<u>2016 Report on Ethanol Market Concentration</u>

I. Introduction

This Report presents the Federal Trade Commission's ("Commission" or "FTC") concentration analysis of the ethanol production industry for 2016.[1] Section 1501(a)(2) of the Energy Policy Act of 2005 requires that the FTC annually "perform a market concentration analysis of the ethanol production industry . . . to determine whether there is sufficient competition among industry participants to avoid price-setting and other anticompetitive behavior."[2] Pursuant to the statute, the FTC must measure concentration using the Herfindahl-Hirschman Index ("HHI") and consider all marketing arrangements among industry participants in preparing its analysis.[3] The FTC's report is due to Congress and the Administrator of the Environmental Protection Agency ("EPA") by December 1 of each year.[4]

As in previous reports, FTC staff ("staff") analyzed concentration based on production capacity and actual production. For each analysis, staff calculated HHIs two different ways, first by allocating market shares among producers and then by allocating market shares among marketers. Concentration based on producer shares is lower under either basis than concentration based on marketer shares. Based on production capacity, the HHIs for the U.S.

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[1] This Report builds upon Commission reports from previous years. Prior reports contain background information absent from this Report. *See* FTC, Oil and Gas Industry Initiatives, Competition Policy: Reports, https://www.ftc.gov/tips-advice/competition-guidance/industry-guidance/oil-and-gas.

[2] Energy Policy Act of 2005, Pub. L. No. 109-58, § 1501, 119 Stat. 1069, 1074, *amended by* Energy Independence and Security Act of 2007, Pub. L. No. 110-140, 121 Stat. 1492. For purposes of this Report, we presume that Congress used the term "price-setting" to mean "price fixing."

[3] *Id*.

[4] *Id*.

ethanol industry are 482 and 737. Based on actual production, the HHIs are 463 and 739. Concentration is substantially unchanged from a year ago.[5]

The low level of concentration and large number of market participants in the U.S. ethanol production industry continue to suggest that the exercise of market power to set prices, or coordination on price or output levels, is unlikely. As has been the case each year since the Commission began reporting, each of the 2016 HHIs indicates that the industry is unconcentrated.[6] At this level of concentration, a single ethanol producer or marketer likely lacks market power. Successful anticompetitive coordination would require agreement among a very large number of competitors and thus is similarly unlikely. Moreover, imports and the possibility of entry would impede the exercise of market power by any group of domestic firms.

II.   Industry Updates

A.   Renewable Fuel Standard

Since 2005, Congress has required that the national transportation fuel supply contain a minimum annual volume of renewable fuels, including fuel ethanol.[7] This mandate, known as the Renewable Fuel Standard ("RFS"), increases every year. In 2007, Congress revised the RFS, significantly increasing the minimum volumes of ethanol and adding requirements for advanced biofuels.[8] For 2016, the RFS mandates 22.25 billion gallons of renewable fuel, 15

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[5] The 2015 HHIs based on producer shares have been revised in light of new information regarding plant ownership and management.

[6] The Commission and U.S. Department of Justice characterize markets in which the HHI is below 1500 as unconcentrated. U.S. Department of Justice and Federal Trade Commission Horizontal Merger Guidelines (2010) ("Horizontal Merger Guidelines") § 5.3, https://www.ftc.gov/sites/default/ files/attachments/merger-review/100819hmg.pdf.

[7] *See* Energy Policy Act of 2005 § 1501, 119 Stat. 1069.

[8] "Advanced biofuel" refers to a renewable fuel, other than ethanol derived from corn starch, that has lifecycle greenhouse gas emissions that are at least 50 percent less than the average greenhouse gas emissions of the baseline fossil fuel. 42 U.S.C. § 7545(o)(1)(B)(i). Advanced biofuels include, but are not limited to, cellulosic biofuel and biomass-based diesel. *Id*. § 7545(o)(1)(B)(ii)(I)-(VII).

billion gallons of which can be conventional corn ethanol.[9] The 2016 advanced biofuels

target is 7.25 billion gallons, at least 4.25 billion gallons of which must be cellulosic biofuel.[10]

The annual use of renewable fuels has not kept pace with the Congressional RFS.[11]

The EPA published revised volume requirements for 2016[12] and has proposed revisions for

upcoming years to address constraints caused by the E10 "blendwall" and limitations on

production and import capabilities.[13] For 2016, the EPA's total renewable fuels requirement

is 18.11 billion gallons, 14.5 billion gallons of which can be conventional corn ethanol.[14] The

2016 volumes require significant increases in the use of renewable fuels compared to

renewable fuel use in 2015.[15]

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[9] *Id*. § 7545(o)(2)(B)(i)(I)-(II).

[10] *Id*. § 7545(o)(2)(B)(i)(II)-(III).

[11] In 2015, the U.S. consumed 13.94 billion gallons of ethanol, more than one billion gallons less than the 2015 RFS target. U.S. Energy Info. Admin., Monthly Energy Review, Table 10.3 Fuel Ethanol Overview, http://www.eia.gov/totalenergy/data/browser/xls.cfm?tbl=T10.03&freq=m (last modified Sept. 27, 2016).

[12] Renewable Fuel Standard Program: Standards for 2014, 2015, and 2016 and Biomass-Based Diesel Volume for 2017, 40 C.F.R. pt. 80 (2015) ("EPA Requirements"), https://www.gpo.gov/fdsys/pkg/FR-2015-12-14/pdf/2015-30893.pdf

[13] *See* Renewable Fuel Standard Program: Standards for 2017 and Biomass-Based Diesel Volume for 2018, 81 Fed. Reg. 34,778 (May 31, 2016) (to be codified at 40 C.F.R. pt. 80), https://www.gpo.gov/fdsys/pkg/FR-2016-05-31/pdf/2016-12369.pdf. The E10 blendwall refers to the industry's limited ability to consume fuel blends containing more than 10 percent ethanol. Production limitations include the industry's limited cellulosic ethanol capacity. The handful of plants capable of producing cellulosic ethanol have a combined capacity of 100 million gallons per year. U.S. Ethanol Plants, ETHANOL PRODUCER MAGAZINE, http://www.ethanolproducer.com/plants/listplants/US/Existing/Cellulosic (last modified Jan. 23, 2016). This capacity is insufficient to meet the 2016 RFS requirement of 4.25 billion gallons per year and the EPA's revised requirement of 230 million gallons.

[14] EPA Requirements, *supra* note 12. The EPA's volume requirements, like the Congressional RFS, set a target for total renewable fuels and include a nested requirement for advanced biofuels. Thus, each gallon of fuel that meets the advanced biofuels requirement also counts toward the total renewable fuels requirements. Once obligated parties meet the minimum requirement for advanced biofuels, they may meet any remaining obligation under the total renewable fuels requirement with conventional corn ethanol.

[15] *See id.* The U.S. Department of Agriculture has announced $210 million in funding under the Biofuel Infrastructure Partnership to increase the number of fueling pumps, storage, and related infrastructure for blends of ethanol higher than E10. Press Release, U.S. Department of Agriculture, USDA Announces $210 Million to be Invested in Renewable Energy Infrastructure through the Biofuel Infrastructure Partnership (Oct. 28, 2015).

B.   Margins

U.S. ethanol industry margins through the first nine months of 2016 followed a seasonality pattern similar to that seen in 2015.[16] Margins were negative or low in January of 2016 but increased and remained positive as demand surged during the spring and summer driving season.[17] The average margin for the first nine months of 2016 was $0.20 per gallon.[18] Over this period, the average net cost of corn – the largest ethanol input cost – was $0.82 per gallon.[19] Ethanol prices fluctuated slightly throughout the year but remained close to 2015 prices, with an average price of $1.40 per gallon.[20]

Figure 1 shows net corn prices, ethanol prices, and return over operating costs for the period January 2011 through September 2016.

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[16] *See Ethanol Margins Return to Seasonal Swings*, ETHANOL PRODUCER MAGAZINE, Jan. 20, 2016, http://www.ethanolproducer.com/articles/12941/ethanol-margins-return-to-seasonal-swings.
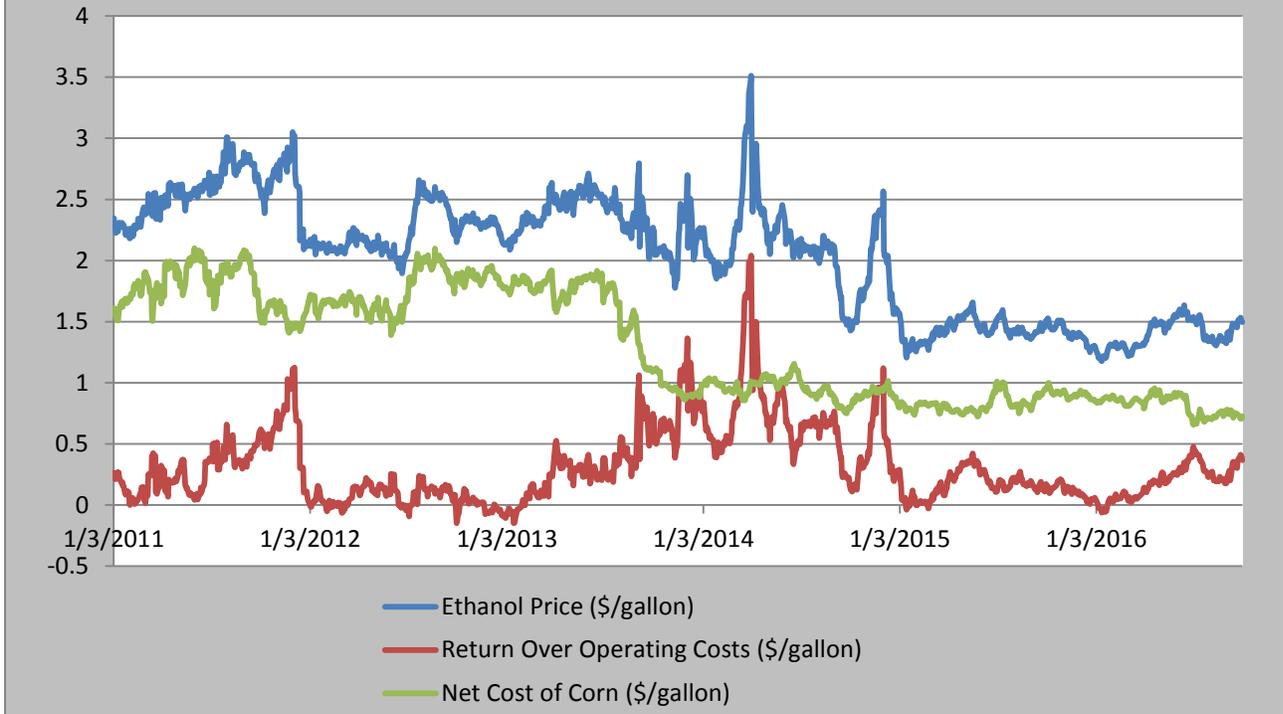
[17] *See* Iowa State University, Center for Agricultural and Rural Development, Historical Ethanol Operating Margins (last modified Oct. 14, 2016), http://www.card.iastate.edu/research/biorenewables/tools/hist_eth_gm.aspx. Margin, or return over operating costs, is the difference between the revenue from ethanol plants (including revenue from ethanol and dried distillers grains with solubles) and variable production costs (including corn, natural gas, and labor).

[18] *Id.* This is higher than the 2015 average margin of $0.17 per gallon for the first nine months of the year.

[19] *Id.* The cost of corn reached a peak of $0.96 per gallon in April 2016 and a trough of $0.66 per gallon in July 2016.

[20] *Id.* Ethanol prices reached a high of $1.63 per gallon in June 2016 and a low of $1.18 per gallon in January 2016. The average price for the first nine months of 2015 was $1.43 per gallon.

**Figure 1: Fuel-Ethanol Price, Corn Cost, and Operating Margin (per gallon)
Jan. 2011 to Sept. 2016**

Source: Iowa State University, Center for Agricultural and Rural Development

C. Market Trends

Domestic ethanol capacity and production increased since last year's Report, while exports remained stable. Domestic ethanol production from July 2015 through June 2016 increased approximately three percent from the prior 12 months, from 14.6 billion to 15 billion gallons.[21] Domestic ethanol production capacity (including capacity under construction) rose to approximately 15.8 billion gallons per year.[22] This marks the third consecutive year of capacity

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[21] U.S. Energy Info. Admin., U.S. Oxygenate Plant Production of Fuel Ethanol, http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=m_epooxe_yop_nus_1&f=m (last visited Oct. 24, 2016).

[22] Staff's total capacity estimate takes into account information obtained through interviews with market participants and publicly available information, including information published online by the Renewable Fuels Association ("RFA"). *See, e.g.*, RFA, Biorefinery Locations, http://www.ethanolrfa.org/resources/biorefinery-locations/ (last

increases.[23] From July 2015 through June 2016, U.S. ethanol exports remained largely

unchanged from the prior year at 854 million gallons.[24]

Over 100 firms produce or are capable of producing ethanol. The largest ethanol

producer's share of domestic capacity is approximately 11 percent, unchanged from its 2015

percent share.[25]

III.   Analysis

Section 1501(a)(2) of the Energy Policy Act of 2005 instructs the Commission to

measure concentration in the U.S. ethanol production industry using HHIs.[26] HHIs can provide a

snapshot of market concentration based upon the number of market participants and their

respective sales, production, or capacity.[27] An analysis of competition among market

participants using these HHIs assumes that the U.S. ethanol production industry is an appropriate

antitrust market.[28] This assumption precludes consideration of a broader relevant product market

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visited Oct. 24, 2016). Interviewees routinely provide staff with operating capacities exceeding their nameplate capacities. Staff used the higher operating capacity when calculating capacity estimates for this Report. Staff's capacity estimate is higher than the EIA's published total of 14.9 billion gallons. U.S. Energy Info. Admin., U.S. Fuel Ethanol Plant Production Capacity (June 29, 2016), http://www.eia.gov/petroleum/ethanolcapacity/. EIA's capacity data are a snapshot of capacity as of January 1 of each year and exclude plants that were idle, shut down, or still under construction as of that month. *See* U.S. Energy Info. Admin., EIA Releases U.S. Fuel Ethanol Production Capacity Data (Nov. 30, 2011), http://www.eia.gov/todayinenergy/detail.cfm?id=4110 (describing EIA's method for calculating total capacity for its first annual reports).

[23] U.S. Energy Info. Admin., U.S. Ethanol Plant Capacity Increases for Third Consecutive Year (Aug. 10, 2016), http://www.eia.gov/todayinenergy/detail.cfm?id=27452.

[24] U.S. Energy Info. Admin., U.S. Exports of Fuel Ethanol (exports from July 2014 through June 2015 totaled 865 million gallons), http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=M_EPOOXE_EEX_NUS-Z00_MBBL&f=M (last visited Oct. 24, 2016); *see also* U.S. Energy Info. Admin., U.S. Ethanol Exports Exceed 800 Million Gallons for Second Year In a Row (Mar. 10, 2016), http://www.eia.gov/todayinenergy/detail.cfm?id=25312.

[25] *See* 2015 Ethanol Report, *supra* note 1, at 7.

[26] Energy Policy Act of 2005 § 1501(a)(2), *supra* note 2. A given market's HHI is the sum of the squares of the individual market shares of all market participants. For example, a four-firm market with market shares of 30 percent, 30 percent, 20 percent, and 20 percent has an HHI of 2600 [(30*30) + (30*30) + (20*20) + (20*20) = 2600]. HHIs range from 10,000 in a one-firm (pure monopoly) market to a number close to zero in a highly unconcentrated market.

[27] The Commission and the U.S. Department of Justice regularly use HHIs to measure concentration in a relevant antitrust market as part of their analysis of the likely effects of a merger or acquisition on competition in that market. *See* Horizontal Merger Guidelines, *supra* note 6, § 5.3.

[28] A relevant antitrust market has both product and geographic aspects. A relevant product market is a product or group of products such that a hypothetical profit-maximizing firm that was the only seller of those products likely

that includes other gasoline blending components that might be economically viable and environmentally acceptable substitutes for ethanol. In the event that ethanol competes with other blending components, HHIs based on a fuel ethanol market would understate the amount of competition in the industry. This assumption also precludes consideration of a broader or narrower relevant geographic market than the United States that could provide further insight about competition in ethanol production and marketing.

This Report presents four HHIs for the ethanol industry, calculated using two different measures of market share – production capacity and actual production – and two different methods of allocating those market shares. First, staff calculated market shares based on domestic ethanol production capacity. Staff then attributed the producer's market share to (1) the producer itself, and (2) the producer or the third-party firm that actually marketed the producer's ethanol output. Staff relied on publicly available information and interviews with producers, marketers, and other industry participants to determine the production capacity of each ethanol plant and to calculate the market shares based on marketing arrangements.

Second, EIA staff calculated market shares based on actual production, attributing the market shares as described in the preceding paragraph. Due to the confidential nature of the ethanol production data the EIA collects, staff provided to EIA staff the information necessary to

could profitably impose at least a small but significant and nontransitory increase in price ("SSNIP"). If such a price increase would not be profitable because of the loss of sales to other products, the product or group of products would not be a relevant product market. Similarly, a relevant geographic market is a region such that a hypothetical profit-maximizing firm that was the only seller of the relevant product in that region likely could impose at least a SSNIP above the competitive level. If such a price increase would not be profitable because of the loss of sales to sellers outside the region, the region would be too narrow to be a relevant geographic market. *See id.* §§ 4.1-4.2.

allocate market shares.[29] EIA staff performed each of the two HHI calculations and provided the

resulting production-based HHIs.[30]

A. **Concentration with Market Shares Based on Production Capacity**

For each of the HHI calculations described below, staff first calculated producers' market

shares based on their fuel ethanol production capacity.[31] Production capacity provides a useful

and easily confirmable indicator of a producer's competitive significance.[32] In determining each

producer's aggregate capacity, staff included the capacity of existing plants, as well as the

projected capacity of plants currently under construction and plants currently undergoing

expansion.[33] Incorporating capacity from such projects into current market share calculations is

consistent with the approach set forth in the Horizontal Merger Guidelines.[34]

1. *Attributing Market Shares to Producers*

Under the first approach to market concentration, staff allocated market share to each

producer based on the producer's percentage of total production capacity. This method of

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[29] For producers for which EIA maintains production data, staff provided EIA with the identities of those producers' marketers. EIA used this information, in conjunction with its own data on ethanol production, to calculate the HHIs that attribute market share to marketers.

[30] Because the production data are confidential, EIA staff did not disclose the volumes of ethanol attributable to any individual producer or the market shares based on those volumes.

[31] The RFA's website provides frequently updated data on ethanol plant capacity and capacity expansion plans. Capacity information is also available on many individual producers' websites, some of which also provide details of construction and expansion plans.

[32] *See* Horizontal Merger Guidelines, *supra* note 6, § 5.2. In markets for homogeneous products (such as ethanol), a firm may derive its competitive significance primarily from its available capacity – *i.e.*, its ability and incentive to increase production in the event of a competitor's price increase or output reduction. *Id.*

[33] Staff included the capacity of these construction and expansion projects only where the producer had finalized construction plans, received the necessary financing for construction, and begun physical construction. Ethanol producers frequently announce capacity additions, new plants, plant sales, and cancellations of plans to build new capacity. These HHI calculations represent staff's best estimate of the industry's concentration as of September 2016, the cut-off date for our analysis unless otherwise indicated. This approach therefore excludes any more recent publicly available information that might be relevant to industry HHI calculations. These HHI calculations also might not capture the full complexity of industry ownership structures, especially the degree of control by minority interests held by marketers or third-party management service firms. However, the HHI resulting from allocating production to the marketer should capture any such complexity not reflected in the producer HHI.

[34] *See* Horizontal Merger Guidelines, *supra* note 6, § 5.1. Firms that are not currently producing but likely would respond rapidly in the event of a SSNIP have competitive significance even though they do not currently supply the relevant market. *Id.*

calculation yielded an HHI of 482, a level regarded as unconcentrated under the Horizontal

Merger Guidelines.[35] This HHI is a slight increase from the revised 2015 HHI of 449.[36]

2. *Attributing Market Shares to Marketers*

Many producers enter into marketing agreements with third parties to market their

ethanol to blenders and end users, while other producers sell their output directly. An ethanol

marketer may represent and make limited decisions for multiple individual producers, essentially

aggregating these producers' capacities under a single entity. For purposes of competitive

analysis, attributing production capacity to marketers rather than to the actual producers provides

a measure of industry concentration that captures this aggregation. For those producers that

engage in direct sales, staff attributed the market shares to the producers themselves.[37]

This approach yields an HHI of 737, unconcentrated under the Horizontal Merger

Guidelines. This HHI is higher than the corresponding HHI of 621 in 2015.[38]

B. <u>Concentration with Market Shares Based on Actual Production</u>

Firms that produce more than eight million gallons of oxygenates (such as ethanol) per

year must report to EIA their monthly production volumes by product. Using production data is

instructive because capacity data have certain limitations, particularly insofar as stated capacity

does not necessarily represent actual production capabilities. Ethanol plants often can produce as

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[35] The Commission and the U.S. Department of Justice characterize markets in which the HHI is below 1500 as unconcentrated. HHIs between 1500 and 2500 indicate moderately concentrated markets, which may or may not raise competitive concerns in the context of a horizontal merger or acquisition. Markets with HHIs over 2500 are highly concentrated, and horizontal mergers or acquisitions in such markets are more likely to pose competitive concerns. *See id.* § 5.3.

[36] *See* Figure 2. Some of the change to the HHI may be attributable to a producer's acquisition of another producer's facilities. In several instances, these acquisitions coincided with the restart or reconstruction of an idled facility. Some of the change to the HHI may also be attributable to excluding plants that were converted to other uses, formally closed, or judged unlikely to reopen in the near future.

[37] Some marketers publicly announce new agreements with producers. Where staff could not determine whether a producer marketed for itself or used an outside marketing firm, staff attributed market share to the producer.

[38] 2015 Ethanol Report, *supra* note 1, at 10.

much as 10 to 15 percent more than their stated design capacities and tend to operate at
increasing rates as their owners and operators improve the production process and gain expertise
in operating their plants.[39] In this respect, actual production may reflect a market participant's
competitive significance more accurately than would its plants' capacities.

There are some limitations on the accuracy of HHIs based on actual production, just as
there are limitations on capacity-based HHIs. HHIs based on production over a given period
may overstate or understate actual concentration due to entry and exit of firms, expansion of
existing capacity, and variations in capacity utilization rates during the relevant period.
Specifically, the production-based HHIs provided below do not fully reflect the deconcentrating
impact of new facilities that began production during the last 12 months, nor do they fully reflect
the concentrating impact of plant closures and idling during the period. In both cases, these
facilities will have produced only a fraction of what they otherwise could produce in a full year,
leading to an understatement (in the case of new facilities) or an overstatement (in the case of
idled facilities) of their competitive significance in the market. Similarly, the HHIs below do not
account for the effects on concentration of plant expansions within the last 12 months and
capacity-enhancing improvement projects that are not yet in operation.

These production-based HHIs reflect actual production volumes from July 2015 through
June 2016. Where EIA attributed the actual production market share directly to individual
producers, the resulting HHI is 463. This is essentially the same as the revised 2015 HHI of
464.[40] The production-based HHI calculated by attributing the market share of each producer to

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[39] Similarly, some ethanol producers may not be in a position to utilize their full plant capacity. Actual production
may be a better indicator of their competitive significance in such cases.
[40] *See* Figure 2.

the firm that markets for that producer results in an HHI of 739, slightly higher than the 2015 HHI of 714.[41]

C. Entry and Imports

The U.S. ethanol industry is unconcentrated today, suggesting that any unilateral or coordinated attempt to exercise market power is highly unlikely. Should the industry become more concentrated, the possibility of new firms entering the domestic market and the responsiveness of ethanol imports to relative changes in domestic ethanol prices would likely provide additional constraints on anticompetitive behavior by domestic firms. Potential entrants can purchase and restart existing production facilities that were idled due to recent economic conditions or can design and build new plants to enter the market.

Ethanol import levels historically have responded to fluctuations in the price of U.S. ethanol relative to foreign ethanol prices, particularly prices for sugar cane-based ethanol from Brazil.[42] This responsiveness would likely restrain any potential exercise of market power by a domestic firm. Additionally, to the extent U.S. prices increase because of exercise of market power among a group of U.S. producers or marketers, it is likely that other producers would react by exporting less to take advantage of more favorable U.S. ethanol prices (thereby increasing U.S. supply).

IV. Conclusion

Regardless of the particular measure of market share or the market share allocation method used to calculate concentration, ethanol production remains unconcentrated. The

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[41] 2015 Ethanol Report, *supra* note 1, at 11.

[42] Brazil has been the largest exporter of ethanol to the United States every year since 2011. *See* U.S. Energy Info. Admin., U.S. Imports by Country of Origin, http://www.eia.gov/dnav/pet/pet_move_impcus_a2_nus_epooxe_im0_mbbl_a.htm. Though the United States is a net exporter of ethanol, there is demand for imported ethanol that has lower greenhouse gas emissions, such as sugar cane-based ethanol. *See* U.S. Energy Info. Admin., U.S. Ethanol Exports Exceed 800 Million Gallons for Second Year In a Row, *supra* note 24.

industry is less concentrated today than it was at the time of the first Report on Ethanol Market

Concentration in 2005. Furthermore, the possibility of entry and the availability of ethanol

imports provide additional constraints on the exercise of market power by current industry

participants. The low level of concentration and large number of market participants in the U.S.

ethanol production industry continue to suggest that the exercise of market power to set prices, or

coordination on price and output levels, is unlikely.

Figure 2: Domestic Fuel Ethanol Concentration[43]

Concentration Based on Capacity	2015 HHI[44]	2016 HHI
Shares attributed to each producer	449	482
Shares attributed to marketers for all marketing agreements	621	737
Concentration Based on Production	**2015 HHI**	**2016 HHI**
Shares attributed to each producer	464	463
Shares attributed to marketers for all marketing agreements	714	739

Note: Capacity for 2015 includes the capacity as of September 2015 and the capacity additions under construction and expected to be completed within 12 to 18 months after September 2015. Capacity for 2016 includes the capacity as of September 2016 and the capacity additions under construction and expected to be completed within 12 to 18 months after September 2016. Production data for 2015 are from July 2014 through June 2015; production data for 2016 are from July 2015 through June 2016.

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[43] As discussed in note 35, *supra*, the Commission and the Department of Justice characterize markets with HHIs below 1500 as unconcentrated. HHIs between 1500 and 2500 indicate moderately concentrated markets, and HHIs over 2500 indicate highly concentrated markets that are more likely to pose competitive concerns. An increase in the HHI of less than 100 points is unlikely to have adverse competitive effects. Horizontal Merger Guidelines, *supra* note 6, § 5.3. Regardless of the change in HHI, unconcentrated markets are unlikely to have adverse competitive effects and ordinarily require no further analysis. *Id.* § 5.3.

[44] The 2015 HHIs based on producer shares have been revised in light of new information regarding plant ownership and management.

Figure 3: Historical Fuel Ethanol Capacity and HHIs
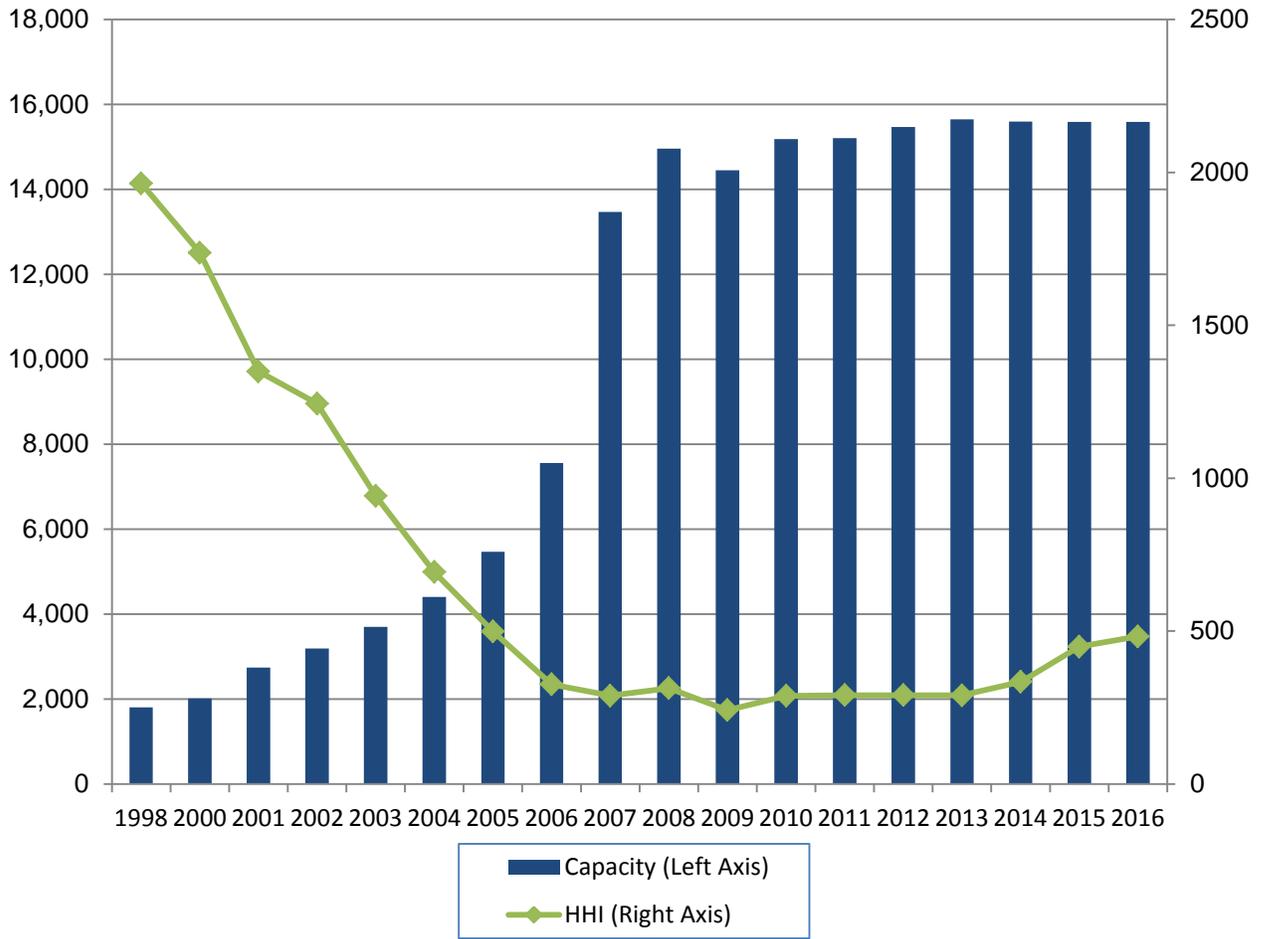
Note: Annual figures are for operable capacity and capacity under construction at year-end for 1998 to 2004, and as of October for 2005 to 2016. (Capacity additions attributed to 2016 are expected to be completed by mid-2017.) The HHI figures shown are capacity-based, with market share attributed to the producer.