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ONE HUNDRED FIFTEENTH CONGRESS

Congress of the United States
House of Representatives
COMMITTEE ON ENERGY AND COMMERCE
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MEMORANDUM

April 12, 2018

To: Subcommittee on Environment Democratic Members and Staff

Fr: Committee on Energy and Commerce Democratic Staff

Re: Oversight Hearing on "High Octane Fuels and High Efficiency Vehicles: Challenges and Opportunities"

On **Friday, April 13, 2018, at 9:00 a.m. in room 2123 of the Rayburn House Office Building**, the Subcommittee on Environment will hold a hearing entitled "High Octane Fuels and High Efficiency Vehicles: Challenges and Opportunities."

I. BACKGROUND

Octane is a hydrocarbon component of gasoline. Fuels with a higher octane component prevent engine knocking, which occurs when fuel ignites from compression, rather than ignition, in vehicle engines. Engine knock degrades fuel efficiency and can damage a vehicle's engine; however, it is rarely experienced today due to higher octane levels in fuel and improved technology in vehicle engines.

Refiners blend additives into gasoline in order to control its octane level. Ethanol is currently the most common source of octane in gasoline. However, there are other petrochemical and biofuel-derived sources of octane available to refiners.

High-octane fuels are required for optimal operation of high performance engines. Burning high-octane gasoline in a high-compression engine improves vehicle fuel efficiency. Switching from today's standard engines to high-compression engines powered by high-octane fuel can improve efficiency by approximately three percent to nine percent or more, depending

upon the specific octane rating of the fuel burned and the vehicle's engine design.[1] One of the goals of the Department of Energy (DOE) is to improve fuel efficiency by pairing fuel development with engine design.[2] The Department does this through its co-optimization program, which was discussed during the subcommittee's transportation fuels hearing on March 7, 2018.

U.S. retailers generally sell passenger vehicle fuels in three levels, ranging from a rating of 87 octane for regular grade fuel to 93 octane for premium fuel. The octane rating of fuel shown on the fuel pumps at consumer outlets refers to the Anti-Knock Index (AKI). The AKI rating is based on the average of two numbers: the motor octane number (MON) and the research octane number (RON). These two numbers are determined in a test engine by comparing the anti-knock performance of the fuel being tested against a standard fuel blend of iso-octane (100 RON) and n-heptane (0 RON) under controlled conditions at a specific engine speed (900 rpm for MON; 600 rpm for RON). RON is the most common measure of octane in fuels around the world. Testing for MON includes use of a preheated fuel mixture and other conditions designed to stress the fuel's knock resistance. MON octane ratings are generally lower than RON ratings.

II. RELATIONSHIP TO THE RENEWABLE FUELS PROGRAM

The Energy Policy Act of 2005 established the Renewable Fuels Standard (RFS) program to expand the use of renewable fuels, diversify the transportation fuel market, support rural development and farm incomes, and deliver air quality and other environmental benefits. Amendments to the program contained in the Energy Independence and Security Act of 2007 expanded the mandates for increasing the proportion of renewable fuel in the fuel supply. For more detail on the RFS program and its requirements, see the memorandum for the subcommittee hearing held on June 22, 2016.[3]

Proponents of a uniform high-octane fuel standard with an octane rating equal to or exceeding the octane rating of premium gasoline argue such a standard will lead to emission and fuel efficiency benefits, and heighten production and sales of vehicles with advanced, high-compression engines. In order to realize these benefits, the higher octane fuel would have to be used in vehicles with higher performance engines. Using higher octane fuel in an engine that is not designed to take advantage of this fuel will not provide these benefits.

The use of high-octane fuel could be expanded by moving to the sale of a single, high-octane standard fuel and gradually phasing out all other octane blends. There are a number of

[1] Department of Energy, Argonne National Laboratory, Energy Systems Division, *Wells-to-Wheels Greenhouse Gas Emissions Analysis of High-Octane Fuels with Various Market Shares and Ethanol Blending Levels,* ANL/ESD-15/10. P.1 (Jul. 14, 2015).

[2] For more information, see the memo from the March 7, 2018 Environment Subcommittee hearing here.

[3] House Committee on Energy and Commerce, Subcommittee on Energy and Power. *Hearing on the Renewable Fuel Standard – Implementation Issues*, 114th Cong. (2016) (H. Rept. 114-155).

key questions about the implementation of a high-octane fuel standard, especially if it is offered as a substitute for the RFS program. After 2022, there are no specific, mandated volumes through the RFP program for renewable fuel in the fuel supply.

Moving to a single, high-octane standard would affect all stakeholders in the transportation fuel market: refiners, renewable fuel producers, vehicle manufacturers, fuel retailers, and consumers. The effects on each group will vary depending upon the specific octane standard chosen and whether that standard would include requirements for achieving high octane through blending with renewable fuel. If the high-octane standard chosen is equivalent to today's premium fuel, there is no need to move to higher ethanol blends. In that case, E10 would likely remain the most common fuel blend. Because this is a standard fuel sold today, little new investment would be required by retail outlets to boost sales of premium fuel. However, refineries may need to make additional investments or incur greater costs to produce greater volumes of premium fuel.

Retailers currently sell high-octane gasoline at a premium price, approximately $0.50 per gallon higher than regular grade fuel.[4] High-octane gasoline accounts for about 12 percent of total gasoline sales. Although it has a higher octane rating, today's premium gasoline does not contain more ethanol than standard or mid-grade fuel: all three grades contain 10 percent ethanol (E10). More new vehicle models on the market recommend or require the use of premium fuel. The distinction between "recommended" and "required" is important. If premium fuel is recommended, the vehicle will perform best using premium fuel, but there is little risk of engine damage if regular fuel is used. Due to the price differential, many consumers continue to use regular fuel even when the manufacturer recommends the use of high-octane fuel, reducing the fuel economy and emission benefits of these vehicles. However, if lower octane fuel is used in a vehicle where premium fuel is required, misfueling would not only reduce performance, it could result in engine damage or premature aging of equipment.

Many of the studies conducted by DOE and others envision a high-octane fuel that is comprised of higher blends of renewable fuel, from E15 to E40. Studies have focused on blends in the range of E25 to E30 because they are projected to achieve greater greenhouse gas emission reductions and fuel efficiency gains than E10 blends. Biofuel producers would gain greater market share in these cases; however, there is no guarantee at this point that refiners would choose to use bio-based additives absent a specific mandate. Higher blends of ethanol would require greater investments by fuel retailers and refiners to overcome challenges that result from their use in existing equipment. Additionally, higher blends of renewable fuel will significantly reduce market share of petroleum.

[4] Energy Information Administration, *Growing Octane Need Widen the Price Difference Between Premium and Regular Gasoline* (Jun. 21, 2017) (www.eia.gov/todayinenergy/detail.php?id=31732).

III. WITNESSES

The following witnesses have been invited to testify:

Timothy Columbus
General Counsel
Society of Gasoline Marketers of America (SIGMA), and National Association of Convenience Stores (NACS)

Dan Nicholson
Vice President, Global Propulsion Systems
General Motors
On behalf of the United States Council for Automotive Research

Chet Thompson
President
American Fuel and Petrochemical Manufacturers

Paul Jeschke
Chairman
Illinois Corn Growers Association

Emily Skor
CEO
Growth Energy