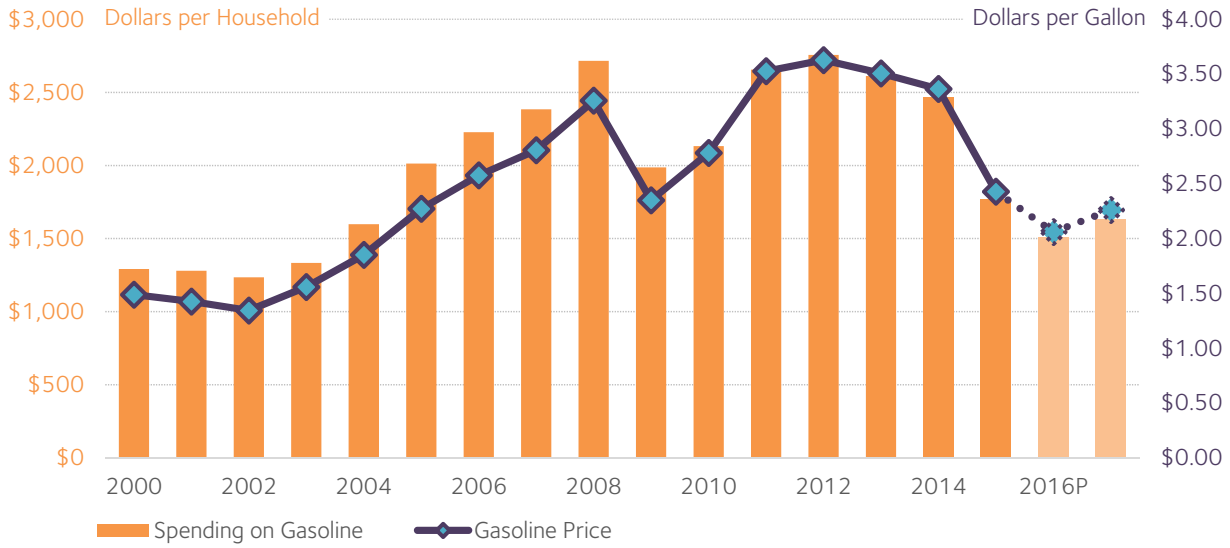
[9] EPA, NHTSA, and California Air Resources Board (CARB), *Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025* (hereafter, *TAR*), July 2016, at ES-2.
[10] Id., at ES-3.
[11] See, e.g., DOT, Fastlane, "Technical Report Highlights Auto Industry's Success Meeting Fuel Economy and GHG Standards," July 18, 2016.
[12] SAFE analysis based on data from EIA, *Monthly Energy Review* (*MER*), July 2016, Table 1.3 (2015 data).
[13] EIA, U.S. primary energy consumption by source and sector, 2015; and EIA, *MER*, July 2016, Table 3.1 (2015 data).
[14] SAFE analysis based on data from EIA, *MER*, July 2016, Table 2.5 (2015 data).
[15] DOT, Bureau of Transportation Statistics; and ORNL, *Transportation Energy Data Book*, Edition 34, September 2015, at Table 1.14.

decision not to reduce output despite a growing imbalance between global oil demand and supply, and more importantly against expectations long rooted in historical precedent, helped contribute to a more than 50 percent decline in oil prices between the summer of 2014 and January 2015, resulting in levels of oil price volatility not observed since 2009, among other impacts.[16] Moreover, approximately three-quarters of the world's proved oil reserves are held by government-owned national oil companies whose investment and production decisions are far removed from the free market ideal.[17]

FIGURE 2 • HOUSEHOLD SPENDING ON GASOLINE, 2000 TO 2017 P



Source: SAFE analyis based on data from BLS, Census Bureau, and EIA

Between 2011 and 2014, the country's reliance on oil resulted in an average economy-wide spend of almost $880 billion per year on petroleum products, equivalent to more than 5 percent of U.S. gross domestic product (GDP).[18] Total U.S. spending on petroleum fuels exceeded a combined $3.5 trillion during this period.[19] These high levels of spending—more than twice what they were in the early 2000s—strain the budgets of consumers, businesses, and governments alike.[20] Higher oil prices also added $1.2 trillion to the U.S. federal debt between 2002 and 2012, and every U.S. recession for the past 40 years has been preceded by, or coincided with, an oil price spike.[21] Despite an increase in domestic oil production, the United States continues to send nearly $1 billion abroad each day to pay for oil, often to countries that share neither American interests nor values.[22]

Oil prices and U.S. spending on oil were markedly lower in 2015—averaging $52 per barrel (bbl) and falling below $600 billion, respectively.[23] They are projected to fall further in 2016.[24] Annual household

[16] SAFE analysis based on data from EIA.
[17] EIA, Energy in Brief, "Who are the major players supplying the world oil market?" last updated February 11, 2016.
[18] SAFE analysis based on data from BEA.
[19] SAFE analysis based on data from EIA.
[20] SAFE analysis based on data from BEA and EIA.
[21] SAFE, *Oil and the Debt*, October 2013, at 1; and SAFE analysis based on data from BEA, EIA, and the National Bureau of Economic Research.
[22] SAFE analysis based on data from EIA (2015 data).
[23] EIA; and SAFE analysis based on data from EIA.
[24] Id.

spending on gasoline has dropped by approximately $700 since 2014, to levels last observed in 2009 (during the Great Recession) and 2005 (Figure 2).[25]

Conversely, the effect on the American energy industry has been detrimental; more than 140,000 workers have lost their jobs since late-2014 despite rising GDP and a declining unemployment rate economy-wide.[26] Post-2015 oil expenditures are projected to remain between double and triple the inflation-adjusted levels observed from 1986 to 2002.[27] Similarly, in 2008 when oil prices spiked to a historic high of $147/bbl the effect on GM, Chrysler, and Ford was especially damaging. Both GM and Chrysler were forced into bankruptcy as consumer preferences shifted away from SUVs and pickups towards more efficient options, and economic conditions deteriorated generally, decreasing vehicle sales.

The extreme economic importance of oil to the United States creates adverse national security challenges. Notably, more than 50 percent of daily oil supplies transit through seven major chokepoints in often unstable regions, particularly the Middle East.[28] The U.S. military is placed in harm's way to protect these maritime supply routes and vulnerable energy infrastructure across the globe. Moreover, U.S. oil dependence weakens the country's ability to address foreign policy challenges. Effective sanctions on Iran's oil industry, for example, were undermined as far back as 2005 by the impact such sanctions would have had on global oil prices.

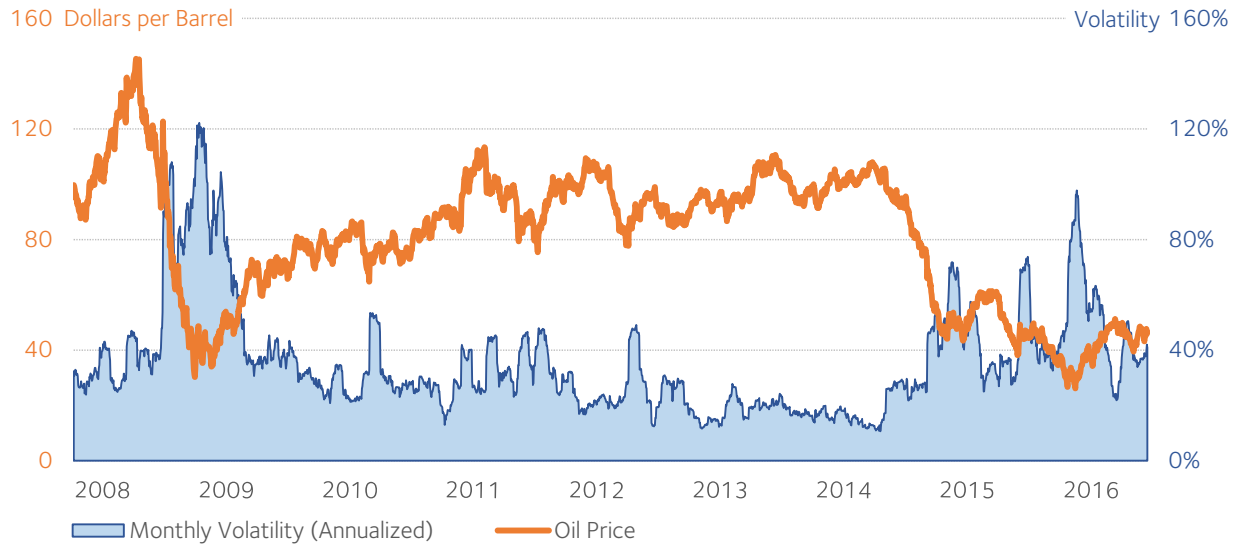
Uncertain events around the world also contribute to volatility in global oil markets and oil prices (Figure 3). For example, conflict in Yemen affected oil prices in mid-2015 despite Yemen's minimal oil production capacity, in part due to the country's strategic location adjacent to the Bab el-Mandeb strait and shared border with Saudi Arabia. Moreover, political and economic turmoil in Venezuela, the emergence and expansion of Daesh (Islamic State of Iraq and the Levant, or ISIL) in Northern Iraq and Syria, and other developments foment concerns over the security and stability of global oil supplies beyond already meaningful disruptions to output in countries like Libya and Nigeria.

The United States has made genuine progress toward advancing energy security since the country first became aware of the risks posed by oil dependence in the early 1970s. Most importantly, observed vehicle fuel economy has improved by more than 86 percent, from 13.6 mpg in 1974 to 25.3 mpg in 2016 (although much of that progress was made between 1975 and 1986).[29] The oil intensity of the economy has been reduced by nearly 50 percent over the same period (i.e. there is double the level of economic activity for each barrel consumed).[30]

Improved light-duty vehicle fuel efficiency has been critically important in enhancing U.S. economic and national security. Lowering the oil intensity of the economy through improving vehicle fuel efficiency helps mitigate the vulnerability. Although the United States has faced serious challenges as a nation over the past several decades as a result of its dependence on oil, these would have been more serious without the progress made in improving the fuel efficiency of light-duty vehicles.

[25] SAFE analysis based on data from BLS, Census Bureau, and EIA.
[26] SAFE analysis based on data from BLS.
[27] See, e.g., EPA and NHTSA, *TAR*, July 2016, at 10-21.
[28] See, e.g., EIA, World Oil Transit Chokepoints, November 10, 2014, at 2.
[29] See, e.g., NHTSA, Historical Passenger Car Fleet Average Characteristics; and NHTSA, Summary of Fuel Economy Performance.
[30] SAFE analysis based on data from EIA and BEA.

FIGURE 3 • OIL PRICE VOLATILITY



Source: SAFE analysis based on data from EIA

SAFE's 2006 Recommendations and the Energy Independence and Security Act of 2007

In its 2006 report, *Recommendations to the Nation on Reducing U.S. Oil Dependence*, SAFE, under the auspices of its Energy Security Leadership Council (ESLC), recommended that increased fuel economy standards serve as the centerpiece of a series of policies—which also included increased domestic oil production—to enhance the nation's economic and national security.[31] Specifically, the ESLC recommended that:

- NHTSA be directed to revise the CAFE regulatory structure by establishing size-based and/or attribute based standards for passenger car fuel efficiency, while also increasing reliance on market mechanisms such as those that allow the banking and trading of compliance credits;
- NHTSA tighten fleetwide fuel economy standards by 4 percent each year over a period of several years and be allowed to establish multi-year compliance periods;
- NHTSA be allowed to slow the pace of fuel efficiency improvement if it determined that the 4 percent default requirement: was technologically unachievable; could not be achieved without materially reducing the overall safety of the passenger car fleet; or if there was clear and convincing evidence that the default standard was not cost-effective after taking into account the total social, economic, and geopolitical value of reduced gasoline consumption to the United States; and,
- Light-duty trucks be subject to the current regulatory regime through its expiration in 2012, at which time they would be merged into a single LDV fleet with the goal of maintaining the 4 percent improvement target for the combined fleet thereafter.[32]

[31] SAFE, *Recommendations to the Nation on Reducing U.S. Oil Dependence*, 2006.
[32] Id.

In the year after the ESLC's report was released oil prices rose, intensifying national interest in fuel economy standards. This culminated in the passage of the Energy Independence and Security Act of 2007 (EISA), which, to a significant extent, incorporated SAFE's recommendations.[33] Most importantly, it required that beginning with MY 2011, fuel economy standards be increased so that they would reach a combined average of 35 mpg by 2020.[34] President George W. Bush signed EISA into law on December 19, 2007.[35] President Barack Obama has embraced and strengthened this legacy since entering office.

Midterm Review Versus 2012 Rulemaking

Conditions in the global oil market have changed substantially since EPA and NHTSA released the final 2012 rule. Largely driven by surging American oil production, but alongside slower-than-expected demand growth and the outcome of OPEC's November 2014 meeting—at which Saudi Arabia and its allies decided to sustain production levels—prices plummeted to multi-year lows by January 2015. Despite falling prices, Saudi Arabia took the extraordinary step of sharply increasing its production. After averaging approximately $100/bbl from 2011 to 2014, prices averaged $52/bbl in 2015 and have averaged $40/bbl through July 2016 year-to-date.[36]

In normal market conditions, low oil prices are an overall benefit for the U.S. economy. Indeed, U.S. households in 2015 enjoyed a roughly $94.6 billion reduction in oil spending (on par with the 2011 payroll tax cut, which totaled $108 billion).[37] However, the U.S. energy landscape has transformed over the past decade, and low energy prices present the economy with complex tradeoffs, stimulating consumption while undermining a key growth sector—the domestic oil industry. Perhaps more importantly, the rapid and severe plunge in oil prices is transitory, and simply reflects Saudi Arabia's strategy to regain control of the global oil market and to restore the OPEC cartel's ability to more effectively manipulate markets in its own interests in the future.

The current climate of oil price volatility also creates a highly uncertain investment climate. Global upstream capital spending declined approximately 23 percent between 2014 and 2015 and is forecast to fall a further 26 percent in 2016 (only the second time in history that spending has declined for two consecutive years).[38] In the United States, spending is being affected more severely than elsewhere, and could decline by approximately $100 billion (or more than 60 percent) between 2014 and 2016.[39] In 2015, there were more than 40 oil industry bankruptcies, and several more thus far in 2016.[40] The decline in spending has also led to some 140,000 workers losing their jobs.[41] These elements are sustaining recessionary conditions in areas of the country, and laying the groundwork for future supply shortages.

Few observers expect the global oil market to remain oversupplied for much longer. Both the EIA and IEA expect the market to return to a condition of relative balance by next year. And in fact this realignment of supply and demand is expected to be short-lived, with the market overshooting and moving to a condition of undersupply in relatively short order. In a sense, this is the classic challenge

[33] Energy Independence and Security Act of 2007 (EISA), Public Law No. 110-140, 121 Stat. 1492.
[34] EISA at §102(2a).
[35] The White House, Office of the Press Secretary, President Bush Signs H.R. 6, the Energy Independence and Security Act of 2007, December 19, 2007.
[36] EIA, *Short Term Energy Outlook*, August 2016.
[37] SAFE analysis based on data from BEA.
[38] SAFE analysis based on data from Barclays Global Survey.
[39] Id.
[40] Navigant Consulting, *Oil and Gas Market Notes: 2016 State of Play*, March 2016, at 1.
[41] SAFE analysis based on data from BLS.

that has long afflicted the oil industry. Inelastic supply and demand fundamentals lead to periods of overshooting and undershooting, which can only be regulated by extreme swings in prices.

The coming period of undersupply, characterized by net inventory withdrawals rather than additions, is currently expected to be prolonged and relatively severe by historical standards. As of early 2016, IEA expects markets to roughly balance in 2017 followed by four consecutive years of net inventory withdrawals from 2018 to 2021, which average a steep 1.0 mbd in 2020 and 2021 combined and would remove a total of 1.1 billion barrels of oil from global inventories across the entire period.[42] The most recent analogous oil market occurred between 2007 and 2011, a period of record oil prices.

This anticipated structural imbalance is perfectly consistent with the longer-term elements of the Saudi strategy—including sharply reduced investment in developing new non-OPEC oil supplies, reduced competition to oil in transportation, and potential structural shifts in oil policy in the United States and other oil-consuming countries. In effect, these (uncertain and ever-changing) trends will reduce the market's already limited capacity to respond flexibly as prices rise, requiring significantly higher prices to balance the market.

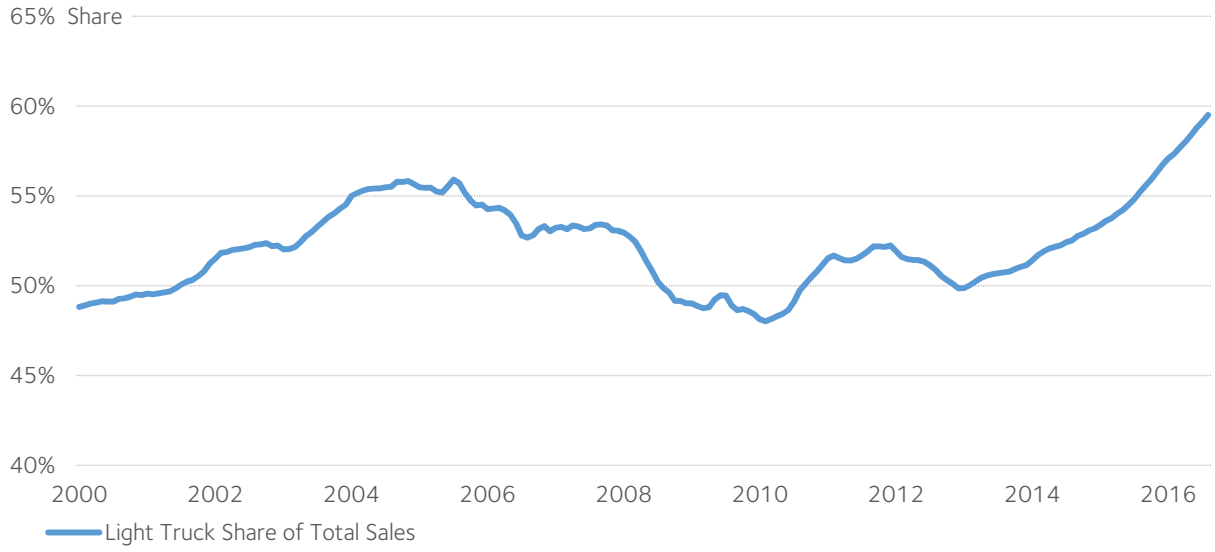
Lower oil prices have already spurred greater demands for mobility and gasoline in the United States. Once considered an early indicator of peak demand for travel and fuel consumption in America, U.S. vehicle miles traveled (VMT) increased at its fastest pace in at least 45 years in 2015, and now stands at its highest level in history. Even on a per capita basis, VMT in 2015 surged to levels last seen in 2007, prior to the financial crisis. Meanwhile, U.S. gasoline demand averaged 9.2 mbd in 2015, very near its all-time high.[43]

The impact of lower oil prices on vehicle buying decisions has also been significant. The light truck and SUV share of total LDV sales today is approximately 60 percent (Figure 4).[44] These vehicles accounted for less than 50 percent of total sales as recently as 2012.[45] Sales of AFVs also slowed markedly in 2015, exhibiting effectively zero growth year-over-year.[46] Moreover, and at least partly a consequence of these dynamics, the growth of average fuel economy rating of new LDVs sold has also flattened, remaining steady since late-2014 after increasing approximately 18 percent between MY 2008 and MY 2014 (Figure 5).[47]

At the time the MY 2017 through MY 2025 LDV standards were issued, EIA's most recent gasoline projection was $3.85 per gallon in 2015 (average) and $4.19 per gallon in 2025 (average).[48] In fact, gasoline averaged just $2.51 per gallon in 2015, approximately 35 percent lower.[49] Gasoline is currently projected by EIA to average $2.97 per gallon in 2025.[50]

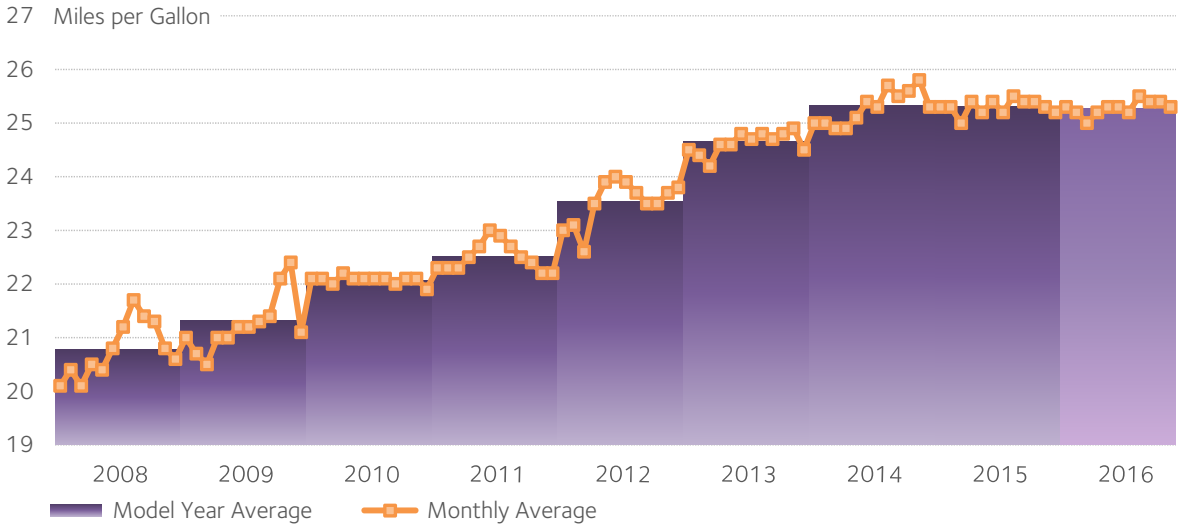
[42] SAFE analysis based on data from IEA, *2016 Medium-Term Oil Market Report* and *2015 Oil Market Report Statistical Annex*.
[43] EIA, *Petroleum Supply Monthly*.
[44] SAFE analysis based on data from BEA.
[45] Id.
[46] SAFE analysis based on data from Hybridcars.com.
[47] SAFE analysis based on data from Michael Sivak and Brandon Schoettle, University of Michigan Transportation Research Institute.
[48] EIA, *Annual Energy Outlook 2012*, Table 12 (adjusted to 2015 dollars).
[49] SAFE analysis based on data from EIA, *MER*, July 2016, Table 9.4.
[50] EIA, Annual Energy Outlook 2016, Table 12.

FIGURE 4 • LIGHT TRUCK SHARE OF U.S. AUTO SALES



Source: SAFE analysis based on data from BEA

FIGURE 5 • NEW LIGHT-DUTY VEHICLE FUEL ECONOMY RATINGS



Note: Average sales-weighted fuel-economy rating of purchased new light-duty vehicles through August 2016.
Source: SAFE analysis based on data from University of Michigan Transportation Research Institute

In the 2012 rule, EPA and NHTSA assumed that in 2017, 57 percent of LDV sales would be cars and 43 percent would be trucks.[51] By last year, however, the government was projecting that in 2017 only 49.8 percent of LDV sales would be cars and 50.2 percent would be trucks, and that by 2025, 52 percent would be cars and 48 percent would be trucks.[52] A sales mix of 52 percent cars and 48 percent trucks translates to a fleetwide mpg-e of 50.8, equivalent to 36.0 mpg on-road fuel economy

[51] EPA and NHTSA, *Joint Technical Support Document: Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards,* August 2012, at 1-14 to 1-15.
[52] EIA, *Annual Energy Outlook 2015*, Table 39.

and is the Reference Case presented in the TAR.[53] Notably, even this fleet mix is far more heavily weighted towards cars than today's sales mix. The National Program thus may fall short—and perhaps far short—of its oil savings goals if the fleet continues to skew more heavily toward trucks. Ultimately, even highly efficient trucks are not as efficient as passenger cars.

The Council continues to support the National Program, and the important role it plays in reducing oil dependence. The Council recognizes the difficulty of addressing the challenge posed by lower-than-expected oil prices, believing that such price dynamics reinforces the importance of not weakening the standards during the MTE. Gasoline prices are likely to rise substantially—and remain volatile—over the course of the program. Furthermore, today's price decline is an important validation of public policies that support long-term goals like efficiency and fuel diversity, regardless of short-term market fluctuations. Indeed, in the absence of fuel-economy standards, global oil price volatility and today's relatively low oil prices together would likely prevent nearly any gains in efficiency whatsoever, and render the country even more exposed to oil price shocks than it is currently.

Solutions

SAFE's mission is to pursue policies and strategies that aggressively reduce the nation's dependence on oil. Ultimately, this will require a diversification of fuel sources in the transportation sector. Today, plug-in electric vehicles hold incredible promise and must be prioritized in vehicle regulations. However, functionally these vehicles simply replicate the job of a gasoline-powered vehicle moving travelers from point A to point B. While offering numerous consumer benefits, electric vehicles therefore do not offer a truly transformation mobility experience. This is one of the great benefits of autonomous vehicles. Not only do these vehicles lend themselves to electrification, they also offer the consumer benefits beyond those of conventional vehicles. This is important because current fuel economy standards may ultimately not meet oil consumption or GHG goals due to consumer preferences. If it can be verified that the use of autonomous vehicles will improve overall fuel economy and reduce GHG emissions, the agencies should explore ways to maximize the benefits as soon as feasible.

In pursuit of greater vehicle electrification and in recognition of the promise of autonomous vehicles, SAFE encourages the agencies to carefully consider several issues as part of the MTE. These issues include extending the incentive multiplier for advanced fuel vehicles (AFVs), examining the future role of autonomous and connected vehicle technologies, exploring the emerging role of carsharing, ridesharing, and other new mobility business models on vehicle usage patterns and fuel savings, and adjusting the energy security analysis.

Incentive Multiplier for Advanced Fuel Vehicles

The widespread use of advanced fuels represents the best long-term solution to U.S. oil dependence. For this reason, the Council fully supported the inclusion in the 2012 rule (EPA) of an incentive multiplier for BEVs, PHEVs, CNGVs, and FCVs sold between MY 2017 and MY 2021.[54] This incentive was designed, in part, to facilitate economies of scale and ultimately the widespread adoption of these technologies beyond MY 2021 as the standards become more stringent. However, there is already some concern that the standards cannot be met without meaningful levels of electric vehicle adoption before 2025. Yet plug-in electric and other advanced fuel vehicles remain new to the marketplace and have thus far achieved only a very small share of total vehicle sales. To make matters worse, the appeal of these vehicles is also currently challenged by relatively lower oil prices. Given the inability to

[53] EPA and NHTSA, *TAR*, Table 10.3, at 10-4.
[54] Federal Register, *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards; Final Rule*, October 15, 2012, at 62628.

accurately predict consumer preferences or control market dynamics, the Council believes that EPA should extend the incentive multiplier for BEVs, PHEVs, CNGVs, and FCVs through MY 2025.

Support for Autonomous Vehicle Technologies

Autonomous vehicle technology has developed rapidly over the last several years and is on a trajectory to materially impact the U.S. transportation system before 2025, and radically transform transportation in the years that follow. The Council believes that autonomous vehicles could spur a much more rapid shift to advanced fuels like electricity and encourage the scaling of new business models such as mobility-on-demand.

These developments provide both a challenge and an opportunity for effective fuel efficiency regulations. Autonomous vehicles and ridesharing will change vehicle utilization dramatically and have the potential, if done properly, to decouple system-wide petroleum consumption and GHG emissions from current calculations of fuel economy based narrowly around the powertrain and specific vehicle attributes. Including autonomous vehicles in fuel efficiency regulations could offer an enormous opportunity to shape a technology which will have a deep impact on energy consumption.[55] Some scenarios for autonomous vehicle development show massive positive impacts in reduced petroleum consumption and GHG emissions.[56] These scenarios should be tested to see if the promise of autonomous vehicles can be demonstrated and if so, if that promise can be accelerated through regulation.

The MTE provides an opportunity to lay the early groundwork for the introduction of autonomous vehicles, which are poised for a first-generation test cycle under real world conditions. The Council offers two recommendations regarding methods to utilize fuel efficiency regulations to encourage the adoption of autonomous vehicles and maximize the fuel economy of the entire system, including both autonomous and non-autonomous vehicles.

Move towards the regulation of system impacts as opposed to on-vehicle technologies

Fuel economy standards are based on a limited number of testing procedures which focus on powertrain efficiency, with an allowance for off-cycle credits. As autonomous vehicles become more prevalent, they offer substantial opportunities to reduce energy consumption in the ground transportation system if the most efficient vehicles are used in the carsharing and ridesharing applications. The current approach to regulating fuel consumption, however, is focused on regulating the efficiency of the individual vehicles and not systems of vehicles. NHTSA and EPA should examine the opportunity to account for the greater efficiency and reduced oil consumption resulting from actual miles traveled to help ensure that the most efficient or non-petroleum vehicles accumulate the most miles per year. Moreover, the use of real world data—which is now increasingly available—should be encouraged to the extent feasible as an alternative to continued reliance on test-cycle data.

This approach could take the form of driving efficiencies through better algorithm design and accounting for the system-wide impacts of improved safety, better reaction times, and increased connectivity. Autonomous vehicles are likely to smooth driving cycles, which studies

[55] Austin Brown, Jeffrey Gonder, and Brittany Repac, "An Analysis of Possible Energy Impacts of Automated Vehicle", *Road Vehicle Automation* (2014); Don Mackenzie, Zia Wadud, Paul Leiby, "Help or hindrance? The travel, energy and carbon impact of highly automated vehicles," 2016.
[56] SAFE, *A National Strategy for Energy Security*, 2016; and Jeffery Greenblatt, Samveg Saxena, "Autonomous taxis could greatly reduce greenhouse-gas emissions of US light-duty vehicles," *Nature Climate Change*, 2015.

have shown are associated with significant gains in efficiency and emissions reduction.[57] Most importantly, quantifying and accounting for the greater impact of shared vehicles will incentivize the use of more efficient vehicles in this application and increase the number of miles driven by these vehicles.

Significant research will be needed to accurately quantify these effects. This effort should proceed quickly and with sufficient resources to enable the integration of autonomous vehicle technology into fuel economy standards going forward.

Interim approach to fuel economy standards and autonomous vehicle technology

As described earlier, the emergence of autonomous vehicle technology is generating enthusiasm for a radical transformation of the transportation sector, one that could spur a much more rapid shift to advanced fuels like electricity.

To encourage the development of this technology, the Council recommends that EPA and NHSTA coordinate with industry to establish a meaningful incentive to encourage the testing of autonomous vehicle fleets. The incentive should be based on actual usage data from autonomous vehicles and tied to the projected fuel consumption avoided had the travel instead occurred in a vehicle with fleet average fuel economy. This interim program should be designed so that data and insights collected from this effort will inform a comprehensive approach towards accounting for autonomous vehicle technology and induced utilization changes in vehicle regulations.

Energy Security and Societal Costs and Benefits

The agencies evaluate the energy security benefits of the National Program by estimating the economic costs of U.S. dependence on oil imports. Given the country's continued dependence on crude oil imports and the negative macroeconomic effects this dependence exacts on the economy when oil prices spike, it remains an important consideration in the evaluation of the program's energy security benefits. However, the country's core energy security vulnerability is its reliance on oil as the near-exclusive fuel used to power transportation. This would remain true even if U.S. net oil imports were to fall to zero. Until the U.S. transportation sector is no longer beholden to oil, the country will be vulnerable to oil price volatility. Improving the fuel efficiency of the U.S. vehicle fleet is a valuable insurance policy against this volatility. The Council believes that to strengthen the calculation of societal costs and benefits, the agencies should extend the analysis of energy security by developing a method that more comprehensively captures the economic costs of oil dependence in the U.S. transportation sector.[58]

[57] Constantine Samaras and Avi Chaim Mersky, "Fuel economy testing of autonomous vehicles," *Transportation Research Part C: Emerging Technologies* (2016); and Jun Liu, Kara Kockelman, and Aqshems Nichols, "Anticipating the emissions impact of smoother driving by connected and autonomous vehicles, using the MOVES model," 2016 (Under review for presentation at the 96th Annual Meeting of the Transportation Research Board, University of Texas).

[58] See, e.g. David L. Greene, Roderick S. Lee, and Janet L. Hopson, "OPEC and the Costs to the U.S. Economy of Oil Dependence: 1970-2010," White Paper 1-13, February 2013.