2022 Report on Ethanol Market Concentration

I. Introduction

This Report presents the Federal Trade Commission's ("Commission" or "FTC") concentration analysis of the ethanol production industry for 2022.[1] The report includes certain data and information from the U.S. Energy Information Administration ("EIA"), industry participants, and other sources.[2] 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."[3] 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.[4] Also pursuant to the statute, the FTC delivers its report to Congress and the Administrator of the Environmental Protection Agency ("EPA") by December 1 of each year.

The HHI is a measure of market concentration. A given market's HHI is the sum of the squares of the individual market shares of all market participants.[5] As in previous reports, FTC staff ("staff") analyzed concentration based on U.S. ethanol production capacity and actual production of ethanol. Staff's analysis does not address whether ethanol production in any geographic area constitutes a relevant antitrust market; instead, it calculates concentration on a

[1] This Report builds upon Commission reports from previous years. Prior reports contain background information not included in this Report. *See* FTC, Oil and Gas Industry Initiatives: Reports, https://www.ftc.gov/tips-advice/competition-guidance/industry-guidance/oil-and-gas.

[2] Certain data and information relied upon in this Report may be revised or updated between annual reports.

[3] Energy Policy Act of 2005, Pub. L. No. 109-58, § 1501, 119 Stat. 1067, 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 "illegal price fixing."

[4] *Id*.

[5] 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.

nationwide basis, based on ethanol production capacity and actual ethanol production. For both measures, HHIs are calculated for producers and marketers. For both production capacity and actual production, concentration for producer shares is lower than concentration for marketer shares. Based on production capacity, the HHIs are 545 for producer-based shares and 869 for marketer-based shares. Based on actual production, the HHIs are 516 for producer-based shares and 922 for marketer-based shares. HHIs attributed to producers decreased from last year, while HHIs attributed to marketers increased.

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 coordinate on price or output levels, is unlikely on a nationwide basis. As has been the case each year since the Commission began reporting, the current HHIs indicate that the industry is unconcentrated nationwide.[6] At this level of concentration, a single ethanol producer or marketer likely lacks market power at a national level. Successful anticompetitive coordination at a national level would require agreement among a very large number of competitors and thus is similarly unlikely. Moreover, imports and the possibility of entry would likely 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

[6] The Commission and the 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 § 5.3 (2010), https://www.ftc.gov/sites/default/files/attachments/merger-review/100819hmg.pdf ("Horizontal Merger Guidelines").

[7] *See* Energy Policy Act of 2005 § 1501, *supra* note 3.

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] The annual use of renewable fuels did not keep pace with the statutory RFS requirements, however.[9] This situation has prompted the EPA for several years to use its rulemaking authority to decrease the annual requirements below the statutory volumes.[10] For 2022, the RFS mandates 36.0 billion gallons of renewable fuel, 15.0 billion gallons of which can be conventional corn ethanol.[11] The 2022 advanced biofuels target is 21.0 billion gallons, at least 16.0 billion gallons of which must be cellulosic biofuel.[12] For 2022, the EPA reduced the requirement for total renewable fuel to 20.63 billion gallons, of which 15.0 billion gallons can be conventional corn ethanol.[13] The EPA reduced the requirement for advanced biofuels to 5.63 billion gallons, at least 0.63 billion gallons of which must be cellulosic biofuel.[14]

B. Supply and Demand

Most market participants that staff interviewed characterize the ethanol industry as having excess capacity. Most market participants interviewed stated that demand for ethanol

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[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).

[9] *See* 2013 Ethanol Report, *supra* note 1, at 4; 2014 Ethanol Report, *supra* note 1, at 3; 2015 Ethanol Report, *supra* note 1, at 3.

[10] *See* 2016 Ethanol Report, *supra* note 1, at 3 (discussing revised volume requirements), and subsequent reports. The Clean Air Act provides EPA authority to adjust cellulosic, advanced, and total volumes set by Congress as part of the annual rulemaking process. *See* EPA, Overview for Renewable Fuel Standard (last updated Feb. 22, 2022), https://www.epa.gov/renewable-fuel-standard-program/overview-renewable-fuel-standard.

[11] 42 U.S.C. § 7545(o)(2)(B)(i)(I).

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

[13] EPA, Final Volume Standards for 2020, 2021, and 2022 (last updated Aug. 31, 2022), https://www.epa.gov/renewable-fuel-standard-program/final-volume-standards-2020-2021-and-2022/. The EPA's volume requirements, like the statutory RFS mandate, 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.

[14] *Id*.

has substantially recovered to a more normal level, along with demand for gasoline, after previously declining due to the COVID pandemic.

Most market participants interviewed stated that the EPA's waivers allowing E15 gasoline (having a 15 percent ethanol blend) to be sold during the summer of 2022 had little impact on demand for ethanol.[15]

C. Prices and Margins

Ethanol prices were volatile this year. Prices briefly spiked in November 2021, declined dramatically, and then rose somewhat and declined slowly the rest of the year. Margins spiked in November along with prices, then declined to negative levels, and remained at low or negative levels the rest of the year. Figure 1 shows daily net cost of corn,[16] ethanol prices, and margins from the beginning of 2014 to October 14, 2022, expressed on a per-gallon basis.[17] Margins are measured by a return over operating costs estimated for a hypothetical dry mill in Iowa, as reported by the Iowa State University Center for Agricultural and Rural Development.[18]

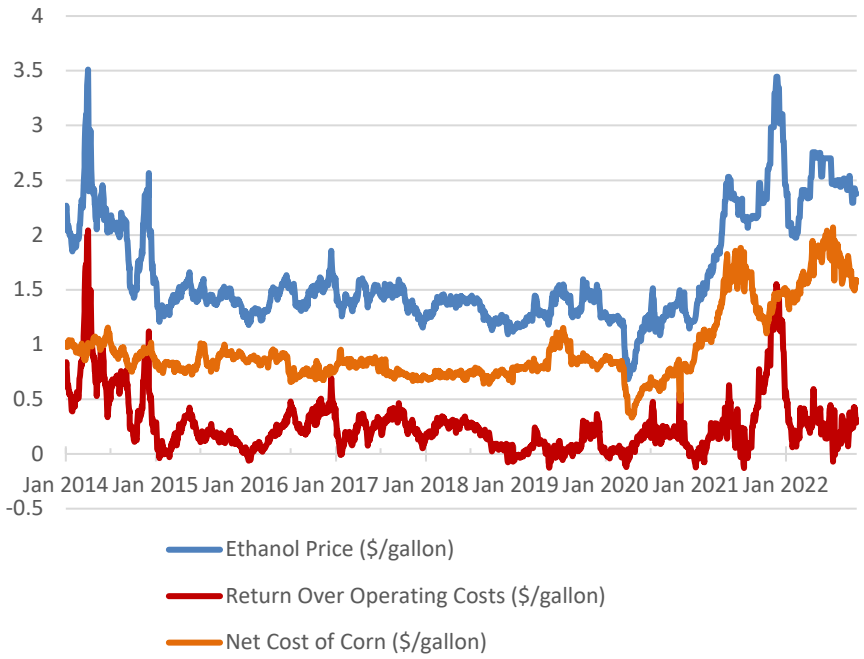
[15] *See* EPA, Fuel Waivers, https://www.epa.gov/enforcement/fuel-waivers (2022 Fuel Waivers, Nationwide) (last updated Aug. 27, 2022).

[16] Net cost of corn is the daily nearby futures price in Chicago plus Iowa corn basis. Weekly corn basis is calculated as the price that Iowa ethanol plants pay, as reported by the U.S. Department of Agriculture's Livestock and Grain Market News, minus the Chicago Board of Trade nearby futures price. *See infra* note 18.

[17] October 14, 2022 is the last date for which data from Iowa State University were reviewed for purposes of this Report.

[18] *See* Iowa State University, Center for Agricultural and Rural Development, Historical Ethanol Operating Margins, http://www.card.iastate.edu/research/biorenewables/tools/hist_eth_gm.aspx (last visited Oct. 25, 2022). "Return over operating costs" is specifically defined as the difference between the revenue from ethanol (including revenue from ethanol and dried distillers grains with solubles) and variable production costs (including corn, natural gas, and labor). As of November 2016, revenue includes sales of corn oil, a byproduct of ethanol, which could make margins not comparable before that date.

Figure 1: Ethanol Price, Corn Cost, and Margin
Jan. 2014 to Oct. 2022



Data from Iowa State University, Center for Agricultural and Rural Development, Historical Ethanol Operating Margins

The average estimated margin from the beginning of 2021 through mid-October 2022 was $0.25 per gallon, which is unchanged from the same period last year and higher than the margin in 2020.[19]

D. Market Trends

Domestic ethanol production capacity increased slightly, and actual production increased since last year's Report. Production capacity (including capacity under construction) was 18.1 billion gallons per year.[20] Actual production from July 2021 through June 2022

[19] *Id*. Margins as reported in previous Ethanol Reports. *See supra* note 1.

[20] Production capacity increased slightly from 17.77 billion gallons per year in 2021 to 18.127 billion gallons per year in 2022. Staff's total capacity estimate takes into account information obtained through interviews with market

increased to 15.5 billion gallons per year from 14.5 billion gallons per year during the prior 12 months.[21]

Ethanol exports increased. From July 2021 through June 2022, the United States exported approximately 1.40 billion gallons of ethanol.[22] This marked an increase from 1.27 billion gallons of ethanol during the previous July-to-June period, after three consecutive annual declines during a July-to-June period.[23]

Over 100 firms produced ethanol in 2022. The largest ethanol producer's share of domestic capacity is approximately 17 percent, the same as last year.[24]

Most market participants interviewed cited ongoing transportation challenges due to either a shortage of drivers in trucking or railroad staffing issues.

III. Analysis

Section 1501(a)(2) of the Energy Policy Act of 2005 instructs the Commission to use HHIs to measure concentration in the U.S. ethanol production industry.[25] HHIs can provide a snapshot of market concentration based upon the number of market participants and their

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participants and publicly available information, including information published online by the Renewable Fuels Association ("RFA") as of September 8, 2022, regarding Ethanol Biorefinery Locations. RFA, Ethanol Biorefinery Locations, https://ethanolrfa.org/resources/ethanol-biorefinery-locations. Staff's capacity total is greater than the EIA annual published estimate of 17.38 billion gallons. EIA, U.S. Fuel Ethanol Plant Production Capacity (release date: Aug. 8, 2022), http://www.eia.gov/petroleum/ethanolcapacity/. EIA's Fuel Ethanol Production Capacity estimate is intended to measure estimated gallons of fuel alcohol that a plant is capable of producing over a period of one year (365 consecutive days) starting on the first day of each report month. *Id*.

[21] EIA, Monthly Energy Review, Table 10.3 Fuel Ethanol Overview (release date: Oct 26, 2022), https://www.eia.gov/totalenergy/data/browser/?tbl=T10.03#/?f=M&start=201903&end=202106&charted=7-18.

[22] Calculations based on July 2021-June 2022 monthly exports reported in EIA, U.S. Exports of Fuel Ethanol (Sept. 30, 2022 release date), http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=M_EPOOXE_EEX_NUS-Z00_MBBL&f=M (calculating a monthly sum of barrels converted to U.S. gallons (1 barrel = 42 U.S. gallons)).

[23] *Id.*

[24] *See* 2021 Ethanol Report, *supra* note 1, at 8 (largest producer's share 17 percent).

[25] Energy Policy Act of 2005 § 1501(a)(2), *supra* note 3.

respective sales, production, or capacity.[26] An analysis of competition among market participants using these HHIs assumes that the U.S. ethanol production industry is an appropriate (or "relevant") antitrust market, a question that this Report does not address.[27] Such an assumption precludes consideration of a broader product market that includes other gasoline blending components that might be viable substitutes for ethanol. In the event that ethanol competes with other blending components, HHIs based on fuel ethanol production and marketing would likely misstate concentration in the industry. This assumption also precludes consideration of whether broader or narrower geographic markets than the United States could provide further insight about competition in ethanol production and marketing.

This Report presents four HHIs for the ethanol industry, based on two different measures of market share (production capacity and actual production) and two different methods of attributing those market shares to various market participants (producers and marketers). In regard to measuring market share, for purposes of this Report "production capacity" is defined to mean a plant's maximum annual output of ethanol minus any required downtime for maintenance.[28] "Actual production" is defined to mean a plant's actual annual output of

[26] 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.

[27] 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 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.

[28] Production capacity is also sometimes referred to as "operating capacity." For purposes of this Report, production capacity is distinct from "nameplate capacity," a common industry term that may refer to the intended full-load sustained output of a facility. Nameplate capacity may also be variously known as "rated capacity," "nominal capacity," "installed capacity," or "stated design capacity."

ethanol.[29] In regard to attributing market shares to market participants, "producer" is defined to mean a firm that in fact manufactures the ethanol. As discussed below, "marketer" is defined to mean the firm, whether the producer itself or a third-party firm, that sells and transports a producer's ethanol output.

FTC staff calculated market shares based on domestic ethanol production capacity for producers and marketers. FTC staff relied on publicly available information and interviews with producers and marketers to determine the production capacity of each ethanol plant and marketing activities of marketers. FTC staff then calculated capacity-based HHIs for producers and marketers.

EIA staff calculated market shares based on actual production for producers and marketers. Due to the confidential nature of the ethanol production data the EIA collects, FTC staff provided to EIA staff the information necessary to attribute market shares to market participants.[30] EIA staff then separately calculated production-based HHIs for producers and marketers.[31]

A. Concentration with Market Shares Based on Production Capacity

FTC staff calculated market shares based on fuel ethanol production capacity.[32] Production capacity provides a useful and easily confirmable indicator of a producer's

[29] Actual production is also sometimes referred to as "operating production."

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

[31] 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.

[32] The RFA 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. Staff obtained the production capacity for some producers directly from firm officials.

competitive significance.[33] 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.[34] Incorporating capacity from such projects into current market share calculations is consistent with the approach set forth in the Horizontal Merger Guidelines.[35]

1. *Attributing Market Shares to Producers*

Under the first approach to market concentration, FTC staff attributed market share to each producer based on the producer's percentage of total production capacity. This method of calculation yielded an HHI of 545, a level regarded as unconcentrated under the Horizontal Merger Guidelines.[36] This HHI is lower than the corresponding HHI of 561 in 2021.[37]

2. *Attributing Market Shares to Marketers*

Under the second approach, FTC staff attributed the market share of each producer to the firm that markets for that producer. Some producers sell the ethanol they produce directly to

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[33] *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.*

[34] 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 October 2022. 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 attributing production to the marketer should capture any such complexity not reflected in the producer HHI.

[35] *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.*

[36] *See id*. § 5.3.

[37] *See* 2021 Ethanol Report, *supra* note 1, at 11. The industry continued to experience shifts in plant capacity through plant expansions, conversions, openings, and closures over the past 12 months. Because the HHI captures these adjustments in the aggregate, it ignores the individual activity of industry participants. For example, the HHI may include a producer's acquisition of another producer's facilities that coincided with the restart or reconstruction of an idled facility. Alternatively, the HHI may exclude a plant that was converted to other uses, formally closed, or judged unlikely to reopen in the near future.

blenders and end users. Many producers, however, enter into marketing agreements with third parties to sell their output. An ethanol marketer may represent and make limited decisions for multiple individual producers, essentially aggregating those 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 a producer that engages in direct sales, staff attributed the market shares to the producer itself.[38] For a producer that does not engage in direct sales, staff attributed the market shares to the third-party firm that marketed the producer's ethanol output. This approach yields an HHI of 869, unconcentrated under the Horizontal Merger Guidelines. This HHI is higher than the corresponding HHI of 809 in 2021.[39]

B. Concentration with Market Shares Based on Actual Production

EIA staff calculated market shares based on actual production. Firms that produce ethanol must report their monthly production volumes to EIA. 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 can sometimes produce more than their stated design capacity (*i.e.*, nameplate capacity) and sometimes operate at increasing rates as their owners and operators improve the production process and gain expertise in operating their plants.[40] Thus, actual production may reflect a market participant's competitive significance more accurately than would the sum of its plants' stated design capacities.

[38] 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.

[39] *See* 2021 Ethanol Report, *supra* note 1, at 12.

[40] 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.

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 impact of new facilities that began production during the last 12 months, nor do they fully reflect the impact of plant closures and idling during the period. In both cases, these facilities 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 that have been in effect for less than 12 months and capacity-enhancing improvement projects that are not yet in operation. These production-based HHIs reflect actual production volumes from July 2021 through June 2022.

1. ***Attributing Market Shares to Producers***

Where EIA attributed the actual production market share directly to individual producers, the resulting HHI is 516, lower than the 2021 HHI of 526.[41]

2. ***Attributing Market Shares to Marketers***

Calculating production-based concentration by attributing the market share of each producer to the firm that markets for that producer results in an HHI of 922, higher than the 2021 HHI of 847.[42]

[41] *See* 2021 Ethanol Report, *supra* note 1, at 13.

[42] *Id.*

C. Entry and Imports

The U.S. ethanol industry at a national level remains unconcentrated today. This implies that any unilateral or coordinated attempt to exercise market power is 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 sugarcane-based ethanol from Brazil.[43] This responsiveness would likely constrain any potential exercise of market power by a domestic firm. Additionally, to the extent U.S. prices increase because of the exercise of market power among a subset 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 attribution method used to calculate concentration, the ethanol industry remains unconcentrated at a national level. Furthermore, the possibility of entry and the availability of ethanol imports likely provide

[43] Brazil has been the largest exporter of ethanol to the United States every year since 2011. *See* EIA, U.S. Imports by Country of Origin (release date: Oct. 31, 2022), https://www.eia.gov/dnav/pet/pet_move_impcus_a2_nus_epooxe_im0_mbbl_a.htm, and prior FTC reports on ethanol market concentration, *supra* note 1. Although the United States is a net exporter of ethanol, demand exists for imported ethanol with low greenhouse gas emissions, such as sugarcane-based ethanol. *See* EIA, U.S. ethanol exports fell for the first time in four years in 2019 (May 1, 2020), https://www.eia.gov/todayinenergy/detail.php?id=43575.

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.

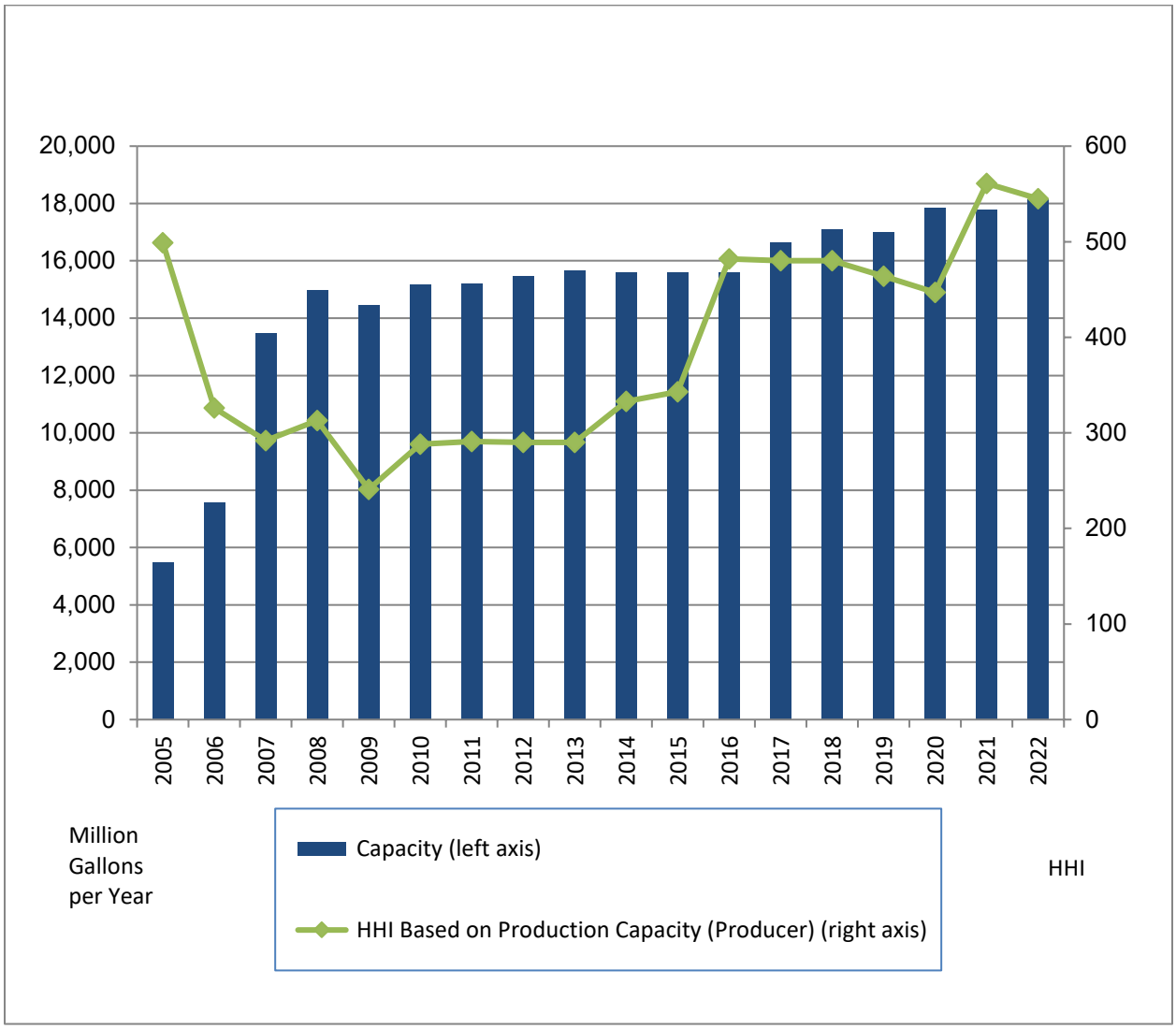
Figure 2: Domestic Fuel Ethanol Concentration

Concentration Based on Production Capacity	**2021 HHI[44]**	**2022 HHI**
Shares attributed to each producer	561	545
Shares attributed to marketers for all marketing agreements	809	869
Concentration Based on Actual Production	**2021 HHI[45]**	**2022 HHI**
Shares attributed to each producer	526	516
Shares attributed to marketers for all marketing agreements	847	922
Note: Production capacity for 2022 includes the annual production capacity as of October 2022 and the capacity additions under construction and expected completions within 12 to 18 months thereafter. Actual production data for 2022 are from the annual period of July 2021 through June 2022.		

[44] *See* 2021 Ethanol Report, *supra* note 1, at 15.

[45] *Id*.

Figure 3: Historical Fuel Ethanol Capacity and HHIs[46]



[46] Figure 3 in this year's report contains certain corrections in order to make HHI Based on Production Capacity (Producer) consistent with HHIs reported for this measure in previous years' reports beginning in 2005. *See supra* note 1.