

Consumer Savings from Year-Round Nationwide E15 Use

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Executive Summary

One of the most significant opportunities for both consumers and the ethanol industry lies in expanding demand by increasing use of higher blend levels. Since motor gasoline containing higher levels of ethanol typically sell at a discount to regular gasoline, consumers benefit from lower prices while farmers and others in the economy benefit from increased production of ethanol. Most motor gasoline used in the U.S. contains 10 percent ethanol (E10). However, demand for higher blends such as E15 (15 percent ethanol) also are increasing. While nationwide sales of E15 are not reported, according to the U.S. Environmental Protection Agency (EPA), E15 is sold in 31 states and the number of retail stations offering E15 has more than doubled over the last five years, from 1,200 in 2017 to an estimated 2,700 currently. In April 2022, the Biden Administration announced that E15 would be available for sale nationwide during the summer months.¹ In response, EPA issued an emergency fuel waiver to allow E15 to be sold in the 2022 summer driving months (June through September). Prior to the announcement, EPA allowed the year-round sale of E15 nationwide but restricted E15 sales during summertime months in states without a Reformulated Gasoline (RFG) Program.² This restricted E15 sales in roughly two-thirds of the country in the peak summer driving months. EPA's emergency waivers following the President's April announcement removed this ban and allowed drivers across the U.S. to benefit from E15 for the 2022 summer driving season.

Increasing the availability and use of E15 year-round will reduce consumer spending on motor fuel by \$20.6 billion on an annual basis, saving the average American household \$168 this year

¹ EPA Issues Emergency Fuel Waiver for E15 Sales. U.S. Environmental Protection Agency. April 29, 2022

² The EPA Final Rule was issued in May 2019

alone. Replacing the current standard E10 with E15 nationwide on a year-round basis will increase domestic ethanol demand by an additional 6.1 billion gallons and will generate economic benefits for the U.S. economy. Implementing nationwide E15 use will require an increase in ethanol production that will be reflected in higher demand for feedstocks (mostly corn) and other inputs and will support an expansion of industry capacity.

This study estimates the impact for consumers and the U.S. economy of expanding E15 use to the nation's entire motor gasoline supply based on annualized current (year-to-date 2022) production and consumption levels and input prices. As such, this study updates and revises our 2021 analysis of the impacts of nationwide E15 use that was based on historical data.

The economic impact of expanding ethanol use results from the spending on goods and services to produce ethanol and build the new capacity required to support a larger industry. Producing the 18.8 billion gallons of ethanol needed to replace E10 on a nationwide basis will:

- Reduce consumer spending on motor fuel by \$20.6 billion annually and save the average American household \$168 on motor fuel costs.
- Generate \$66.3 billion of value-added output (GDP) to the U.S. economy. The largest share of this GDP impact is provided by the agriculture sector and reflects corn prices that have more than doubled over the past year.
- Support nearly 555,000 jobs in all sectors of the economy, including 188,417 new jobs attributable to E15 replacing E10. Put an additional \$36.3 billion in income into the pockets of American households.
- Generate an additional \$7 billion in tax revenue for the Federal Treasury and \$6 billion for State and local governments

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Introduction

One of the most significant opportunities for both consumers and the ethanol industry lies in expanding demand by increasing use of higher blend levels. Since motor gasoline containing higher levels of ethanol typically sells at a discount to regular gasoline, consumers benefit from lower prices while farmers and others in the economy benefit from increased production of ethanol. Most motor gasoline used in the U.S. contains 10 percent ethanol (E10). However, demand for higher blends such as E15 (15 percent ethanol) also are increasing. While nationwide sales of E15 are not reported, according to the U.S. Environmental Protection Agency (EPA), E15 is sold in 31 states and the number of retail stations offering E15 has more than doubled over the last five years from 1,200 in 2017 to 2,700, currently.³ In April 2022, the Biden Administration announced that E15 would be available for sale nationwide during the summer months.⁴ In response, EPA issued an emergency fuel waiver to allow E15 to be sold in the 2022 summer driving months (June through September). Prior to the announcement, EPA allowed the year-round sale of E15 nationwide but restricted E15 sales during summertime months in states without a Reformulated Gasoline (RFG) Program.⁵ This restricted E15 sales in roughly two-thirds of the country in the peak summer driving months. EPA's emergency waivers following the President's April announcement removed this ban and allowed drivers across the U.S. to benefit from E15 for the 2022 summer driving season.

ABF Economics was asked by Growth Energy to examine the potential consumer savings and economic implications of expanding E15 year-round and on a nationwide basis replacing regular

³ <https://www.eia.gov/todayinenergy/detail.php?id=40095>

⁴ EPA Issues Emergency Fuel Waiver for E15 Sales. U.S. Environmental Protection Agency. April 29, 2022

⁵ The EPA Final Rule was issued in May 2019

unleaded (E10) gasoline. The objective of this study is to estimate the savings to consumers from E15 use and the impact for the U.S. economy of expanding E15 use to the nation's entire motor gasoline supply.

Methodology

Consumer Savings from E15 Use

Consumers benefit from lower prices for E15 compared to regular unleaded gasoline containing E10. Price differentials between E10 and E15 for the 2022 summer months (May through August) were calculated from prices reported by retail stations selling E15 in 29 states by OPIS.⁶ These data are summarized by state in Table 1.

Table 1
E10 and E15 Prices, \$/gallon May through August 2022

State	E15	E10	Difference	State	E15	E10	Difference
AR	\$3.91	\$3.95	-\$0.04	ND	\$4.16	\$4.32	-\$0.16
CO	\$4.31	\$4.45	-\$0.14	NE	\$4.10	\$4.28	-\$0.18
FL	\$4.23	\$4.20	\$0.02	NM	\$4.04	\$4.24	-\$0.20
GA	\$3.74	\$3.96	-\$0.22	OH	\$4.10	\$4.31	-\$0.21
IA	\$3.97	\$4.14	-\$0.17	OK	\$3.91	\$4.00	-\$0.09
IL	\$4.53	\$4.74	-\$0.21	PA	\$4.13	\$4.62	-\$0.49
IN	\$4.20	\$4.51	-\$0.31	SD	\$4.18	\$4.29	-\$0.11
KS	\$4.09	\$4.13	-\$0.04	TN	\$3.85	\$4.03	-\$0.17
KY	\$4.03	\$4.13	-\$0.10	TX	\$3.86	\$4.01	-\$0.15
LA	\$3.97	\$3.94	\$0.03	UT	\$5.13	\$4.81	\$0.32
MD	\$4.15	\$4.38	-\$0.22	VA	\$4.11	\$4.24	-\$0.13
MN	\$4.16	\$4.30	-\$0.14	WI	\$4.05	\$4.19	-\$0.15
MO	\$3.90	\$4.07	-\$0.16	WV	\$3.99	\$4.39	-\$0.40
MS	\$3.87	\$3.87	\$0.00	WY	\$3.88	\$4.44	-\$0.56
NC	\$3.78	\$4.10	-\$0.32	Average	\$4.08	\$4.24	-\$0.16

⁶ EPA reports 31 states with stations that offer E15. (<https://www.eia.gov/todayinenergy/detail.php?id=40095>). We excluded Alabama and Michigan from our price analysis due to inconsistent data.

The OPIS data indicates that the average price of E15 over the May through August (post EPA Waiver) period was 16 cents per gallon below that of regular unleaded (E10) gasoline. These savings were applied to the estimate of annualized gasoline consumption discussed below to calculate savings to consumers.

Gasoline and E15 Use

Increasing the blend level of ethanol from E10 to E15 will increase ethanol use. This will require an increase in production that will be reflected in higher demand for feedstocks (mostly corn) and other inputs and will necessitate an expansion of industry capacity. The economic impact of expanding ethanol use results from the spending on goods and services to produce ethanol and build the new capacity required to support a larger industry. The first step in this process is to estimate the amount of E15 that would be needed to supply the nation's motor gasoline supply.

The Energy Information Administration (EIA) reported in 2005 that more than 95 percent of the nation's motor fuel supply contained at least 10 percent ethanol (E10). The Department of Energy Alternative Fuels Data Center (AFDC) provides updated estimates stating that "More than 98% of U.S. gasoline contains up to 10% ethanol to boost octane, meet air quality requirements, or satisfy the Renewable Fuel Standard."⁷ EIA does not track the use of E15 or other higher blends of ethanol and currently only two states – Iowa and Minnesota -- report sales of E15 and other higher ethanol blends.

We estimated the amount of E15 that would be required to replace E10 in the nation's motor gasoline supply by using data for the domestic use of finished motor gasoline and ethanol imputed from production, ending stocks, imports, and exports published by EIA. Simply, domestic use is estimated by subtracting exports plus ending stocks from total supply (beginning stocks plus production and imports).

⁷ https://afdc.energy.gov/fuels/ethanol_blends.html accessed October 13, 2022

Since ethanol is an additive to motor gasoline, the demand for fuel ethanol is determined by the quantity of gasoline used and the ethanol blend level. The petroleum and ethanol industry are recovering from the disastrous 2020 COVID-induced economy-wide shut down. Production and consumption levels have increased. However, prices for both inputs and outputs have increased dramatically in 2022 and are reflected in near-record inflation rates. These impacts are incorporated in our analysis. This analysis uses January-June 2022 domestic finished motor gasoline and ethanol demand annualized for the full year of 2022. Our analysis also uses current (year-to-date prices for inputs corn, natural gas and electricity) and outputs (ethanol, DDGS and Distiller's corn oil).

EIA data indicate that American consumers used an average of 66.4 billion gallons of finished motor gasoline during the first six months of 2022. Annualized, this amounts to 132.8 billion gallons, two percent below 2021 levels. Over this same period, total domestic fuel ethanol use averaged 6.8 billion gallons (13.7 billion gallons annualized).⁸ As indicated earlier, most gasoline sold in the U.S. is E10. However, higher blends of ethanol currently are sold. These gallons would not be replaced by additional E15. We estimated existing use of E15 and E85 based on published reports.⁹ On the conservative assumption that 95 percent of the nation's fuel supply currently contains ethanol, and existing E15 and E85 sales amount to 798 million and 250 million gallons, respectively, E10 demand is estimated at an annualized 12.7 billion gallons in 2022. Making E15 the standard ethanol blend in the nation's motor gasoline supply would require 18.8 billion gallons of ethanol, 6.1 billion more than is currently being used. EIA reported that ethanol industry capacity totaled 17.38 billion gallons on January 1, 2022. Meeting the 18.8 billion gallons of ethanol demand represented by nationwide E15 would necessitate adding nearly 1.4 billion gallons of new production capacity and would boost corn

⁸ Imputed domestic use of finished motor gasoline and ethanol was calculated by constructing a supply and demand balance for each using production, imports, exports, and ending stock data taken from online EIA databases. In any year beginning stocks are the previous year ending stocks. Total supply is beginning stocks plus production and imports. Domestic demand is imputed by subtracting exports and ending stocks from total supply.

⁹ An April 2022 analysis published by the Renewable Fuels Association used data reported by Minnesota and Iowa to estimate 2021 E15 sales of 814 million gallons nationwide. "E15 Sales Surge to New Record in 2021 but are at risk going forward due to regulatory uncertainty" RFA April 6, 2022.

demand by more than 6.1 billion bushels. The amount of E15 needed to meet year-round nationwide demand, new capacity, and corn requirements are detailed in Table 2.

Table 2
Calculation of E15 Nationwide Demand

	2021 (Mil Gal)	2022 Annualized (Mil Gal)
Imputed Gasoline Use	135,531	132,830
Gasoline blended with EtOH	128,755	126,189
EtOH (E100) Production	15,016	15,429
Imputed Domestic EtOH Use	13,944	13,714
E10	12,875	12,667
Current E15	814	798
Other Blends	255	250
E15 Needed to Replace E10	14,807	18,771
Addl Ethanol to produce E15	2,221	6,104
Current EtOH Capy (Jan 1)	17,380	17,380
New Capacity Required	(143)	1,391
Additional Corn Equiv (Mil bu)	766	2,105

Economic Impact

The use of E15 nationwide on a year-round basis will increase demand for and production of ethanol. To evaluate this, we calculated the economic impact of the producing the additional ethanol required to meet an E15 standard. As indicated earlier, this analysis is based on annualized year-to-date production and consumption data and year-to-date prices for inputs and outputs. Consequently, this analysis reflects current market conditions.

The impact of the ethanol industry on the American economy was estimated by applying expenditures by supplying industries to the industry-level final demand multipliers for value added output, earnings, and employment provided by the IMPLAN (Impact Analysis for Planning) multiplier database to develop a model of the national economy.

Multipliers typically measure three types of impacts: direct, indirect, and induced:

- Direct effects are the known changes in the economy from an activity such as ethanol production.
- Indirect effects are the business-to-business transactions required to produce direct effects (i.e., increased output from businesses providing intermediate inputs to ethanol producers such as feedstocks).
- Induced effects are derived from spending on goods and services by people working to satisfy direct and indirect effects (i.e., increased household spending resulting from higher income).

Economic impact models provide three economic measures that describe the economy: value added, income, and employment.

- Value added is the total value of the goods and services produced by businesses in the country and is generally referred to as GDP.
- Labor income reflects employee compensation (payroll and benefits). An important component of this is the income that is generated by increased demand for corn and other feedstocks used to produce ethanol. This supports farm income through higher crop receipts than would be the case without ethanol production.
- Employment represents the annual average number of employees, whether full or part-time, of businesses producing output and is expressed in full-time equivalent jobs.

E15 Analysis

The ethanol industry will spend nearly \$57 billion on feedstocks and other inputs to produce 18.8 billion gallons of ethanol represented by year-round nationwide E15 use. The majority (91 percent) of these expenditures are accounted for by feedstocks (corn) and energy (natural gas) the average price of each has more than doubled from last year. As these dollars circulate

through the economy, they generate value added output (GDP), income, and support employment in all sectors of the economy. The impacts of nationwide E15 use are summarized in Table 3. These represent the effects on major supplying industries and the entire national economy of producing the ethanol that would be required if E15 replaced E10 in the nation's motor gasoline supply.

Table 3
Economic Impact of Nationwide E15 Use

	GDP (Mil 2022\$)	Employment (FTEs)	Income (Mil 2022\$)
Ethanol Production	\$16,718	111,120	\$7,840
Direct	\$4,997	10,150	\$1,150
Indirect	\$6,413	44,776	\$3,434
Induced	\$5,308	56,194	\$3,257
Construction	\$2,998	31,676	\$1,997
Direct	\$1,111	13,856	\$901
Indirect	\$763	6,281	\$459
Induced	\$1,125	11,539	\$637
Agriculture	\$35,252	374,521	\$20,266
Direct	\$8,042	91,084	\$4,134
Indirect	\$15,803	172,377	\$9,668
Induced	\$11,407	111,059	\$6,464
R&D	\$1,478	12,546	\$949
Exports (Total)	\$9,889	24,806	\$5,241
Total Ethanol	\$66,336	554,668	\$36,293
Direct	\$14,699	118,458	\$6,569
Indirect	\$33,262	251,940	\$19,063
Induced	\$18,375	184,269	\$10,661

GDP (Value-Added)

The full impact of the spending for ethanol and co-product output, production of agricultural feedstocks, and construction of new capacity, is projected to contribute \$66.3 billion to GDP in 2022. While ethanol manufacturing alone will contribute \$16.7 billion to the nation's GDP, the largest contributor to the GDP will be the agriculture sector. The importance of agriculture

reflects the fact that corn and other feedstocks account for more than 80 percent of the direct costs of producing ethanol. It is important to note that the prices of all other inputs also have increased substantially over the past year. Most of this contribution from expenditures will come from indirect and induced impacts as the dollars spent to produce ethanol circulate throughout the entire economy.

Employment

Jobs are created from the economic activity supported by ethanol output, additional agricultural output for feedstock production and construction activity for new capacity. Ethanol production is not a labor-intensive industry (accounting for about 10,000 full time equivalent direct jobs nation-wide)¹⁰. However, the economic activity of supporting industries supports a substantially larger number of jobs in all other sectors of the national economy. Moving to an E15 standard would support nearly 555,000 jobs in all sectors of the economy. Non-agricultural jobs supported by E15 are estimated at more than 180,000 full time equivalent jobs. Agriculture represents the largest sector impacted by E15 and is projected to support more than 468,150 jobs in the entire economy under nationwide E15 use. Direct employment in production agriculture resulting from economy wide E15 use is estimated at about 91,000 jobs. However, most agriculture jobs supported by the ethanol industry are not in production but are those in support activities related to crop production, ranging from farm advisors, producers and distributors of crop protection products, fertilizer, and farm equipment, and other service providers. Taken together, these represent not just the direct jobs associated with E15 production but also the indirect and induced jobs supported by the economic activity created by additional ethanol demand and production, including agriculture.

¹⁰ The Census Bureau does not report employment in ethanol production. This analysis conservatively assumes the average ethanol plant employs approximately 50 full-time equivalent employees.

Income

Economic activity and associated jobs produce income for American households. Moreover, the profitable operation of ethanol production will generate corporate income that will be paid to shareholders of public companies and owners of locally owned ethanol plants. The economic activities associated with E15 will put \$36.3 billion in additional income into the pockets of American households and an estimated \$4.3 billion in corporate and proprietor income. As is the case with employment, the direct impact on income provided by the ethanol industry is largely concentrated in agriculture, manufacturing, and services.

The impact of increased ethanol production will be compounded by the benefits consumers will experience from lower prices at the pump. Blending ethanol into motor gasoline lowers retail gasoline prices. As indicated earlier, recent reporting of average pump prices for E10 and E15 suggests that E15 enjoys a 16 cents per gallon discount relative to E10. Adopting an E15 standard nationwide will save consumers \$20.6 billion annually or \$168 per household.

Tax Revenue

The combination of GDP, household, and corporate income supported by E15 will contribute an additional \$7 billion in Federal tax revenue and \$6 billion more for State and local governments. Combined, E15 will increase revenue to Federal and State coffers by \$13 billion.

Conclusion

Nationwide use of E15 directly benefits Americans by reducing annual spending on motor fuel by \$20.6 billion, or household savings of \$168 annually. Nationwide E15 use will expand ethanol production. This expansion also will stimulate demand for agricultural feedstocks that will directly benefit farm income. The economic benefits from nationwide E15 use are significant increases in GDP, jobs supported in all sectors of the economy, household income, and tax revenue.