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Biofuels—Snake Oil for the Twenty-First Century

Most Americans are painfully aware that our present consumption of petroleum is unsustainable. The United States has less than 5% of the world's population, but consumes 24.4% of the world's petroleum production.[1] Only 8.5% of the world's petroleum production comes from American wells,[2] which necessitates the importation of 58.2% of our oil.[3] Demand for oil, worldwide, has led to the price of Saudi Arabian Light-34, a typical crude oil, increasing from $15.50 a barrel in 1998 to $93.02 in 2008.[4] In addition to the spiraling cost of petroleum-based fuel, the transfer of our nation's wealth to oil exporting countries helps to lower the value of the dollar[5] while adversely affecting the nation's options in dealing with other nations. Moreover, the combustion of gasoline and diesel fuel is a major source of pollution and contributes to climate change. The solution is simple. We must use less fossil fuel for

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1 STACY C. DAVIS, SUSAN W. DIEGEL & ROBERT G. BOUNDY, U.S. DEP'T OF ENERGY, ORNL-6981, TRANSPORTATION ENERGY DATA BOOK 1–5, tbl.1.4 (27th ed. 2008).

2 *Id.* at 1–4, tbl.1.3.

3 *Id.* at 1–8, tbl.1.7.

4 U.S. Dept. of Energy, Energy Info. Admin., Crude Oil Prices by Selected Type, 1970–2009, tbl.11.7, *available at* http://www.eia.doe.gov/emeu/aer/txt/ptb1107.html (last visited July 12, 2009).

5 From September 2001 to September 2008 the U.S. dollar has declined 38% against the Euro, 20% against the British Pound, 11% against the Japanese Yen, and 20% against the Singapore Dollar. *See* http://www.x-rates.com/cgi-bin/hlookup.cgi (last visited September 25, 2008).

transportation or reduce the vehicle miles driven or a combination of both approaches. But, Congress and President Bush did little to address the need to reduce petroleum consumption. Instead, Congress created a biofuels program that mandates the use of ethanol and biodiesel. This Article explores how agribusiness and their political allies have foisted this snake oil program on the American consumer in a successful effort to transfer billions of dollars from the public to corn farmers, and ethanol and biodiesel producers. In doing this, the environment and the economy are harmed, while the program has little positive effect on our foreign petroleum dependence.

In 2007, 68.3% of the petroleum consumed in the United States was used by the transportation sector,[6] and about 84% of the transportation sector petroleum consumption was by highway vehicles.[7] This light vehicle fleet averages about 18.5 miles per gallon ("mpg"),[8] which is substantially below the federal corporate average fuel economy ("CAFE") standards. If the fuel consumed by light vehicles were reduced by 25%, U.S. petroleum consumption would decline about 15%, which would result in approximately a 25% reduction in petroleum imports.[9] To accomplish this, the actual average fuel economy of light vehicles would need to increase by about six mpg. To end the need for imported petroleum the fuel efficiency of light duty vehicles would have to increase to about forty-three mpg. While major increases in fuel efficiency will take time to achieve, a Toyota Prius already gets forty-eight mpg. The obvious ways to achieve independence from foreign oil are to mandate more stringent CAFE standards, increase the cost of fuel to encourage fuel conservation, and provide incentives to drive fewer miles using more fuel-efficient vehicles. Such efforts would quickly reduce gasoline consumption at a modest cost.[10] Many vehicle models that are available for purchase substantially exceed a 25% reduction target, and several hybrid vehicles greatly exceed that

6 DAVIS, DIEGEL & BOUNDY, *supra* note 1, at 1–17, tbl.1.13.

7 Calculated from data at *id.* at 1–18, tbl.1.14.

8 In 2006, cars and two-axle, four-tire trucks traveled 2771 billion miles. DAVIS, DIEGEL & BOUNDY, *supra* note 1, at 4–2, tbl.4.1, 4–3, tbl.4.2. To accomplish this, 149.4 billion gallons of gasoline were combusted (16,796 trillion Btus of fuel, *id.* at 2–8, tbl.2.6, containing 112,417 Btus/gal., *id.* at B–4, tbl.B.4).

9 *Id.* (calculated from the figures in the text).

10 *See generally* U.S. DEPT. OF TRANSP. & NAT'L HIGHWAY SAFETY ADMIN., STUDY OF FEASIBILITY AND EFFECTS OF REDUCING USE OF FUEL FOR AUTOMOBILES (2006).

target.[11] But, federal CAFE standards for cars remained at 27.5 mpg from 1990 to 2007.[12] The CAFE requirement for light trucks was 20.5 mpg from 1987 to 2004, and then became slightly stricter at 21.0, 21.6, and 22.2 mpg in 2005, 2006, and 2007 respectively.[13] Furthermore, real world fuel efficiency is significantly lower than the CAFE standards. For nearly two decades, as the U.S. dependency on foreign oil increased, Congress and many motor vehicle manufacturers made no serious effort to improve fuel efficiency, and the average consumer did not purchase fuel-efficient vehicles. Congress finally acted in the Energy Independence and Security Act of 2007 to require the average fuel economy for model year 2020 vehicles to be at least 35 mpg.[14] The law requires too little, too slowly. But the program, if successful, would reduce the nation's dependency on foreign oil.

President Obama directed the National Highway Traffic Safety Administration to issue new fuel economy standards for model year ("MY") 2011. On March 27, 2009, MY 2011 standards were changed to require a 2 mpg increase from MY 2010 passenger cars and light trucks to have a combined average of 27.3 mpg. Passenger cars must meet a standard of 30.3 mpg, which is the first increase since the 27.5 mpg standard was set in 1975. For light trucks the MY 2011 standard will be 24.1 mpg. On May 19, 2009, President Obama announced that new fuel economy standards for MY 2016 vehicles will require a combined average of 35.5 mpg for cars and light trucks. In addition, the Environmental Protection Agency ("EPA") is considering a limit of 250 grams of carbon dioxide per mile based on the authority of CAA section 202(a). EPA and the Department of Transportation intend to have a joint rulemaking with new standards beginning in MY 2012. When they are fully implemented in MY 2016, cars will have a 39 mpg fuel economy requirement and light trucks will have to meet a 30 mpg standard. The President said this will reduce oil

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[11] *See generally Which Affordable Hybrids Save You the Most Money?*, CONSUMER REPORTS, Oct. 2008, at 40.

[12] Nat'l Highway Traffic Safety Admin., CAFE Overview: Frequently Asked Questions, http://www.nhtsa.dot.gov/CARS/rules/CAFE/overview.htm (last visited July 12, 2009).

[13] *Id.*

[14] Energy Independence and Security Act of 2007, Pub. L. No. 110-140, § 102, 121 Stat. 1492, 1499 (2007).

consumption by more than the imports from Saudi Arabia, Venezuela, Libya, and Nigeria combined.[15]

The beneficial effects of improved fuel efficiency of motor vehicles will not materialize if they are nullified by increases in population and vehicle miles driven. Moreover, independence from foreign oil does not necessarily mean lower prices. Oil companies sell their products in a world market, including those produced from American oil and processed in U.S. refineries. They will sell to the highest bidder regardless of nationality.

While Congress has been slow to mandate vehicle fuel efficiency improvement, it has worked hard to create a biofuels program aimed at ultimately reducing the petroleum used by light vehicles. In 2005 and again in 2007 Congress mandated the use of renewable fuel.[16] The 2007 law requires the use of thirty-six billion gallons of renewable fuel by 2022. This will reduce the need for petroleum by about twenty-four billion gallons a year, because ethanol has only two-thirds the energy of gasoline.[17] This is equal to about 18% of the gasoline used by highway vehicles in 2006.[18] The biofuel program's cost to taxpayers in 2022 will likely exceed $20 billion a year and will provide a fuel saving that alternatively could be achieved by improving light vehicle fuel economy by about four mpg. The 2008 requirement to use nine billion gallons of renewable fuel will reduce petroleum demand by about 3.8% at a cost well in excess of $5 billion, and the benefit could be achieved with an improved vehicle fuel economy of less than one mpg.[19] The biofuel program results in increased pollution and it adversely impacts the quality of the environment. Furthermore, it does very little to reduce overall fossil

[15] *See* Steven D. Cook, *Ninety-One Congressman Urge Obama to GO Beyond Bush Fuel Economy Standards*, 40 ENV'T REP. (BNA) 677 (Mar. 27, 2009); Steven D. Cook & Carolyn Whetzel, *Declaring Status Quo "Not Acceptable," Obama Announces Rules for Fuel, Emissions*, 40 ENV'T REP. (BNA) 1159 (May 22, 2009).

[16] Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594 (2005); Energy Independence and Security Act of 2007, Pub. L. No. 110-140, 121 Stat. 1492 (2007).

[17] The net Btu value for gasoline is 115,400 Btus/gal., for ethanol the value is 75,670 Btus/gal. DAVIS, DIEGEL & BOUNDY, *supra* note 1, at B–4, tbl.B.4.

[18] Calculated from date at DAVIS, DIEGEL & BOUNDY, *supra* note 1, at 2–13, tbl.2.11 & 2–6, tbl.2.4.

[19] In 2008 the federal mandate is to use nine billion gallons of ethanol, which has the energy value of about six billion gallons of gasoline. The total fuel consumption was about 157.26 billion gallons. Thus, about 4% of the petroleum is replaced. The average fuel economy for light-duty vehicles is about 18.5 mpg, so a 4% improvement can be obtained with an increase in fuel efficiency of less than one mpg. *See id.*, at 2–9, tbl.2.7; *see also supra* note 17.

fuel energy consumption because of the fossil fuel required to produce ethanol, which means the use of ethanol does not materially reduce greenhouse gas emissions. The use of biofuels raises the price of food and can remove food from world markets because it is worth more as fuel. Its use also threatens ecosystems, worldwide, by encouraging the creation of biofuel plantations. The biofuel program, because of subsidies, attracts capital to increase ethanol production, which may create another financial "bubble" if the public decides that government support for this industry should end.

I
OVERVIEW OF MOBILE SOURCE FUEL REGULATION UNDER THE CLEAN AIR ACT

As part of the response to the Clean Air Act's ("CAA") mandate to reduce emissions from motor vehicles, automotive fuels are regulated, primarily by section 211. Fuel modifications may reduce emissions at a lower cost than motor vehicle emission controls and can be targeted at a geographical region or at a season with high levels of air pollution. The benefits of fuel regulation can begin quickly without waiting for the vehicle fleet to turn over. Fuel regulations are relatively easy to enforce because petroleum refining and fuel distribution are controlled by a small number of corporations.[20] Moreover, fuel modifications may shift some of the costs of pollution reduction from the automotive industry to the petroleum industry, which is an incentive for the automotive industry to press for fuel improvements.[21] In 1970 the CAA Amendments authorized the control of fuels and fuel additives.[22] At the end of 1970, the EPA was created by President Nixon, and it was given the authority to administer the CAA.[23] The EPA used CAA section 211(c)(1) to regulate fuels and fuel additives if (A) they cause "air pollution which

[20] Energy Info. Admin., Ranking of U.S. Refineries, http://www.eia.doe.gov/neic/rankings/refineries.htm (last visited July 12, 2009).

[21] See, e.g., *Motor Vehicle Mfrs. Ass'n v. N.Y. State Dep't of Envtl. Conservation*, 17 F.3d 521 (2d Cir. 1994), in which the automotive industry argued that if states other than California were to impose California standards they also were required to adopt California fuel standards.

[22] Clean Air Act Amendments of 1970, Pub. L. No. 91-604, § 211(b)(2), 84 Stat. 1676, 1698–99 (codified as amended primarily at CAA § 211, 42 U.S.C. § 7545).

[23] REORGANIZATION PLAN NO. 3 OF 1970, 3 C.F.R. XX (1970), *reprinted in* 84 STAT. 2090–93 (1970), and in 35 FED. REG. 15,627–30 (1970), and reprinted with amendments in 5 U.S.C. APP. AT 1557–61 (1994).

may reasonably be anticipated to endanger the public health or welfare or, (B) if emission products . . . will impair to a significant degree the performance of any emission control device or system which is in general use, or which the Administrator finds has been developed to a point where in a reasonable time it would be in general use were such regulation to be promulgated."[24] One of the EPA's most conspicuous successes in using this provision was the elimination of lead from gasoline.[25]

The CAA Amendments of 1977[26] and 1990[27] expanded the EPA's authority to regulate fuels. In addition to restricting fuel additives, the 1990 amendments require fuel combustion to result in fewer emissions. Section 211(h) of the CAA imposes restrictions on fuel volatility by specifying the allowable Reid Vapor Pressure ("RVP") level in fuels during the high ozone season to protect public health from dangers created by the volatile chemicals found in gasoline.[28] Sections 211(k), 211(*l*), and 211(m) each provide mechanisms to reduce air pollution generated by automobiles by specifying what must be in gasoline. Section 211(k) requires the use of reformulated gasoline to substantially reduce emissions from gasoline-fueled vehicles used in ozone nonattainment areas. Section 211(*l*) requires the use of detergents in gasoline. Section 211(m) mandates the use of oxygenated fuels in some carbon monoxide ("CO") nonattainment areas. These requirements influence which fuels are produced and what additives fuels may contain.

II
OXYGENATED FUEL

Oxygenates have been used since 1970 as octane enhancers to prevent engine knock and can be used as a substitute for the lead-based additive that was phased out. Some states imposed oxygenated gasoline requirements for gasoline to improve combustion to control CO emissions during cold weather months. In 1988, Denver,

[24] 42 U.S.C. § 7545(c)(1) (2006).

[25] *See generally* Arnold W. Reitze Jr., *The Regulation of Fuels and Fuel Additives Under Section 211 of the Clean Air Act*, 29 TULSA L.J. 485 (1994).

[26] Clean Air Act Amendments of 1977, Pub. L. No. 95-95 § 222, 91 Stat. 685, 762–63.

[27] Act of Nov. 15, 1990, Pub. L. No. 101-549, 104 Stat. 2399 (codified at 42 U.S.C. § 7545 (2006)).

[28] Gasoline volatility requirements are found at 40 C.F.R. § 80.27. The requirements applicable to enforcement of these regulations are analyzed by the EPA's Environmental Appeals Board in In Re *Commercial Cartage Company*, 7 E.A.B. 784 (1998).

Colorado, was the first air quality control region to implement an oxygenate program.[29] After 1990 and prior to 2005, achieving the oxygen content required for gasoline by the CAA usually involved the addition of alcohol or ether. Alcohols are derivatives of hydrocarbons in which a hydroxyl group ("OH") replaces a hydrogen atom. This additional oxygen improves combustion.[30]

The alcohols most commonly used in gasoline are ethanol ("CH_3CH_2OH") and methanol ("CH_3OH"). Ethanol can be made from any biomass feedstock, and is the same compound that is used in alcoholic beverages. Producing fuel alcohol is a four-step process. First, a carbohydrate (almost always corn in the United States) is reduced to a sugar solution.[31] Next, it is fermented to ethanol and carbon dioxide. The ethanol then is removed by distillation to create a 95% alcohol solution. Finally, the water is removed. Because ethanol has about two-thirds the energy content of gasoline,[32] a 10% ethanol blend results in a 2–3% decrease in mpg for the blend.[33]

Methanol or wood alcohol can be made from wood, coal, biomass, municipal waste, or any other carbon-containing material. However, most U.S. methanol is produced from natural gas.[34] The use of methanol results in reduced emissions of conventional pollutants, but its use has many negative effects. For example, methanol can produce unacceptable engine wear and is corrosive to fuel systems. It burns with a flame that is hard to see, thus, its use creates a potential safety problem. It is toxic if ingested, inhaled, or absorbed through the skin. It is easily contaminated by water, which reacts with methanol to produce acid.[35] To avoid these negative attributes, one molecule of water can be removed from two molecules of alcohol to

29 NAT'L SCI. & TECH. COUNCIL COMM. ON ENV'T & NATURAL RES., INTERAGENCY ASSESSMENT OF OXYGENATED FUELS 3–3 (1997).

30 *See* BRENT D. YACOBUCCI, CONG. RESEARCH SERV., RL33290, FUEL ETHANOL: BACKGROUND AND PUBLIC POLICY ISSUES, CRS REPORT FOR CONGRESS CRS–12 (2006).

31 U.S. DEPT. OF AGRIC., THE ECONOMIC FEASIBILITY OF ETHANOL PRODUCTION FROM SUGAR IN THE UNITED STATES 1 (2006) [hereinafter USDA].

32 Gasoline contains about 125,000 Btus/gal., and ethanol contains about 84,600 Btus/gal. DAVIS, DIEGEL & BOUNDY, *supra* note 1, at B–4, tbl.B.4.

33 YACOBUCCI, *supra* note 30, at CRS–6.

34 *See* Inst. for Analysis of Global Sec., Sources of Methanol, http://www.iags.org/methanolsources.htm (last visited July 12, 2009).

35 Staff of House Subcomm. on Fossil and Synthetic Fuels, Comm. on Energy and Commerce, 98th Cong., Methanol as an Automotive Fuel 14 (Comm. Print 1984).

produce ether.[36] Methanol can be processed to Methyl Tertiary Butyl Ether ("MTBE") and then used as a fuel additive with about half the RVP of ethanol, which makes it less likely to evaporate, especially in warm weather.[37] Neither MTBE nor ethanol cause engine corrosion at the concentrations used in standard motor vehicle fuel. But, ethanol is a more effective oxygen source than MTBE. An 11% MTBE blend, or a 5% ethanol blend, is required to increase the oxygen content of gasoline by at least 2%.[38]

MTBE is no longer in common use, but for more than a decade it was the oxygenate of choice because it costs less than other oxygenates; it has a higher energy content than other oxygenates; it is not water soluble, as are other oxygenates; it can be blended at the refinery and shipped through pipelines; and it can be used in warm weather without increasing emissions. Ethyl Tertiary Butyl Ether ("ETBE"), a similar additive made from ethanol that is processed with isobutylene (a petroleum byproduct) can be used. It has not been used commercially in the United States because it is costly and may create water contamination problems similar to MTBE, discussed below.[39] It is used in Europe to meet the European Union's volatility standards.[40] Tertiary-amyl Methyl Ether and Tertiary-Butyl Alcohol also can be used to oxygenate gasoline, but neither is considered a viable choice by the petroleum industry.[41]

A. MTBE Problems

By 1997 there was serious concern in California over the effects of MTBE releases on drinking water supplies. MTBE creates taste and odor problems in water at low concentrations. It migrates into groundwater, resists conventional water treatment processes, and is considered a potential human carcinogen. Removal of MTBE from

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[36] *See* CHARLES E. MORTIMER, CHEMISTRY: A CONCEPTUAL APPROACH 722 (4th ed. 1979).

[37] *See id.*

[38] U.S. ENVTL. PROT. AGENCY, EPA/600/R-96/069, OXYFUELS INFORMATION NEEDS 1 (1996).

[39] NEW ENGLAND INTERSTATE WATER POLLUTION CONTROL COMM'N ("NEIWPCC") & NORTHEAST STATES FOR COORDINATED AIR USE MGMT. ("NESCAUM"), HEALTH, ENVIRONMENTAL, AND ECONOMIC IMPACTS OF ADDING ETHANOL TO GASOLINE IN THE NORTHEAST STATES 8 (2001) [hereinafter NEIWPCC & NESCAUM].

[40] UNITED NATIONS CONFERENCE ON TRADE AND DEV., UNCTAD/DITC/COM/2006/15, CHALLENGES AND OPPORTUNITIES FOR DEVELOPING COUNTRIES IN PRODUCING BIOFUELS 13 (2006) [hereinafter UNITED NATIONS CONFERENCE].

[41] NAT'L SCI. & TECH. COUNCIL, *supra* note 29, at iii.

drinking water requires municipal water treatment plants to use additional technology. MTBE has caused extensive ground water contamination because of leaks from storage tanks, but it also gets into water supplies from motor vehicle and boat exhaust and from the deposition of windborne emissions. Remediation from ground water is difficult and expensive.[42] MTBE is a hazardous waste under the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") if it exceeds the reportable quantity of 1000 pounds or more.[43]

On March 25, 1999, California's governor ordered the use of MTBE to be phased out of California's gasoline by December 31, 2002. On December 9, 1999, the California Air Resources Board ("CARB") approved regulations banning the use of MTBE in gasoline by January 1, 2003. The Oxygenated Fuels Association challenged California's law.[44] On June 4, 2003, the Ninth Circuit affirmed the lower court's decision upholding California's authority to ban MTBE, despite a federal preemption-based challenge,[45] and on March 31, 2004, the California MTBE ban took effect at the retail level.[46]

The MTBE was used to meet federal air quality mandates in more than fifteen states.[47] But Congress, which had created the problem of ground water contamination from MTBE with its oxygenated gasoline requirements, was not supporting a phase-out demanded by environmentalists, the American Petroleum Institute, and state governments. While MTBE producers claimed defective underground gasoline storage tanks were the reason oxygenates leaked into drinking water, sales plummeted. MTBE production went from 302 million gallons in 1985 to a peak of 3.315 billion gallons in 1999. Its use declined to 2.572 billion gallons in 2003 and continued to decline thereafter.[48]

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[42] *See, e.g.*, Ground-Water Monitoring, 40 C.F.R. pt. 265, subpt. F (2008); National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. pt. 300, app. A & D (2008).

[43] 42 U.S.C. §§ 9601 to 9675; 40 C.F.R. § 302.4, tbl.302.4.

[44] Oxygenated Fuels Ass'n v. Davis, 163 F. Supp. 2d 1182 (E.D. Cal. 2001).

[45] Oxygenated Fuels Ass'n v. Davis, 331 F.3d 665 (9th Cir. 2003).

[46] CAL. AIR RES. BD., UPDATED INFORMATIVE DIGEST 3, *available at* http://www.arb.ca.gov/regact/mtberesid/infodig.pdf (last visited July 12, 2009).

[47] Ryan W. Herrick, *MTBE or Not to Be?: Clean Air, Dirty Water, and Common Law Nuisance*, 30 MCGEORGE L. REV. 1325, 1328 (1999).

[48] STACY C. DAVIS & SUSAN W. DIEGEL, ORNL-6973, TRANSPORTATION ENERGY DATA BOOK 2–12, tbl.2.10 (24th ed. 2004).

The MTBE ban meant that California refiners would need most of the ethanol produced in the United States to meet its oxygenate requirement. Therefore, California's governor requested that the EPA waive the oxygen content requirement of CAA section 211(k)(2)(B).[49] California is allowed to exercise control over fuel and fuel additives,[50] and it used this authority to develop its own reformulated gasoline. California's position was that Phase 3 reformulated gasoline would meet air emission reduction requirements without added oxygenates.[51] The EPA found that California failed to "clearly demonstrate" the effect that waiver would have on ozone emissions as required by section 211(k)(2)(B) and refused to grant a waiver.[52] The EPA found it unnecessary to address the possible benefits the waiver might have on particulate matter ("PM") emissions.[53]

Undeterred, California sought review of the EPA's denial of its waiver, but the Ninth Circuit upheld the EPA's decision.[54] California, in the court's view, had not clearly shown what impact a waiver would have on the ozone National Ambient Air Quality Standard ("NAAQS"). The EPA's modeling concluded that emissions of NO_x would likely decrease, CO emissions would increase, and VOC emission changes were uncertain.[55] According to the court, the EPA did not act arbitrarily or capriciously in deciding that California had not met its burden to show the oxygen requirement interfered with meeting the ozone NAAQS. The EPA's position was that a waiver should be granted only when it would aid in attaining at least one NAAQS and not hinder achieving any NAAQS.[56] The court, however, held that the EPA abused its discretion by refusing to consider the effect an oxygen waiver would have on the PM NAAQS after research demonstrated that the oxygen requirement interfered with attainment of the PM standard.[57] According to the Ninth Circuit, the EPA must evaluate the impact of an oxygen waiver on all

49 Davis v. EPA, 348 F.3d 772, 777 (9th Cir. 2003).

50 CAA § 211(c)(4)(B) (2006), 42 U.S.C. § 7545(c)(4)(B) (2006).

51 *Davis*, 348 F.3d at 777.

52 *Id.* at 780–81.

53 *Id.* at 783–84.

54 *Id.* at 783.

55 *Id.* at 782.

56 *Id.* at 783.

57 *Id.*

NAAQS for which evidence relevant to a NAAQS was presented.[58] California may adopt its own fuel regulation pursuant to section 211(c)(4)(B). But, this section has to be read in conjunction with section 211(k)(2)(B), which required oxygenates to be used until the provision was repealed in 2005.[59] The California requirements must be in addition to, rather than in lieu of, federal requirements. The court then remanded the matter to the EPA to consider the effects of a waiver on both ozone and PM NAAQS.[60]

The MTBE controversy played a part in preventing passage of the national energy policy legislation from 2001 to 2005, because some representatives wanted MTBE use to be restricted to expand the role of ethanol. A simple ban on MTBE would favor ethanol, and was supported by many members of Congress, especially those from corn-producing districts.

A major obstacle to obtaining a congressional response to the MTBE controversy was the issue of liability, or nonliability, of MTBE producers. The House Republican leadership advocated inclusion of protection from liability for MTBE producers in the energy bill debated from 2001 through 2005. Local governments, water utilities, and congressional members from areas contaminated by MTBE opposed granting such legislative protection. The House of Representatives passed The Energy Policy Act of 2003 (H.R. 6) with language protecting MTBE producers from tort liability arising from the substance's presence in water supplies. This provision was unacceptable to many in the Senate so the liability shield was removed in an effort to gain votes in support of the bill. In the end, the bill was subject to a Senate filibuster, and, once again, it failed to get a final vote. In 2004, H.R. 4503, a near duplicate of the prior H.R. 6 passed the House, but never received a final vote in the Senate. In 2005, the House energy bill, H.R. 6, included immunity from strict products liability for MTBE manufacturers, however, this provision was removed in conference, and the Energy Policy Act of 2005, as enacted, did not contain any MTBE liability shield.[61]

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[58] *Id.* at 784.

[59] Pub. L. No. 109-58, Title XV, § 1504(a)(1)(B), 119 Stat. 1076 (2005).

[60] *Davis*, 348 F.3d at 787.

[61] Energy Policy Act of 2005, Pub. L. No. 109-58, § 1504, 119 Stat. 594 (2005); *see also The 2005 Energy Bill*, ABOUT.COM, Aug. 8, 2005, http://uspolitics.about.com/od/electionissues/p/energy_bill.htm.

The repeal of the CAA's oxygenate requirement for reformulated fuel by the Energy Policy Act of 2005[62] eliminated most of the incentive for refiners to use MTBE. The repeal took effect in California immediately and in the rest of the country on May 5, 2006.[63] With the near-universal use of fuel injection systems and oxygen sensors in motor vehicles, there now is little need for oxygenated fuel. MTBE is not federally banned, but it can be banned by the states. By 2006 twenty-six states had banned MTBE.[64] New York and California's bans were challenged and upheld in federal court as not preempted by the CAA's RFG program or general goals.[65]

B. MTBE Tort Actions

The concern over MTBE resulted in a bevy of tort lawsuits. The marquee case for MTBE litigation is *In re: Methyl Tertiary Butyl Ether ("MTBE") Products Liability Litigation*.[66] This opinion is one of many procedural skirmishes, but it provides a useful description of how the case evolved. The case began as a multi-district proceeding in the U.S. District Court for the Southern District of New York when New York residents and well owners sued for contamination of the groundwater with MTBE.[67] Originally the plaintiffs' cases were class actions, but class status was denied in July 2002.[68] In 2003, dozens of MTBE cases were filed in state courts throughout the country, but the defendants quickly acted and removed them to the federal courts.[69] Following removal, the defendants motioned that all MTBE cases in the federal court system be consolidated with the multidistrict action already progressing in the Southern District of New York.[70] In February 2004, forty-three cases were transferred to that court.[71] Following consolidation, the case featured plaintiffs from sixteen states. On April 20, 2005, the court held that in multidistrict litigation

62 Pub. L. No. 109-58, § 1504, 119 Stat. 594 (2005).

63 *Id.*

64 Lynn Garner, *Inhofe Resurrects Liability Waiver Idea for Refiners Making Gasoline Fuel Additive*, 21 TOXICS L. REP. 399 (2006).

65 *See* Oxygenated Fuels Ass'n v. Pataki, 293 F. Supp. 2d 170 (N.D.N.Y. 2003).

66 342 F. Supp. 2d 147 (S.D.N.Y. 2004).

67 *Id.* at 148.

68 *Id.*

69 *Id.*

70 *Id.* at 149.

71 *See id.*

the law of the transferee circuit applies.[72] Subsequently, the court held that water authorities may not pursue claims of MTBE groundwater contamination on behalf of individual water users.[73] Other opinions followed that concerned procedural matters, such as requests for remand, rehearing, interlocutory appeal, and one protesting personal jurisdiction.[74]

The Energy Policy Act of 2005 did not prevent existing tort actions from continuing,[75] however, it did allow MTBE tort claims filed after August 8, 2005, to be removed to a U.S. district court.[76] In May 2008, fourteen oil companies agreed to pay $422 million to settle the case, but other defendants, including Exxon Mobil did not join the settlement,[77] so the multidistrict litigation continued. The federal district court, on July 8, 2008, held that the petroleum exclusion in CERCLA does not bar claims stemming from the release of MTBE.[78] MTBE contamination problems helped ethanol take over the blended fuel market, but ethanol also poses potential problems at the higher concentrations being encouraged by government policies, and this could lead to new contamination problems, and presumably, new tort actions.[79]

C. Oxygenates in Carbon Monoxide Nonattainment Areas

The 1990 CAA Amendments added CAA section 211(m) to require the use of oxygenates to help reduce CO emissions during cold weather in CO nonattainment areas with design values of 9.5

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[72] *In re*: Methyl Tertiary Butyl Ether ("MTBE") Prod. Liab. Litig., 379 F. Supp. 2d 348 (S.D.N.Y. 2005).

[73] *In re*: Methyl Tertiary Butyl Ether ("MTBE") Prods. Liab. Litig., No. 1:00-1898, 2005 U.S. Dist. LEXIS 12400 (S.D.N.Y. June 24, 2005).

[74] *See, e.g.*, *In re*: Methyl Tertiary Butyl Ether ("MTBE") Prods. Liab. Litig., 364 F. Supp. 2d 329 (S.D.N.Y. 2004) (removal of suit was proper; *In re*: Methyl Tertiary Butyl Ether ("MTBE") Prods. Liab. Litig., 399 F. Supp. 2d 325 (S.D.N.Y. 2005) (personal jurisdiction for defendant joint venture); *In re*: Methyl Tertiary Butyl Ether ("MTBE") Prods. Liab. Litig., 399 F. Supp. 2d 356 (S.D.N.Y. 2005) (magistrate's denial of remand upheld).

[75] BRENT D. YACOBUCCI, CONG. RESEARCH SERV., RL32873, KEY ENVIRONMENTAL ISSUES IN THE ENERGY POLICY ACT OF 2005 (P.L. 109-58, H.R. 6), at CRS 2–3 (2005).

[76] Energy Policy Act of 2005, Pub. L. No. 109-58, § 1503, 119 Stat. 594 (2005).

[77] Jeff Kinney, *Oil Firms Settle MTBE Case for $422 Million; Money to Be Used to Treat Affected Wells*, 39 ENV'T REP. 955 (2008).

[78] Steven Patrick, *Petroleum Exclusion Does Not Apply to MTBE Alone, Federal Judge Says*, 39 ENV'T REP. 1443 (2008).

[79] *Waning Ethanol Support Stymies Study Limiting Fuel Spills from USTs*, 25 ENVTL. POL'Y ALERT (Inside Wash. Publishers, D.C.), June 18, 2008.

ppm or more, based on CO data for the two-year period of 1988 and 1989.[80] The state must implement an oxygenated gasoline program in the specified control areas using gasoline meeting a minimum oxygen content of 2.7% by weight as determined by tests established by the administrator.[81] But, states are free to require more than a 2.7% oxygen content. This oxygen content requirement applies during the portion of the year when the areas are prone to high ambient concentrations of CO (e.g., cold weather); the control period is established by the administrator and cannot be less than four months in length. The EPA may reduce the control period if a state can demonstrate, based on meteorological conditions, that there will be no violation of the CO standards during the reduced control period.[82]

The oxygen content requirement covers all gasoline sold in the larger of the Consolidated Metropolitan Statistical Area or the Metropolitan Statistical Area where the nonattainment area is located.[83] When the oxygenated fuel program first was implemented in the winter of 1992 there were thirty-six areas in the program. By the end of 2005 only twelve areas in nine states had winter oxygenated fuel programs because of improved air quality for CO.[84] Half of these states have been redesignated as attainment, but they continue an oxygenated fuel program as part of their maintenance plans.

The oxygenated gasoline program is a state program, subject to the EPA's guidelines, and is implemented as part of a state implementation plan ("SIP").[85] There are no federal regulations except for the labeling of oxygenated fuels at the service station.[86] Proposed guidelines for the oxygenate program were issued in

[80] Nonattainment areas are portions of a state or states that fail to meet one or more applicable NAAQS. The CAA section 186(a)(1) explains that the design value is calculated using the methodology issued by the Administrator prior to Nov. 15, 1990. For CO it is the second worst annual eight-hour reading. 40 C.F.R. § 50.8 (2008).

[81] Exxon Mobil Corp. v. EPA, 217 F.3d 1246 (9th Cir. 2000).

[82] CAA § 211(m)(2)(B), 42 U.S.C. § 7545(m)(2)(B) (2006).

[83] CAA § 211(m)(2), 42 U.S.C. § 7545(m)(2).

[84] U.S. ENVTL. PROT. AGENCY, EPA 420-B-05-013, STATE WINTER OXYGENATED FUEL PROGRAM REQUIREMENTS FOR ATTAINMENT OR MAINTENANCE OF CO NAAQS 6 (2005).

[85] CAA § 211(m)(2)(B), 42 U.S.C. § 7545(m)(2)(B); *see generally* Arnold W. Reitze, Jr., *Air Quality Protection Using State Implementation Plans—Thirty-Seven Years of Increasing Complexity*, 15 VILL. ENVTL. L.J. 209 (2004).

[86] CAA § 211(m), 42 U.S.C. § 7545(m); 40 C.F.R. § 80.35(a)(1).

1991.[87] A supplemental proposal was published in 1992,[88] but the EPA subsequently chose to only issue guidance documents for the states with CO air quality problems for use in developing an oxygenated gasoline program.[89]

III
REFORMULATED GASOLINE

A. Overview

The 1990 CAA Amendments added CAA section 211(k) that required the EPA's Administrator to promulgate regulations by November 15, 1991, establishing requirements for reformulated gasoline ("RFG") to be used in specified ozone nonattainment areas. Other ozone nonattainment areas may opt-in. RFG is conventional gasoline that has been blended to reduce exhaust emissions and the photochemical reactivity of these emissions.[90] The CAA requires that RFG meet the general requirements of section 211(k)(2) and additional requirements found in section 211(k)(3). The fuel must not result in an increase in nitrogen oxides ("NO_x") emissions over the levels produced by MY 1990 vehicles. Benzene shall not exceed 1% by volume.[91] The gasoline shall have no heavy metals, including lead or manganese, although, except for lead, restrictions on heavy metal content may be waived by the Administrator if the additives do not increase toxic air pollution from motor vehicles.[92] Aromatic hydrocarbon ("HC") content must not exceed 25% by volume.[93] Detergents must be added to prevent the accumulation of deposits in engines or the fuel supply system.[94]

Gasoline also must meet the performance standards of section 211(k)(3) if these requirements are more stringent than the content

[87] Proposed Guidelines for Oxygenated Gasoline Credit Programs Under Section 211(m) of the Clean Air Act as Amended, 56 Fed. Reg. 31,154 (July 9, 1991).

[88] Proposed Guidelines for Oxygenated Gasoline Credit Programs Under Section 211(m) of the Clean Air Act as Amended, 57 Fed. Reg. 4413 (Feb. 5, 1992).

[89] Guidelines for Oxygenated Gasoline Credit Programs and Guidelines on Establishment of Control Periods Under Section 211(m) of the Clean Air Act as Amended, 57 Fed. Reg. 47,853 (Oct. 20, 1992).

[90] *See* 40 C.F.R. § 80.41 (2007).

[91] CAA § 211(k)(2)(C), 42 U.S.C. § 7545(k)(2)(C) (2006).

[92] *Id.* at (k)(2)(D), (k)(3)(A)(iii).

[93] *Id.* at (k)(3)(A)(ii).

[94] *Id.* at (k)(3)(A)(iv).

requirements. Performance standards address volatile organic compounds ("VOCs") and toxics. The term "toxic air pollutants" means emissions of benzene, 1, 3 butadiene, polycyclic organic matter, acetaldehyde, and formaldehyde.[95] Other air toxics may be added pursuant to CAA sections 202(l) and 202(a)(1) or 211(c)(1). A reduction of 15% of VOCs and toxic emissions from baseline gasoline, as defined in section 211(k)(10), was required, and the mandatory reductions increased to 25% after the year 2000.[96] NO_x emissions from RFG must be no higher than the amount produced from baseline gasoline.[97]

The most controversial RFG issue was the section 211(k)(2)(B) and (k)(3)(A)(v) requirement that the oxygen content of the fuel must equal or exceed 2% by weight. This mandate required either an alcohol or an ether to be added to gasoline. On August 8, 2005, the Energy Policy Act repealed the CAA's oxygenate requirement for RFG.[98] However, other provisions of the Energy Policy Act amended CAA section 211 to add a renewable fuel requirement for all gasoline sold in the United States.[99] The renewable fuel requirements are discussed *infra* Parts 5, 6, and 7.

Under CAA section 211, the EPA is required to specify parameters for RFG, but the actual composition of the RFG was to be developed by the petroleum industry. The regulations at 40 C.F.R. section 80.41 list various ways reformulated gasoline may comply with the EPA's requirements. The challenge for refiners is to produce fuel that reduces air pollution while meeting all the legal limitations on the use of additives and on fuel volatility. Reformulated gasoline is by definition gasoline certified by the EPA's Administrator, and after January 1, 1995, only RFG could be sold in specified areas.[100]

The covered areas are the nine nonattainment areas with a population in excess of 250,000 that had the highest 1987–89 ozone levels, plus any area reclassified as a severe or extreme ozone nonattainment area under CAA section 181(b).[101] The areas that are "severe" or "extreme" for ozone pollution include 124 counties with a

95 *Id.* at (k)(10)(C).

96 *Id.* at (k)(3)(B).

97 CAA § 211(k)(2)(A), 42 U.S.C. § 7545(k)(2)(A).

98 Energy Policy Act of 2005, Pub. L. No. 109-58, § 1504, 119 Stat. 594 (2005).

99 *Id.* at § 1501.

100 CAA §§ 211(k)(4), (5), (9), 42 U.S.C. §§ 7545(k)(4), (5), (9).

101 *Id.* at (k)(10)(D).

population of 73.6 million.[102] Ozone nonattainment areas that are not required to use RFG may elect to avail themselves of the statutory provision that allows them to voluntarily opt-in to the RFG program for credits on VOC reductions that are incorporated into the SIP.[103] Moderate and more serious ozone nonattainment areas had to reduce VOC emissions, therefore many SIP revisions included RFG provisions.[104] In 2007, portions of fourteen states and the District of Columbia required the use of RFG, and thirteen states had opt-in areas.[105]

B. The Politics of Developing the RFG Rule

The CAA did not require a specific oxygenate to be used in RFG. It encouraged competition among the various affected industries attempting to carve a market position for reformulated fuels, but some members of the fuels industry attempted to gain a competitive advantage by lobbying the EPA concerning its fuel certification regulations for RFG. These regulations constrain refiner's choices over the composition of fuels, and the EPA had sufficient discretion to allow the certification procedures to benefit one fuel or additive over another. Ethanol producers competed with methanol and MTBE producers to shape the CAA to favor their industry. The EPA tried to appear impartial by offering to develop certification regulations through a regulatory negotiation (reg-neg) process with representatives of the EPA, environmental organizations, along with the petroleum, ethanol, and methanol industries. The EPA succeeded and the parties agreed on a rule, but the agreement largely disintegrated when the ethanol industry tried to circumvent the process by attempting to obtain through new legislation what it failed to get in the reg-neg. Nevertheless, the RFG reg-neg process led to an agreement on August 16, 1991.[106] It was expected that most or all of the Northeastern states would require the sale of RFG by 1995.

Between 1991 and 1993, the EPA opposed expanding ethanol's role because its use increases ozone precursor emissions and increases

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[102] JAMES E. MCCARTHY, CONG. RESEARCH SERV., CLEAN AIR ACT ISSUES IN THE 109TH CONGRESS CRS 12–13 (2005).

[103] CAA § 211(k)(6), 42 U.S.C. § 7545(k)(6); *see also* 40 C.F.R. § 80.70(k) (2008).

[104] CAA § 182(b)(1), 42 U.S.C. § 7511a(b)(1) (2006).

[105] U.S. Envtl. Prot. Agency, Reformulated Gas: Where You Live, http://www.epa.gov/otaq/rfg/whereyoulive.htm (last visited July 12, 2009).

[106] Proposed Guidelines for Oxygenated Gasoline Waivers, 56 Fed. Reg. 43,593 (proposed Sept. 3, 1991).

the volatility of gasoline. Environmentalists and the petroleum industry opposed allowing ethanol producers to use political intervention to get around a negotiated agreement, but the George H.W. Bush Administration supported a renewable oxygenate program that promoted the use of ethanol and other renewable oxygenates in RFG.[107] The Clinton Administration initially opposed regulations that favored ethanol but switched its position to support ethanol in the proposed rule of December 27, 1993. The rule called for a year-round requirement that renewable oxygenates be used for 30% of the statutory oxygen compositional specification.[108] Because California gasoline was exempt from most federal RFG requirements, rules were promulgated requiring each refiner producing California gasoline to meet the renewable oxygenate standard for 54% of their volume of California gasoline, which is equal to the portion of California gasoline sold in Los Angeles and San Diego.[109]

The EPA reversed its position in the final RFG regulation promulgated on February 16, 1994.[110] The ethanol proposal, if adopted, would have sacrificed 40–50% of the VOC control required for reformulated fuel in order to increase the market share for ethanol but without significant energy benefits or cost savings. But, the EPA rejected the renewable oxygenate provisions that it previously proposed because of the large loss in the environmental benefits of the RFG program and its adverse impact on the efficient operation of the marketplace if the 30% ethanol requirement was mandated. But, on August 2, 1994, the EPA switched positions again by promulgating a final rule requiring 30% of the 2% oxygen content in reformulated gasoline be derived from renewable feedstock (e.g., ethanol).[111]

On April 28, 1995, in *American Petroleum Institute v. EPA*, the D.C. circuit held that the EPA exceeded its authority under the CAA in promulgating the renewable oxygenate standard.[112] The court held

[107] Regulation of Fuels and Fuel Additives: Standards for Reformulated Gasoline, 58 Fed. Reg. 11,722 (proposed Feb. 26, 1993).

[108] Regulation of Fuels and Fuel Additives: Renewable Oxygenate Requirement for Reformulated Gasoline, 58 Fed. Reg. 68,343 (proposed Dec. 27, 1993).

[109] *Id.* at 68,349.

[110] Regulation of Fuels and Fuel Additives: Standards for Reformulated and Conventional Gasoline, 59 Fed. Reg. 7716 (Feb. 16, 1994).

[111] Regulation of Fuels and Fuel Additives: Renewable Oxygenate Requirements for Reformulated Gasoline, 59 Fed. Reg. 39,258 (Aug. 2, 1994).

[112] 52 F.3d 1113 (D.C. Cir. 1995).

section 211(k) of the CAA authorized the RFG program to reduce the emission of VOCs and air toxics.[113] The court found that the EPA's mandated use of ethanol increased fuel volatility and created problems in ozone nonattainment areas, thereby defeating the purpose of section 211(k). The ruling did not alter the reformulated program that began January 1, 1995, nor did it prevent refiners from using ethanol in their blends if they so desire. But, the court held "the CAA does not authorize EPA to mandate the manner of compliance or the precise formula for compliance" that refiners use in their reformulated fuels.[114] Battles over mandating the use of ethanol delayed development of an RFG rule. On February 16, 1994, the EPA promulgated a final rule for RFG.[115] It preempted dissimilar state controls unless either of the exceptions in section 211(c)(4) apply, but in accordance with sections 209(b) and 211(c)(4)(B), California was allowed to regulate fuels and fuel additives. California's exemption has been modified several times and is found at 40 C.F.R. section 80.81.

The RFG program has two phases: Phase I began in 1995 and ended December 31, 1999; Phase II began on January 1, 2000. During both Phase I and Phase II, gasoline must meet both the general requirements of section 211(k)(2) as well as the more stringent of the formula and performance standards of section 211(k)(3). The general and formula standards are constant in all time phases of the rule, but the performance standards become more stringent over time. Under CAA section 211(k)(3), the EPA must either require the use of a specified formula fuel or require a 15% reduction in toxic emissions from the level of a baseline gasoline, whichever is more stringent. The EPA concluded that the performance standards were more stringent than the formula for both VOCs and toxics in Phase I and Phase II, and more stringent toxic requirements were not cost effective.

RFG requirements are found in 40 C.F.R. Part 80, Subpart D. RFG standards are found in 40 C.F.R. section 80.41 and may be met on a per gallon basis or by using averaging techniques as specified in section 80.67. The per gallon approach requires all fuel to meet the rule's requirements, whereas the averaged basis imposes a more

113 *Id.* at 1119.

114 *Id.* at 1121.

115 Regulation of Fuels and Fuel Additives: Standards for Reformulated and Conventional Gasoline, 59 Fed. Reg. 7716 (Feb. 16, 1994).

demanding standard over the averaging period, generally one year, but each individual batch is subject to a less stringent standard. By averaging, the refiners can reduce the costs of complying with Phase I and II requirements.

The RFG program has had considerable opposition from the public that believed the program costs too much, and the use of MTBE causes health problems. Most of the southeastern United States decided not to use RFG because their officials believed it was not cost effective. As states began to demand that they be allowed to opt-out of the RFG program, the EPA published opt-out regulations on October 20, 1997, which are codified at 40 C.F.R. section 80.72. Parts of four states had opt-out areas as of May 1, 2007.[116]

IV

CONGRESS AND THE ETHANOL LOBBY

The Energy Policy Act of 2005 amended CAA section 211(k) to eliminate the oxygenate requirement for RFG.[117] Subsequently, the EPA formally eliminated the oxygenated requirement for RFG on May 8, 2006.[118] The environmental problems caused by the use of MTBE were an important factor in terminating the oxygenate requirement. The Western States Petroleum Institute, the American Petroleum Institute, and other oil industry groups lobbied for the repeal, claiming that oxygenates were no longer necessary, and oxygenates limited fuel supplies and increased costs. However, the 2005 act included the first federal mandate that liquid biofuels be purchased by motorists. CAA section 211(o)(2)(B) called for four billion gallons of renewable fuel to be used in gasoline in 2006 and the amount required was to increase in steps each year to 7.5 billion gallons in 2012. Renewable fuels include natural gas produced from biogas and ethanol produced from grain, starch, oilseeds, vegetable, animal or fish materials, sugarcane, sugar beets, sugar components, tobacco, potatoes, or other biomass. The 2005 act also provided that in the year 2013 and thereafter, a minimum of 250 million gallons of

116 U.S. Envtl. Prot. Agency, Reformulated Gas: Where You Live, http://www.epa.gov/otaq/rfg/whereyoulive.htm (last visited July 12, 2009).

117 Energy Policy Act of 2005, Pub. L. No. 109-58, §§ 1501, 1504, 119 Stat. 1076 (2006) (codified in CAA § 211(o)(1)(C)).

118 Regulation of Fuels and Fuel Additives: Removal of Reformulated Gasoline Oxygen Content Requirement, 71 Fed. Reg. 26,691 (May 8, 2006).

renewable fuel must be derived from cellulosic biomass.[119] The Energy Independence and Security Act of 2007 increased the mandatory use of renewable fuel to nine billion gallons in 2008, and the volume increases each year until 2022 when thirty-six billion gallons of renewable fuel must be blended into the nation's transportation fuels.[120] Twenty-two billion gallons of renewable fuel in 2022 must come from advanced biofuels, which is defined as renewable fuels other than ethanol that is derived from cornstarch.

These provisions represent a successful lobbying effort because the renewable fuels program is primarily designed to put money in the pockets of corn farmers and corn-based ethanol producers at a high cost to consumers. To obtain this money, the ethanol lobby relies on political pressure and its contributions to lawmakers. Ethanol's proponents have numerous arguments to justify government subsidies, and when they are discredited they find new arguments to convince the public there are valid reasons to support these multibillion-dollar corporate subsidies.

A. The Environmental Quality Issue

Initially, it was claimed that renewable fuels would reduce air pollution, but renewable fuels have little, if any, beneficial effect in reducing conventional air pollutants, and their use increases emissions of some pollutants.[121] Ethanol when added to gasoline increases the fuel's RVP and is reported to increase evaporative VOC emissions by about 50%.[122] Alcohols from renewable sources should be used only to control CO emissions in the winter when VOC evaporative control requirements are not needed. In warmer months, ethers would be a better choice, from an air pollution control perspective, but their use leads to contamination of ground water supplies.[123] In 1990 when environmentalists, farm-state members of Congress, the EPA, and

[119] CAA § 211(o)(2)(B)(iii), 42 U.S.C. § 7545(o)(2)(B)(iii) (2006). A gallon of cellulosic ethanol is treated as equivalent to 2.5 gallons of sugar- or starch-based ethanol until 2012, after which minimum purchase mandates are imposed. CAA § 211(o)(4), 42 U.S.C. § 7545(o)(4).

[120] Energy Independence and Security Act of 2007, Pub. L. No. 110-140, § 202, 121 Stat. 1521 (codified as CAA § 211(o), 42 U.S.C. § 7545(o)).

[121] U.S. GEN. ACCT. OFF., GAO/GGD-97-41, EFFECTS OF THE ALCOHOL FUELS TAX INCENTIVES 14 (1997).

[122] *Air Pollution: Report Says Adding Ethanol to Gasoline Increases Hydrocarbon, NO_x Vehicle Emissions*, 21 ENV'T REP. 158, 159 (1990).

[123] Regulation of Fuels and Fuel Additives: Renewable Oxygenate Requirement for Reformulated Gasoline, 58 Fed. Reg. 68,343, 68,346 (proposed Dec. 27, 1993).

White House officials were advocating the use of alcohol fuels, the petroleum industry was publicizing a report it had prepared that discredited alcohol fuels.[124] According to the study, a 10% ethanol blend would cut CO emissions by 25%, but would increase NO_x emissions by 8–15%.

The National Research Council reported that the commonly available oxygenates used in RFG have little impact on reducing ozone formation.[125] A 2005 study by Wisconsin's Bureau of Air Management concluded that statewide use of a 10% ethanol blend ("E10") would increase nitrogen oxide emissions by about 1–2% on an average summer day. This increase is equivalent to the NO_x emitted by a 350-megawatt coal-fired power plant.[126] Thus, the use of ethanol can be expected to require additional emission reductions from other sources.

CARB evaluated 1990–95 MY vehicles and found that a 10% ethanol blend, relative to gasoline, decreased toxic emissions by 2% and CO by 10% but increased NO_x by 14%, total HC by 10% and Ozone Formation Potential by 9%; Low Emission Vehicles' ("LEVs") evaporative emissions increased 12%.[127] CARB reported in 2005 that using nonoxygenated gasoline in the South Coast Air Basin (Los Angeles) would reduce HC emissions by twenty-six tons per day, which is equivalent to the total HC emissions from oil refineries and fuel distribution systems in the basin. In addition, removing alcohol and ether from gasoline would reduce NO_X emissions by more than the amount oil refineries and fuel distributions emit.[128] Moreover, ethanol in gasoline allows more VOCs to permeate rubber and plastic components of a vehicle's fuel system and evaporate to the atmosphere.[129] The use of ethanol is not

[124] Henry A. Waxman et al., *Cars, Fuels, and Clean Air: A Review of Title II of the Clean Air Act Amendments of 1990*, 21 ENVTL. L. 1947, 1976 (1991); *New Industry Study Finds Senate Clean Gasoline Plan Would Cause More Smog*, 11 INSIDE EPA (Inside Wash. Publishers, D.C.), May 11, 1990.

[125] NAT'L RESEARCH COUNCIL, OZONE-FORMING POTENTIAL OF REFORMULATED GASOLINE 7 (1999).

[126] BUREAU OF AIR MGMT., WIS. DEP'T OF NATURAL RES., OZONE AIR QUALITY EFFECTS OF A 10% ETHANOL BLENDED GASOLINE IN WISCONSIN 2 (2005).

[127] WORLDWIDE FUEL CHARTER 23 (4th ed. Sept. 2006).

[128] CAL. AIR RES. BD., A SUMMARY OF THE STAFF'S ASSESSMENT REGARDING THE EFFECT OF ETHANOL IN CALIFORNIA GASOLINE ON EMISSIONS 3 (2005).

[129] Nathanael Greene, *Ethanol and the Environment: Delivering on the Promise of a Sustainable Biofuel*, *in* A HIGH GROWTH STRATEGY FOR ETHANOL 51 (Aspen Inst. ed., 2006), *available at* http://www.aspeninstitute.org/sites/default/files/content/docs/energy%20and%20environment%20program/FINALEthanolText.pdf.

an effective way to reduce ozone formation, and U.S. taxpayers are providing billions of dollars in ethanol subsidies to increase air pollution.[130]

Facilities that produce ethanol have significant emissions of nitrogen oxides, carbon monoxide, VOCs, and hazardous air pollutants. A number of ethanol plants avoided more stringent air pollution control requirements by being permitted as minor sources. Subsequently the EPA found many gas-fired ethanol plants exceeded their minor source permit limits.[131] In 2005, the EPA and the DOJ imposed substantial civil penalties for air pollution violations by the ethanol industry, and in early 2006, 83% of the nation's ethanol producers were under consent decrees requiring additional air pollution controls. If the effort to return to the use of coal as fuel in ethanol plants is allowed, ethanol production facilities could significantly increase air pollution.

In response to political pressure from the ethanol lobby, on May 1, 2007, the EPA promulgated final regulations to allow ethanol fuel plants to avoid air pollution requirements imposed by the new source review construction permit programs and to avoid fugitive emissions requirements by changing its definition of major source in 40 C.F.R. Parts 51, 52, 70, and 71.[132] These regulations raised the threshold for ethanol plants to be considered minor sources from 100 tons per year ("tpy") of any criteria pollutant to 250 tpy. This results in less arduous permitting requirements and removes the need for new plants to install the best available control technology. The Natural Resources Defense Council petitioned the EPA to reconsider its decision to allow increases in air pollution from ethanol facilities. On May 2, 2008, the EPA denied the petition.[133]

Air pollution is not the only environmental problem associated with ethanol production. Growing the corn needed for ethanol production has negative environmental impacts due to the use of agrichemicals. Corn production uses more fertilizer and pesticides

130 *See generally* Am. Petroleum Inst. v. EPA, 52 F.3d 1113, 1119 (D.C. Cir. 1995).

131 *Activists Threaten Suit over EPA Plans for Relaxed Ethanol Permits*, 27 CLEAN AIR REP. (Inside Wash. Publishers, D.C.), May 18, 2006.

132 Prevention of Significant Deterioration, Nonattainment New Source Review, and Title V: Treatment of Certain Ethanol Production Facilities Under the "Major Emitting Facility" Definition, 72 Fed. Reg. 24,060 (May 1, 2007) (to be codified at 40 C.F.R. pts. 51, 52, 70 & 71).

133 Andrew Childers, *EPA Denies Environmental Group's Petition to Reconsider Final Rule on Ethanol Plants*, 39 ENV'T REP. 893 (2008).

than any other major crop resulting in high life-cycle environmental impacts per unit of energy from ethanol.[134] The use of nitrogen and phosphorus fertilizers can contaminate surface and ground water, which leads to a loss of biodiversity, eutrophication of fresh and coastal waters, and elevated levels of nitrate and nitrite in drinking-water wells.[135] Pesticides move through the ecosystem in a similar manner. Atrazine is the most common herbicide used on cornfields, and it is a hormone disrupter in wildlife as well as a potential threat to human health.[136] The pesticides used in corn production are more harmful than those used for soybean production, and the use of fertilizers is higher for corn than for other crops.

Ethanol production also has significant adverse impacts on water resources. The demand for ethanol threatens to use scarce water to irrigate cornfields. With 70% of the world's water being used for agriculture, adding a water demand for crops to be used as fuel stresses this limited resource. This was partly addressed by the Energy Independence and Security Act of 2007, which gives the EPA the power to consider water pollution impacts when deciding to ban or restrict the use of a fuel.[137] This provision is expected to help spur the development of cellulosic ethanol, which has a lower environmental impact.

Corn acreage is increasing rapidly because of the demand created by Congress and encouraged by federal and state subsidies. In 2007 92.9 million acres were planted in corn, up 19% from 2006, and up 14% from 2005. Some of this expansion is due to the substitution of corn for soybean-planted areas. The soybean acreage was down 7% in 2008 from 2007, but was still the second largest since 1944.[138] Soybean acreage should continue to increase because Congress continues to expand the subsidies given to soybean-based biodiesel

134 Jason Hill et al., *Environmental, Economic, and Energetic Costs and Benefits of Biodiesel and Ethanol Biofuels*, 103 PROC. NAT'L ACAD. SCI. 11,206 (2006), *available at* http://www.pnas.org/content/103/30/11206.

135 *Booming Corn Production for Ethanol Fuel Could Boost Nutrient Pollution, Report Says*, 38 ENV'T REP. 1576 (2007).

136 Information on atrazine can be found on EPA's Integrated Risk Information System at http://www.epa.gov/NCEA/iris/subst/0209.htm (last visited July 12, 2009). It is interesting to see how little EPA has to report on a pesticide that is used in large quantities and that has been banned in other countries.

137 Pub. L. No. 110-140, § 208, 121 Stat. 1492, 1531 (2007).

138 Press Release, U.S. Dept. of Agric., USDA Report Assesses 2008 Corn and Soybean Acreage (June 20, 2008), *available at* http://www.nass.usda.gov/Newsroom/2008/06_30_2008.asp.

fuel. Demand for corn and soybeans brings marginal lands into production. This is expected to lead to additional increases in soil erosion, water pollution from the use of pesticides and fertilizer, and will adversely impact wildlife habitat. For many years, the Conservation Reserve Program has been paying landowners that voluntarily contract with the federal government to protect and conserve the land while removing it from production.[139] A large portion of the lands under contract do not appear to be remaining in the program as the contracts come up for renewal, presumably because the high demand for corn has increased prices so that conservation is no longer an attractive option.

An important justification for using an alternative fuels program to replace some of the gasoline and diesel fuel used in the transportation sector is the claimed benefits of reducing emissions of greenhouse gases. The alcohols commonly used as fuel are methanol, usually made from natural gas, and ethanol, which in the United States is almost always made from corn. If ethanol is used its carbon content is from a renewable resource, which produces no net CO_2 increase to the atmosphere when combusted. Methanol, because it is produced from natural gas, releases carbon stored over geologic time periods. Unfortunately, fossil fuels are used to produce the corn feedstock and to process it into ethanol, which nullifies most of the GHG benefits gained from its use.

Congress in the Energy Independence and Security Act of 2007 includes a low-carbon standard that requires refiners to achieve at least a 20% reduction in GHG production from new facilities, 50% for biomass facilities, and 60% for cellulosic facilities over their lifecycle.[140] Section 526 of the 2007 Act says that alternative or synthetic fuels cannot be procured by federal agencies unless a lifecycle analysis shows that GHGs are equal to or less than the GHG emissions from conventional petroleum.[141] Coal-fired ethanol plants would be expected to exceed any reasonable lifecycle GHG standard, but facilities that have a total capacity of thirteen to fifteen billion gallons of ethanol are grandfathered because they commenced

[139] The program is administered under numerous statutes administered by the Farm Service Agency of the U.S. Department of Agriculture that can be accessed at http://www.fsa.usda.gov (last visited July 12, 2009). The regulations for the program are found at 7 C.F.R. pts. 7, 14 & 18 (2008).

[140] Pub. L. No. 110-140, 121 Stat. 1492 (2007).

[141] Pub. L. No. 110-140, § 526, 121 Stat. 1492, 1663 (2007).

construction before December 19, 2007.[142] The proposed rule to implement a lifecycle analysis was withdrawn on January 26, 2009, as one of the first actions of the Obama Administration.[143]

Another developing issue concerns the efforts of the air force to expand its purchase of coal-based synthetic fuels and fuel derived from oil sands from Canada. The production of these fuels is claimed to produce far greater quantities of GHG than are released from petroleum refining. It is not clear whether these fuels are alternative fuels under section 526, and Canada may litigate under international trade rules if its oil export trade is restricted by actions based on section 526.[144]

The use of ethanol as fuel has raised the price of food and threatens the food supply of those nations that depend on U.S. food exports because farmland is being used to grow fuel ethanol. In 2008 about one-third of the U.S. corn crop is expected to be used for ethanol,[145] but to substitute biofuels for 10% of the nation's petroleum consumption is estimated to require 43% of the U.S. cropland.[146] In 2007, the government-created demand for ethanol was responsible for half the global increase in demand for corn, which is creating worldwide pressure to convert land to corn production. Land use changes are estimated to be responsible for about 20% of the world's annual GHG emissions, and converting land to produce corn-based ethanol will bring a substantial increase in GHG emissions.[147] Usually the GHG emissions of carbon released from converting native ecosystems into cropland is not considered when evaluating the impact of increased ethanol production.[148] The biofuel industry claims the science does not support the claims that biofuel production

142 *EPA Says Waiver May Limit GHG Controls on Coal-Fired Ethanol Plants*, 19 CLEAN AIR REP. (Inside Wash. Publishers, D.C.), May 21, 2008.

143 *Obama EPA Faces Discount Dispute in RFS Lifecycle GHG Analysis*, 30 CLEAN AIR REP. (Inside Wash. Publishers, D.C.), Feb. 5, 2009.

144 *EPA Faces DOD Pressure on Measure for Fuels' Lifecycle GHG Emissions*, 19 CLEAN AIR REP. (Inside Wash. Publishers, D.C.), Mar. 20, 2008; *House Faces Battle over Pollution Limits on DOD Synfuel Purchases*, ENVTL. POL'Y ALERT (Inside Wash. Publishers, D.C.), Mar. 26, 2008.

145 Robert J. Samuelson, *Let's Shoot the Speculators!*, NEWSWEEK, July 14, 2008, at 18.

146 Renton Righelato & Dominick V. Spracklen, *Carbon Mitigation by Biofuels or by Saving and Restoring Forests?*, 317 SCIENCE 902 (2007).

147 *Key Scientist Faults Industry Push to Limit EPA's RFS Lifecycle GHG Study*, 19 CLEAN AIR REP. (Inside Wash. Publishers, D.C.), Nov. 27, 2008.

148 Jeff Kinney, *Study Finds Using Grain Crops for Biofuels Boosts Emissions, Worsens Global Warming*, 39 ENV'T REP. 319 (2008).

has adverse worldwide ecosystem impacts, and it works to prevent the EPA from considering the effects of GHG emissions based on land use changes associated with biofuel production.[149] But the demand for ethanol fuel contributes to a worldwide conversion of land to the production of ethanol feedstock,[150] which adds to problems created by worldwide deforestration.[151] To meet the renewable fuel mandate of Congress, the ethanol industry is seeking to have the percentage of ethanol in fuel increased to 20%, which will continue the trend of using food for fuel.[152]

B. The Fossil Fuel Dependency Issue

Ethanol proponents assert that using renewable fuels will reduce the nation's dependence on fossil fuels[153] and thereby reduce the emissions of GHGs. But, this benefit is dependent upon ethanol containing significantly more energy than the energy in the fossil fuels used to produce it. In 1991, the DOE estimated that 85,000 to 91,000 British thermal units ("Btus") of energy was needed to produce a gallon of ethanol containing 76,000 Btus.[154] The output-input studies used to evaluate the net energy, if any, from using ethanol as fuel are heavily influenced by assumptions concerning corn yields per acre, the energy requirements for fertilizer manufacture, the amount of fertilizer applied to cornfields, the energy embodied in farm machinery, and the efficiency of the ethanol conversion process. Moreover, the ethanol production process produces various coproducts, and the energy inputs attributable to the coproducts production affects the result of an output-input study.[155] Coproducts

149 *Biofuels Industry Suggests SAB Vet EPA Lifecycle GHG Modeling*, 29 CLEAN AIR REP. (Inside Wash. Publishers, D.C.), Nov. 13, 2008; Steven D. Cook, *Biofuels Industry Asks EPA to Delay Standard for Renewable Fuel, Cites Market Concerns*, 39 ENV'T REP. 2221 (2008).

150 Michael Grunwald, *The Clean Energy Scam*, TIME, Apr. 7, 2008, at 40.

151 *Id.*

152 *Facing Backlash, Ethanol Advocates Ready Push for EPA to Back E20*, 19 CLEAN AIR REP. (Inside Wash. Publishers, D.C.), May 15, 2008.

153 For an interesting discussion of why energy security is unimportant, see Jerry Taylor & Peter Van Doren, *The Energy Security Obsession*, 6 GEO. J.L. & PUB. POL'Y 475 (2008).

154 James Bovard, *Archer Daniels Midland: A Case Study in Corporate Welfare*, CATO INST., Washington, Sept. 26, 1995, at 14, *available at* http://www.cato.org/pubs/pas/pa-241.html.

155 HOSEIN SHAPOURI ET AL., U.S. DEPT. OF AGRIC., AGRIC. ECON. REPORT NO. 721, ESTIMATING THE NET ENERGY BALANCE OF CORN ETHANOL 2 (1995).

from dry milling include dried distillers grains or dried distillers grains with solubles ("DDGS"). Each fifty-six-pound bushel of corn can produce about 17.4 pounds of DDGS, which is used as feed for cattle, hogs, and poultry.[156] Wet milling is a more complex process that produces corn oil, corn gluten meal, and corn gluten feed. Wet milling dominated ethanol production a decade ago, but nearly all plants built since 1996 use dry milling technology, which now is used for 79% of U.S. ethanol production.[157] Thus, energy values attributed to the valuable byproducts heavily influence the net energy balance determination for ethanol production, but the net energy from wet or dry milling does not differ significantly.[158]

In 2005, David Pimentel of Cornell University and Tad W. Patzek of the University of California at Berkley published an important study on the net energy of ethanol production.[159] The authors began by pointing out that U.S. Department of Energy studies in 1980 and 1981 showed a negative energy return when using corn for ethanol production. The Pimentel/Patzek study, using conservative assumptions of the efficiency of the process, concluded that ethanol has a 29% energy deficit,[160] which is a negative energy ratio of 0.81. This is still better than gasoline's energy return, which is a negative value of 0.76 because of the energy needed to produce motor vehicle fuel from petroleum.[161] They concluded that "[e]thanol production in the United States does not benefit the nation's energy security, its agriculture, the economy, or the environment."[162] To produce corn-based ethanol requires 29% more fossil fuel energy than is produced by the ethanol; the corn feedstock alone requires nearly half the ethanol's energy input.[163]

Other studies that show a modest positive energy return from ethanol production may omit important energy inputs or use overly

156 Allen Baker & Steven Zahniser, U.S. Dept. of Agric., *Ethanol Reshapes the Corn Market*, 4 AMBER WAVES, Apr. 2006, at 30, *available at* http://www.ers.usda.gov/AmberWaves.

157 USDA, *supra* note 31, at 11.

158 Roel Hammerschlag, *Ethanol's Energy Return on Investment: A Survey of the Literature 1990–Present*, 40 ENVTL SCI. & TECH. 1744 (2006).

159 David Pimentel & Tad W. Patzek, *Ethanol Production Using Corn, Switchgrass, and Wood; Biodiesel Production Using Soybean and Sunflower*, 14 NAT. RESOURCES RES. 65 (2005).

160 *Id.* at 69.

161 Hammerschlag, *supra* note 158, at 1747, 1749.

162 Pimentel & Patzek, *supra* note 159, at 66.

163 *Id.*

optimistic assumptions. U.S. Department of Agriculture economists have reported that if data from the "best production practices and state of the art processing technology" is used, ethanol will provide 67% more energy than is needed for its production.[164] Other experts are less optimistic and believe that even if assumptions such as high per-acre corn yields and production from the most modern ethanol conversion facilities are used, the energy input/output is only slightly positive.[165] A 2006 National Academy of Science publication concluded that ethanol yields 25% more energy than is required for its production.[166] But, even the relatively modest gains from the use of ethanol may be lower than reported if the lifecycle analysis included the carbon releases from land use changes made to grow more corn and the carbon releases from the use of fertilizer.[167]

Ethanol facilities built since the passage of the 1990 CAA Amendments use far less energy than a typical plant built ten years earlier, but ethanol continues to be produced from older facilities. Nevertheless, efficiency in ethanol production will likely continue to increase as new facilities are brought online to meet the rapid growth in production created by congressional mandate. In 2005 the ethanol industry produced 3.904 billion gallons.[168] In June 2006, there were 101 ethanol plants operating in twenty-one states with a productive capacity of 4.8 billion gallons per year.[169] In January 2008 there were 139 plants with a capacity of 7.888 billion gallons a year; in January 2009 there were 170 plants with a capacity of 10.569 billion gallons a year, although some of this capacity will not be utilized.[170]

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164 RANDY SCHNEPF, CONG. RESEARCH SERV., RL32712, AGRICULTURE-BASED RENEWABLE ENERGY PRODUCTION CRS–15 (2007) (quoting H. Shapouri, J. Duffield & M. Wang, New Estimates of the Energy Balance of Corn Ethanol, presented at 2004 Corn Utilization & Technology Conference of the Corn Refiners Association, June 7–9, 2004, Indianapolis, Ind.).

165 Marcelo E. Dias de Oliveira et al., *Ethanol as Fuel: Energy, Carbon Dioxide Balances, and Ecological Footprint*, 55 BIOSCIENCE 593, 595 (2005) (finding a 1.1 energy output-input ratio for U.S. ethanol production).

166 Hill et al., *supra* note 134, at 11,206.

167 Steven D. Cook, *Lifecycle Analyses of Biofuels Emissions Considered Likely to Hinge on Land Use*, 39 ENV'T REP. 1581 (2008); *EPA Plans to Count Fertilizer GHG Emissions in RFS Despite Industry Fears*, 19 CLEAN AIR REP. (Inside Wash. Publishers, D.C.), Aug. 7, 2008.

168 ENERGY INFO. ADMIN., BIOFUELS IN THE U.S. TRANSPORTATION SECTOR (2007), http://www.eia.doe.gov/oiaf/analysispaper/biomass.html.

169 USDA, *supra* note 31, at 2.

170 Renewable Fuels Ass'n, Statistics, *available at* http://www.ethanolrfa.org/industry/statistics/#A (last visited July 14, 2009).

This represents a more than 120% increase in ethanol production capacity in three years.

The use of ethanol also makes distribution of gasoline blends more costly and difficult because ethanol-blended gasoline cannot be intermingled with other gasoline. This means that ethanol cannot be transported using pipelines. It must be shipped by barge, railroad tank car, or by tanker truck, which is cumbersome and more expensive than pipeline transport.[171] Ethanol must be transported and stored separately from the base gasoline mixture to which it is added near the end of the distribution chain. This requires additional facilities to avoid commingling fuels. Extensive use of ethanol on the East and West Coasts would require substantial infrastructure investments.[172]

The ethanol industry argues that it is worth an energy loss to obtain alternative liquid fuel that can be used by motor vehicles. But, much of the corn-based ethanol production uses natural gas in its production and natural gas can be used directly to power vehicles. The United States is a net importer of natural gas, so increases in ethanol production can be expected to increase imports and the price of natural gas.[173] The use of corn-based ethanol, therefore, produces very modest energy gains and has an even more modest ability to reduce the use of fossil fuels.

The expansion of ethanol use to nine billion gallons in 2008 will replace about six billion gallons of gasoline, which is about 4% of the U.S. gasoline consumption of 149.4 billion gallons.[174] An alternative to the renewable fuel program would be to increase the fuel efficiency of the vehicle fleet by about one mpg. This would provide equivalent benefits and would have trivial costs.

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171 Matthew L. Wald, *New Recipe for Gasoline Helped Drive Up the Price*, N.Y. TIMES, May 6, 2006, at A11; *see also* ENERGY INFO. ADMIN., ELIMINATING MTBE IN GASOLINE IN 2006, at 4 (2006).

172 DOWNSTREAM ALTERNATIVES INC., TRANSPORTATION AND INFRASTRUCTURE REQUIREMENTS FOR A RENEWABLE FUELS STANDARD ES–3 (2002).

173 Net imports accounted for 16.2% of U.S. natural gas consumption in 2005. ENERGY INFO. ADMIN., U.S. NATURAL GAS IMPORTS AND EXPORTS: ISSUES AND TRENDS 2005, at 12 (2007), *available at* http://www.eia.doe.gov/pub/oil_gas/natural_gas/feature_articles/2007/ngimpexp/ngimpexp.pdf.

174 *See supra* text accompanying note 119.

C. Farm Income

After the ethanol lobbyist's environmental and energy-saving claims were refuted, ethanol supporters turned to the argument that renewable fuels would raise farm income, primarily for corn farmers.[175] In 2007, the government-created demand for ethanol was responsible for diverting 20% of the corn crop to ethanol refineries, and a rapid increase in the price of corn.[176] The use of ethanol for fuel has raised the price of food and threatens the food supply of those nations that depend on U.S. food exports because farmland is being used to grow corn for ethanol production, although ethanol supporters argue to the contrary.[177] The expanded demand for ethanol financially benefits some farmers, but at the expense of increased corn costs for livestock and poultry producers. The Congressional Budget Office estimates that from April 2007 to April 2008, the price increase of corn attributable to ethanol production contributed between 0.5% and 0.8% of the 5.1% increase in food prices.[178] In Utah, for example, the price of corn in 2008 tripled from $2 per bushel to more than $6, which is forcing turkey farmers to lower production and is causing processing plants to lay off workers.[179]

Driven by the ethanol fuel industry's demand for corn, the price for corn has increased to the point where it is contributing to the nation's economic woes.[180] On April 25, 2008, the governor of Texas asked the EPA to relax the renewable fuel standard because of rapidly rising food prices.[181] The governor was concerned that the near tripling of feed prices would harm the meat and poultry industry in Texas.[182]

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175 For coverage of the politics of agriculture, see Dan Morgan, Sarah Cohen & Gilbert M. Gaul, *Powerful Interests Ally to Restructure Agriculture Subsidies*, WASH. POST, Dec. 22, 2006, at A1.

176 Rod Nordland & Daniel Gross, *Now It's the $6 Loaf of Bread*, NEWSWEEK, May 5, 2008, at 46.

177 James Bovard, *Dole, Gingrich and the Big Ethanol Boondoggle*, WALL ST. J., Nov. 2, 1995, at A18; Pimentel & Patzek, *supra* note 159, at 68.

178 *The Impact of Ethanol Use on Food Prices and Greenhouse-Gas Emissions*, COSTBENEFIT, May 8, 2009, *available at* http://www.envirovaluation.org/index.php/2009/05/08/the-impact-of-ethanol-use-on-food-prices.

179 Dawn House & Alam Lule, *Utahns Hurt by Rush to Ethanol*, SALT LAKE TRIB., Sept. 20, 2008, at E1.

180 zFacts.com, How Much Energy Independence from Corn Ethanol?, http://zfacts.com/p/350.html (last visited July 14, 2009).

181 Steven D. Cook, *EPA Denies Texas Request for Waiver of Renewables Mandate for Motor Fuels*, 39 ENV'T REP. 1597 (2008).

182 *See id.*

The EPA rejected the request saying ethanol in gasoline did not have a major effect on food prices.[183] Increased demand for ethanol also may increase the demand and price for sorghum, barley, and oats as well as other grains that could be used to make ethanol. But, because of climate or soil conditions, not all producers can respond to a change in demand by shifting their acreage to grains.[184]

Midwest members of Congress continue to work effectively to subsidize corn farmers and ethanol producers through an expanded renewable fuels program that provides regional economic benefits.

D. Toxic Emissions Reduction

Another effort by the ethanol interests to increase the use of ethanol focuses on the toxic components of gasoline. More than a quarter of the molecules in gasoline are hazardous air pollutants (e.g., benzene and other aromatic hydrocarbons).[185] As lead was phased out, benzene, toluene, xylene, and other aromatics were added as octane enhancers. Since these substances were already in gasoline, adding more aromatics did not require EPA approval. In the 1970s aromatics made up about 22% of the gasoline; by 1990 it was a third, and some premium grades were half aromatics.[186] The EPA issued regulations to control toxic emissions in 2001 and 2002 under the CAA's section 112, but did not require new reductions beyond what the industry was doing to comply with RFG requirements.[187] The RFG program has helped reduce toxic emissions from motor vehicle fuel combustion, and the Tier 2 program to control motor vehicle emissions to reduce ozone precursor and particulate matter emissions also reduces toxic emissions. The EPA's nascent program to control fine particulate matter will reduce aromatic air toxic emissions

183 *Id.*

184 Bruce A. Babcock, *Cheap Food and Farm Subsidies: Policy Impacts of a Mythical Connection*, 12 IOWA AG. REV. 1, 2–3 (2006) (total federal payments for corn producers for 2003, 2004, and 2005 were expected to be $20.5 billion); Bruce A. Babcock, *Do Ethanol/Livestock Synergies Presage Increased Iowa Cattle Numbers?*, 12 IOWA AG. REV. 4, 4 (2006).

185 C. Boyden Gray & Andrew R. Varcoe, *Octane, Clean Air, and Renewable Fuels: A Modest Step Toward Energy Independence*, 10 TEX. REV. L. & POL. 9, 11 (2005).

186 *Id.* at 26.

187 Control of Emissions of Hazardous Air Pollutants from Mobile Sources, 66 Fed. Reg. 17,230 (Mar. 29, 2001) (codified at 40 C.F.R. pts. 80 & 86); 65 Fed. Reg. 48,058 (Aug. 4, 2000) (codified at 40 C.F.R. pts. 80 & 86).

because these chemicals often are absorbed onto carbon-based particulates.[188]

In March 2001, the EPA published a final hazardous air pollutant rule setting gasoline performance requirements that targeted benzene, 1,3 butadiene, formaldehyde, acetaldehyde, and polycyclic organic matter.[189] Benzene exposure is the most significant carcinogenic inhalation risk and is responsible for 25% of the cancer risk created by toxic releases and 68% of the benzene emissions to the atmosphere are from onroad and offroad vehicles.[190] The EPA also listed twenty-one compounds as mobile source air toxics, including some metals and VOCs, and diesel particulate matter and diesel emission organic gases.[191]

On October 6, 2005, the EPA released a final rule to readjust the baseline that is applicable to the mobile source air toxics program. The rule tightened requirements to prevent emission increases.[192] On February 26, 2007, the EPA promulgated standards to take effect in 2011 that would reduce the average benzene content in gasoline by 36% to 0.62% by volume.[193] It would establish a national trading program based on pollution credits for producing gasoline cleaner than required. Manufacturers of vehicles also would be required to reduce benzene emissions. The standards include a cap and trade scheme that allows companies after reaching an average benzene level of 1.3% by volume to reach an average of 0.62% benzene by volume across all refineries using tradable credits.[194] This is a concern to states and environmentalists because some refineries may

188 Proposed Rule to Implement the Fine Particle National Ambient Air Quality Standards, 70 Fed. Reg. 65,984 (Nov. 1, 2005); *see generally* Michael P. Vandenbergh, *The Individual as Polluter*, 35 ENVTL. L. REP. 10,723, 10,726 (2005).

189 Control of Emissions of Hazardous Air Pollutants from Mobile Sources, 66 Fed. Reg. 17,230 (Mar. 29, 2001) (codified at 40 C.F.R. Part 80, subpt. J).

190 U.S. Envtl. Prot. Agency, National-Scale Air Toxics Assessment for 1999: Estimated Emissions, Concentrations and Risk, http://www.epa.gov/ttn/atw/nata1999/natafinalfact.html (last visited July 14, 2009).

191 66 Fed. Reg. at 17,233.

192 Control of Emissions of Hazardous Air Pollutants from Mobile Sources: Default Baseline Revision, 70 Fed. Reg. 58,330 (Oct. 6, 2005) (codified at 40 C.F.R. pts. 80 & 86).

193 Control of Hazardous Air Pollutants from Mobile Sources, 72 Fed. Reg. 8428, 8428 (Feb. 26, 2007) (codified at 40 C.F.R. pts. 59, 80, 85 & 86).

194 *Id.*

significantly increase the benzene content of their gasoline above the average.[195]

Under CAA section 211(c)(4)(C) a state may adopt requirements for fuels in its SIP that are more stringent than the federal controls imposed on conventional gasoline if the EPA fuel requirements are necessary to achieve a NAAQS. These fuels, known as "boutique" fuels, are designed to reduce emissions that can lead to high levels of ozone or particulate matter. The Energy Policy Act of 2005 section 1541(b) amended CAA section 211(c)(4)(C)(v) to place additional restrictions on the use of boutique fuels. The restrictions prohibit an increase in the number of boutique fuels to the number that existed as of September 1, 2004. The approval of a state fuel cannot cause supply or distribution problems or have a significant adverse impact on the production of gasoline in the affected or contiguous area. Moreover, the EPA may not approve a state fuel unless it already is approved in at least one SIP in the applicable Petroleum Administration for Defense District. As required by the 2005 Energy Act, the EPA published a draft list of the seven different types of boutique fuels.[196]

The renewable fuels lobby wants the EPA to lower the allowed levels of other aromatic compounds. The ethanol interests claim that a 20% reduction in aromatics could be met by imposing a more stringent maximum available control technology standard based on CAA section 112, and the Energy Policy Act's renewable fuel standard would not be needed.[197] But, ethanol leads to the emissions of other hydrocarbons such as acetaldehyde and peroxyacetylnitrates.[198] Air toxics could increase from the use of ethanol, but the specific benefits or detriments of ethanol concerning toxic emissions is difficult to quantify.[199] While ethanol is an octane enhancer that can replace more toxic octane enhancers, even small amounts of ethanol raises the volatility ("RVP") of gasoline. Nevertheless, due to successful lobbying efforts by its proponents, ethanol blends are allowed to have a higher RVP than conventional

195 *EPA Trading Proposal for Refinery Fuel Air Toxic Limit Draws Criticism*, INSIDE EPA (Inside Wash. Publishers, D.C.), Mar. 10, 2006.

196 Draft Boutique Fuels List Under Section 1541(b) of the Energy Policy Act and Request for Public Comment, 71 Fed. Reg. 32,532 (June 6, 2006).

197 Steven D. Cook, *Energy Coalition Seeks to Increase Ethanol in Gasoline Through EPA Air Toxics Proposal*, 37 ENV'T L. REP. 1262 (2006).

198 NAT'L RESEARCH COUNCIL, *supra* note 125, at 7.

199 NEIWPCC & NESCAUM, *supra* note 39, at 4.

gasoline, which leads to greater hydrocarbon emissions.[200] The Energy Act of 2005, section 1504(b), modified CAA section 211(k)(2) to require the EPA to set standards to prevent an increase in toxic emissions due to reduced MTBE use and increased ethanol use. But, the EPA plans to use the mobile source air toxics rule to reduce emissions rather than issue a rule under the energy act.[201]

It will take more study before valid conclusions may be drawn concerning the effect (good or bad) of ethanol on toxic air emissions. But, the environmental impact of ethanol is not limited to atmospheric impacts. Life cycle environmental effects begin with the feedstock. Corn production is heavily dependent on the use of nitrogen and phosphorous fertilizer and pesticides, which become water pollutants. Growing corn results in these chemicals being released in quantities far higher per unit of energy gain than other crops, such as soybeans. Furthermore, nitrogen fertilizer, which is heavily used in corn production, can be converted in soil and biomass by microbial action to nitrous oxide, which is a potent greenhouse gas.[202]

Ethanol gasoline blends have higher emissions of conventional air pollutants (CO, VOC, PM_{10}, SO_x, and NO_x) than gasoline per unit of energy.[203] Are the unknown benefits from additional control of toxics by using ethanol worth the billions of dollars in subsidies given to the corn-based ethanol industry? The EPA's budget for clean air and global climate change in FY 2009 is about $939 million, which includes its outdoor air pollution control program budgeted at $616.5 million.[204] The cost to the treasury for the alcohol fuels credit in 2006 was $1.55 billion,[205] and the cost of renewable fuel subsidies continues to increase dramatically.

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200 Special Provisions for Alcohol Blends, 40 C.F.R. § 80.27(d) (2008).

201 *Industry, Activists Question EPA Rule on Energy Law Fuel Changes*, CLEAN AIR REP. (Inside Wash. Publishers, D.C.), Apr. 6, 2006.

202 Hill et al., *supra* note 134, at 11,207.

203 *Id.*

204 U.S. ENVTL. PROT. AGENCY, FY 2009: EPA BUDGET IN BRIEF 1 (2008), *available at* http://www.epa.gov/ocfo/budget/2009/2009bib.pdf.

205 SALVATORE LAZZARI, CONG. RESEARCH SERV., RL32979 ALCOHOL FUELS TAX INCENTIVES CRS–9 (2005).

V
ETHANOL SUBSIDIES

With enough money you can turn base metal into gold. With enough gold you can turn corn into liquid fuel. Ethanol costs more to produce than gasoline, but production is increasing rapidly because its production is heavily subsidized by taxpayers, which encourages private capital to flow to the ethanol production industry. In 2005, ethanol production cost per energy equivalent liter was $0.46 compared to $0.44 for gasoline.[206] To create an ethanol market, federal, state, and local governments provide numerous subsidies to the ethanol industry.[207] Although the subsidies cost billions of dollars, it is difficult to quantify because both the recipients and Congress benefit from keeping subsidies hidden from budgetary scrutiny and obscuring who receives the benefits. Thus, the bulk of the federal benefits given to the industry cannot be found by examining the federal budget. Moreover, the costs to the treasury, the aggregate costs to the citizens, and the value of the costs to the ethanol producers are not the same. Because the industry is concentrated, the subsidies at every stage of the production process, from growing corn to consumer use in gasohol, primarily benefit the corporations that dominate the industry.

In addition to production subsidies, the government subsidizes the construction of ethanol facilities. President Carter's Administration supported ethanol tax exemptions and government-backed loans to build ethanol facilities in the Energy Security Act of 1980.[208] President Reagan originally blocked these loans, but later he reversed his position and approved them. The Department of Energy subsequently lost more than $100 million on defaulted ethanol loans.[209] The storage and dispensing of renewable fuel blends is also subsidized. Congress enacted the Energy Independence and Security Act of 2007, section 244.[210] It authorizes $200 million per year through 2014, which includes the storage and dispensing grants, but the limit on each applicant is two years and $20 million, which does not go very far in creating a renewable fuel infrastructure.[211]

206 Hill et al., *supra* note 134, at 11,208.

207 *Id.*

208 *See* Pub. L. No. 96-294, 94 Stat. 611 (1980).

209 Bovard, *supra* note 154, at 11.

210 Pub. L. No. 110-140, § 244, 121 Stat. 1492, 1541 (2007).

211 *Id.* § 244.

The most important success for the ethanol lobby came in 1990 when the CAA Amendments created a mandate to use oxygenates in reformulated gasoline. The ethanol industry responded with continuing efforts to assure that ethanol would have a major share of the new market.[212] When the 1990 CAA Amendments were enacted Archer Daniels Midland Company ("ADM"), of Decatur, Illinois, had an ethanol capacity of 700 million gallons a year.[213] Its closest competitor at that time, Pekin Energy, had an eighty-million-gallon-per-year capacity.[214] Thus, ADM was in a position to be a major beneficiary of the reformulated gasoline market.

More than 90% of the ethanol is sold to the petroleum industry by eight firms; two-thirds is sold by ADM, Ethanol Products, and the Renewable Products Marketing Group.[215] ADM is the most important company in the industry. Its political clout comes from an alliance with farmers and through the Renewable Fuels Association, the American Coalition for Ethanol ("ACE"), the National Corn Growers Association, the American Farm Bureau Federation, and other organizations. RFA represents ADM and about seventy other ethanol groups.[216] ACE is a trade association with 1500 members that are ethanol producers, farmers, investors, agriculture organizations, and other members of the ethanol industry.[217] The American Corn Growers Association has approximately 35,000 members concerned with growing corn for ethanol production.[218] The American Farm Bureau Federation represents the interests of the farm community through farm bureaus in all fifty states. It supports "incentives crucial to continued U.S. ethanol production" and supports tariffs to restrict importation of ethanol.[219] These

212 *See generally supra* § 4(b).

213 Scott Kilman, *Ethanol, in Wake of Oil-Price Rise, May Help Fuel the Fortunes of Archer-Daniels-Midland*, WALL ST. J., Sept. 4, 1990, at C2.

214 *Id.*

215 U.S. ENVTL. PROT. AGENCY, EPA420-D-06-008, RENEWABLE FUEL STANDARD PROGRAM: DRAFT REGULATORY IMPACT ANALYSIS 15 (2006).

216 *See* Renewable Fuels Ass'n, Renewable Fuels Association Members, http://www.ethanolrfa.org/about/membership/documents/Membershiplist_033.pdf (last visited July 14, 2009).

217 *See* Am. Coal. for Ethanol, About ACE, http://ethanol.org/index.php?id=7&parentid=7 (last visited July 14, 2009).

218 *See* Nat'l Corn Growers Ass'n, NCGA's Mission, http://www.ncga.com/ncgas-mission (last visited July 14, 2009).

219 *See* Press Release, Am. Farm Bureau Fed'n, Incentives Crucial to Continued U.S. Ethanol Production (Dec. 5, 1996), *available at* http://www.fb.org/index.php?fuseaction=newsroom.newsfocus&year=1996&file=nr1205.html.

organizations and their members use their substantial political clout to obtain subsidies, but they also give a lot of money to politicians. According to Common Cause, from 1988 to mid-1998, ADM, its subsidiaries, and the family of its former chairman gave $2 million in soft money to Republicans, $1.1 million to Democrats; ADM gave $1.2 million directly to candidates.[220] It is reported that the ten largest ethanol producers gave $4.7 million in federal campaign contributions in 2000–07.[221]

In addition to generous federal subsidies for ethanol production, many states provide subsidies that usually are not part of the budget process. States provide direct payments to producers, tax credits, reduced fuel taxes, grants, subsidized low interest loans, requirements for the purchase of ethanol-fueled government vehicles,[222] and mandatory ethanol content requirements for gasoline.[223] Midwest states are particularly helpful to ethanol producers with state mandates for ethanol content in gasoline.[224] There is a significant effort by many states to see how many benefits they can give to corn farmers and ethanol producers. Although the subsidies are a welfare program for farmers, full-time farmers have a net worth of more than ten times that of the average American household.[225] Local governments also are involved in subsidizing ethanol in the form of tax forgiveness, free or below cost land for ethanol facilities, and upgrades to roads or rail lines used by ethanol plants.[226] These benefits also are largely "off the books."

Perhaps the most important subsidy for the biofuel industry is the existence of a legal mandate that requires its products to be purchased. The oxygen content requirement for reformulated fuel initially was the reason the ethanol market expanded, but the oxygen

220 Vicki Kemper & Deborah Lutterbeck, *The Country Club*, COMMON CAUSE MAG., Spring/Summer 1996, at 16.

221 Marianne Lavelle & Bret Schulte, *Is Ethanol the Answer?*, U.S. NEWS & WORLD REP., Feb. 12, 2007, at 30, 33.

222 Steven Pearlstein, *Going Crazy for Ethanol*, WASH. POST, May 24, 2006, at D1, D3.

223 States Pass New Ethanol Laws Despite Concern over Ozone, Gas Prices, 17 CLEAN AIR REP. (Inside Wash. Publishers, D.C.), May 4, 2006; *Blanco Signs Legislation Setting Standards for Ethanol, Biodiesel Content in Gas, Diesel*, 37 ENV'T REP. 1293 (2006).

224 *See* DOUG KOPLOW, BIOFUELS—AT WHAT COST? GOVERNMENT SUPPORT FOR ETHANOL AND BIODIESEL IN THE UNITED STATES 20 (2006), *available at* www.globalsubsidies.org.

225 James Bovard, *Nearly All Aboard the Grainy Train*, WALL ST. J., Aug. 26, 1987, at 16.

226 KOPLOW, *supra* note 224, at 4.

content requirement was deleted from CAA section 211(k) in the Energy Policy Act of 2005. The act created a new CAA section 211(o) that required renewable fuel, primarily ethanol, to be blended into gasoline in large quantities.[227] The petroleum industry is required to purchase ethanol to blend with gasoline and pay whatever price the ethanol industry charges. Section 211(o) also provides for refiners or other distributors that blend fuels to receive tradable credits for fuel that contains higher percentages of renewable fuel than is required by the EPA.[228] Blenders of ethanol produced from cellulose, which includes corn stalks or grass, receive bonus credits at a 2.5–1 ratio. Small refiners are exempt from renewable fuel standards until 2011, but may opt-in early to participate in the credit program. CAA section 211(o)(7) allows the EPA to waive the requirements of the renewable fuel standard if the administrator determines there would be severe harm to the environment or the economy. Texas requested a waiver because of alleged impact of the renewable fuel mandate on the price of corn, but the request was denied in 2008.[229]

On December 30, 2005, the EPA published a direct final rule, requiring fuel sold or dispensed to consumers in the United States to have a 2.78% by volume renewable component in 2006.[230] This was a collective cap, not an individual cap, and was the default renewable fuels standard required by CAA section 211(o)(2)(iv) if the EPA did not have the time to adopt a credit trading program for renewable fuel usage credits. The 2.78% standard translated to requiring the use of about four billion gallons of renewable fuel, which at that time was the statutory requirement.[231]

On February 22, 2006, the EPA promulgated rules to implement the Energy Policy Act of 2005 by removing the oxygen content requirement for RFG in section 211(k) of the CAA. Because the agency considered this to be noncontroversial, it published a direct

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[227] Pub. L. No. 109-58, § 1504(a), 119 Stat. 594, 1076–1077 (2005); 42 U.S.C. § 7545(o) (2006).

[228] Pub. L. No. 109-58, § 1501(a), 119 Stat. 594, 1067 (2005).

[229] U.S. Envtl. Prot. Agency, EPA420-F-08-029, EPA Decision on Texas Request for Waiver of Portion of Renewable Fuel Standard (RFS) (2008), *available at* http://www.epa.gov/oms/renewablefuels/420f08029.htm.

[230] Regulation of Fuels and Fuel Additives: Renewable Fuel Standard Requirements for 2006, 70 Fed. Reg. 77,351 (Dec. 30, 2005).

[231] Amena H. Saiyid, *EPA Sets Default Renewable Fuels Standard for 2006 in Absence of Credit Trading Plan*, 37 ENV'T REP. 33 (2006).

final rule and a proposed rule applicable to California and a direct final rule and a proposed rule applicable to the rest of the nation on the same date.[232] The RFG rules affected about 30% of the gasoline used in the United States.[233] On May 8, 2006, in response to adverse comments to the direct final rules, the EPA withdrew the direct final rules, but finalized the proposed rule to remove the oxygen content standard and the associated compliance requirements from the RFG regulations.[234] On September 7, 2006, the EPA expanded its efforts to require the use of ethanol in the nation's gasoline by proposing a rule to require at least 3.71% of the nation's gasoline to be corn-based ethanol or other renewable fuels.[235] The percentage or renewable fuel subsequently increased in response to new Congressional mandates. Nine billion gallons of renewable fuel were required to be used in 2008 by the Energy Independence and Security Act of 2007 ("EISA").[236] This led to the EPA implementing EISA on February 14, 2008, when it required gasoline to contain 7.76% renewable fuel in 2008.[237] In 2009 the requirement is 10.21%, which is the equivalent of 11.1 billion gallons of renewable fuel.[238]

This massive subsidy to the ethanol industry does not appear in the budget and its cost is difficult to quantify. Consumers must pay at the pump for the ethanol, which adds about $0.10 per gallon (adjusted for ethanol's lower energy content) to an E10 ethanol blend, and additional costs are imposed on the community to deal with increased air pollution from ethanol use.[239] In addition, consumers must pay at the food store because ethanol-driven demand for corn leads to price increases for the corn used to produce meat and for the corn syrup

232 71 Fed. Reg. 8965 (California Direct Final Rule, Feb. 22, 2006); 71 Fed. Reg. 9064 (California Proposed, Feb. 22, 2006); 71 Fed. Reg. 8973 (Direct Final Rule, Feb. 22, 2006); 71 Fed. Reg. 9070 (Proposed Feb. 22, 2006).

233 U.S. Envtl. Prot. Agency, EPA 420-F-06-020, Removal of Reformulated Gasoline Oxygen Content Requirement and Revision of Commingling Prohibition to Address Non-Oxygenated Reformulated Gasoline (2006), *available at* http://www.epa.gov/oms/regs/fuels/rfg/420f06020.htm.

234 Regulation of Fuels and Fuel Additives: Removal of Reformulated Gasoline Oxygen Content Requirement, 71 Fed. Reg. 26,691 (May 8, 2006).

235 Steven D. Cook, *EPA Proposes Rule to Increase Amount of Renewable Fuel in Gasoline in 2007*, 37 ENV'T REP. 1918 (2006).

236 Pub. L. No. 110-140, § 202, 121 Stat. 1492, 1521 (2007).

237 Revised Renewable Fuel Standard for 2008, 73 Fed. Reg. 8665 (Feb. 14, 2008).

238 Andrew Childers, *EPA Sets Renewable Fuel Standard for Gasoline at 10.21 Percent for 2009*, 39 ENV'T REP. 2299 (2008).

239 YACOBUCCI, *supra* note 30, at CRS–11 (calculated from the data).

that is universally used in processed food. Consumers, as taxpayers, also must pay directly and indirectly for the many subsidies granted by Congress to ethanol producers.

If consumers are to be forced to pay for ethanol at the price determined by the producers, it is important to the U.S. ethanol industry to limit the availability of less costly imported ethanol. The domestic ethanol industry has higher costs of production, even with subsidies, than foreign producers of ethanol. The ethanol lobby has been successful in having Congress and the President limit ethanol imports through the use of tariffs and import duties.[240] In 1983, Congress enacted the Caribbean Basin Economic Recovery Act ("CBERA") to grant duty-free access to many Caribbean products if 35% of the product's value originated in the Caribbean.[241] CBERA section 213(a)'s duty-free treatment provision allows up to 15% of value added by U.S.-made material to count toward the 35% local content requirement. This legislation allows duty-free entry to the United States of Caribbean-produced ethanol, which includes ethanol produced in El Salvador, Jamaica, and Costa Rica. But, the Tax Reform Act of 1986[242] raised the local value-added requirement for Caribbean ethanol to 75% in 1989 to limit importation of Caribbean ethanol.

The Steel Trade Liberalization Program Implementation Act of 1989 changed the rule for Caribbean ethanol to limit duty-free imports from Caribbean Basin countries to sixty million gallons a year or 7% of the U.S. domestic ethanol market, whichever is greater. A local feedstock requirement of 30% applies to the next thirty-five million gallons of ethanol imports, and a 50% local feedstock requirement applies to additional imports. The importation requirements were modified in 1998 by the Transportation Equity Act.[243] The United States International Trade Commission determines the tariff rate quota annually.[244] A tariff rate of either 2.5% or 1.9% (depending on the tariff classification) is imposed on

[240] *Id.* at CRS–5.

[241] Pub. L. No. 98-67, 97 Stat. 384 (1983) (codified at 19 U.S.C. § 2701 *et seq*. (2006)).

[242] Pub. L. 99-514, § 423, 100 Stat. 2230 (1986) (codified at 19 U.S.C. § 2703 (2006)).

[243] The Transportation Equity Act for the 21st Century, Pub. L. No. 105-178, § 9003(a)(4), 112 Stat. 107, 501 (1998).

[244] U.S. INT'L TRADE COMM'N, PUB. 3701, THE ECONOMIC EFFECTS OF SIGNIFICANT U.S. IMPORT RESTRAINTS: FOURTH UPDATE 2004, at 49 (2004).

ethanol imports above that amount.[245] There are a number of exceptions for countries that receive preferential treatment under various trade agreements.

The Central America Free Trade Agreement allocated the 7% of the U.S. market that is the limit for duty-free imports so that Costa Rica and El Salvador receive country-specific shares of the existing Caribbean quota.[246] For this reason, hydrosis (wet) ethanol, which is usually produced in Brazil or Europe, is shipped to Caribbean countries where it is dehydrated. Dehydration plants are operating in Jamaica, Costa Rica, El Salvador, and Trinidad and Tobago. These plants ship their output, duty-free, to the United States.[247] In 2005, only about 5% of the U.S. ethanol consumption came from imports, and between 1999 and 2003 more than half the ethanol imports to the United States came from the Caribbean.[248]

Brazil, a major ethanol producer, does not receive the favorable treatment given to the Caribbean nations.[249] Non-CBERA sugar-producing countries like Australia, Colombia, India, Mexico, and Thailand could become producers of ethanol, but Congress has acted to create tariff and customs barriers to increase the cost of ethanol imported from these countries. For ethanol imports that do not qualify for favorable treatment under CBERA, the U.S. *ad valorem* tariff of either 2.5% or 1.9% as well as a duty of $0.54 per gallon on ethanol helps to limit imports of ethanol.[250] The Harmonized Tariff Schedule is implemented pursuant to 19 U.S.C. §§ 3001–3012.[251]

The United States is not the only nation to protect ethanol producers. Intervention in the free market to protect domestic sugar producers is a common governmental response by sugar-producing

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[245] Customs duties are based on regulations issued pursuant to 19 U.S.C. § 2703(c)(3) (2006).

[246] The Dominican Republic-Central America-United States Free Trade Agreement, *available at* http://www.ustr.gov/Trade_Agreements/Regional/CAFTA/Section_Index.html (last visited July 14, 2009).

[247] Glenn R. Simpson, *ADM Used European Wine for Ethanol: Government Subsidies Pave the Trail from Europe to Caribbean to U.S.*, WALL ST. J., Apr. 25, 2002, at A4.

[248] BRENT D. YACOBUCCI, CONG. RESEARCH SERV., RS21930, ETHANOL IMPORTS AND THE CARIBBEAN BASIN INITIATIVE CRS–2 (2006).

[249] 19 U.S.C. § 2702 (2006); *see generally* George F. Will, *The Biofuel Follies*, NEWSWEEK, Feb. 11, 2008, at 64.

[250] U.S. INT'L TRADE COMM'N, HARMONIZED TARIFF SCHEDULE OF THE UNITED STATES 2207.20.00, 2207.10.60 (2009), *available at* http://www.usitc.gov/tata/hts/bychapter/index.htm.

[251] *Id.*

nations. One-half to two-thirds of the world's sugar production is converted to ethanol, and the governments of sugar-producing nations have intervened to regulate the production, trade, and consumption of ethanol.[252] Congress has acted to benefit sugar growers, corn growers, and ethanol producers, but this adds to the cost of subsidies paid by taxpayers and increases the cost to consumers of gasoline and products containing sugar.[253] Limits on imported cane sugar also benefit corn producers because corn syrup competes with cane sugar for use by the food processing industry.

In 2006 President Bush suggested that the $0.54 per gallon tariff on imported ethanol be lifted to increase the ethanol supply, but House Speaker Dennis Hastert (R-Ill.) and Senate Finance Committee Chairman Charles Grassley (R-Iowa) quickly killed the proposal.[254] On March 9, 2007, Brazil and the United States signed a Memorandum of Understanding ("MOU") to promote cooperation in biofuels.[255] The MOU provides for joint research and development of standards, but does not deal with the barriers that impede the sale of Brazilian ethanol in the United States. The refusal of the United States to liberalize tariffs on ethanol resulted in Brazil rejecting the World Trade Organization's trade plan in December 2007.[256]

A renewable energy law that increases petroleum consumption, but benefits the automobile industry more than the ethanol industry, is the Energy Policy and Conservation Act[257] that sets CAFE standards for motor vehicles. In 1993 Congress created a flexible-fuel credit that allows automobile manufacturers to receive credit toward the federal fuel economy requirements for producing vehicles that run on ethanol.[258] Flexible-fuel vehicles can run on petroleum-based fuels or an alternative fuel, which is usually an 85% ethanol blend ("E85").

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252 TATSUJI KOIZUMI, THE BRAZILIAN ETHANOL PROGRAMME: IMPACTS ON WORLD ETHANOL AND SUGAR MARKETS 1 (U.N. Food and Agric. Org. ed.) (2003).

253 Editorial, *A Good Gas Idea*, WALL ST. J., May 8, 2006, at A18; *see also* Congressional Quarterly Green Sheets, Renewables, May 11, 2006; John Tierney, *Fiddling While Fuel Burns*, N.Y. TIMES, Apr. 29, 2006, at A11.

254 Laura Meckler & John J. Fialka, *Energy May Still Stall Refreshed Congress*, WALL ST. J., June 3, 2006, at A4.

255 CLARE RIBANDO SEELKE & BRENT D. YACOBUCCI, RL34191, ETHANOL AND OTHER BIOFUELS: POTENTIAL FOR U.S.-BRAZIL ENERGY COOPERATION (2007), *available at* http://fpc.state.gov/documents/organization/93476.pdf.

256 Daniel Pruzin, *Brazil Rejects U.S.-EU Liberalized Trade Plan for Environmental Goods, Citing No Biofuels*, 38 ENV'T REP. 2623 (2007).

257 Pub. L. No. 94-163, 89 Stat. 871 (1975),

258 49 U.S.C. § 32905 (2006).

To receive credit, the flexible-fuel vehicles must be driven half the time using an 85% ethanol fuel. As implemented by the federal government, vehicles only need to have the capability to run on ethanol; they do not actually have to use the fuel. While 4.5 million vehicles (mostly SUVs) in the United States can use up to 85% ethanol blends, less than 150,000 vehicles actually use an alternative fuel, and less than 0.4% of the gas stations in the United States sell E85.[259] Motor vehicle manufacturers use this provision to avoid federal penalties for selling vehicles that do not meet CAFE standards.[260]

The flexible-fuel credits were to expire at the end of the 2004 model year, but the DOT extended them through MY 2008.[261] The 2005 Energy Policy Act's section 772 extends the credits through MY 2010, and extends the DOT's authority to continue the credits through MY 2014.[262] Congress extended the flexible-fuel loophole until MY 2019, but with a declining credit in section 109 of the Energy Independence and Security Act of 2007.[263] CAFE standards provide for flexible-fuel vehicles to have their fuel economy calculated as 1.74 times higher than their actual fuel economy with a total maximum increase per manufacturer of 1.2 mpg.[264] Because almost no flexible-fueled vehicles actually use E85 as fuel, the flexible-fuel credit allows the auto industry to produce vehicles with lower fuel economy than CAFE requirements would otherwise require. Because manufacturers can continue to use this loophole to avoid some of the CAFE-imposed fuel economy requirements, this renewable fuel requirement results in an increase in petroleum consumption.

A significant barrier to E85 production is the lack of a distribution system. The United States has about 176,000 gasoline stations, but only 1413 provide the E85 ethanol blend.[265] This is a classic

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259 David Adams, *Sugar in the Tank*, FORBES, Nov. 16, 2005.

260 *Senate Committee Defeats Effort to Close SUV "Loophole" Boosts Clean Coal Funding*, 36 ENV'T REP. 1043 (2005).

261 Automotive Fuel Economy Manufacturing Incentives for Alternative Fueled Vehicles, 69 Fed. Reg. 7689 (Feb. 19, 2004) (codified at 49 C.F.R. pt. 538).

262 Pub. L. No. 109-58, § 772, 119 Stat. 594, 834 (2005) (codified at 49 U.S.C. § 32905).

263 Pub. L. No. 110-140, § 109, 121 Stat. 1492 (2007) (to be codified at 49 U.S.C. § 32906).

264 NAT'L RESEARCH COUNCIL, *supra* note 125, at 89.

265 DAVIS, DIEGEL & BOUNDY, *supra* note 1, at 6–6, tbl.6.4. In the Midwestern states, blender pumps are appearing that allow the customer to choose the mix of alcohol and gasoline they pump. Fuel having high percentages of ethanol also is being sold illegally

"chicken-and-egg" dilemma. Investors will not provide refueling facilities until there is adequate demand, and consumers will not purchase flexible-fuel vehicles unless there is a support infrastructure. In comparison, Brazil has 29,000 stations that provide ethanol.[266] The Energy Policy Act of 2005 has an "Alternative Fuel Vehicle Refueling Property Credit" that provides a 30% credit, up to $30,000, against income taxes for installing clean-fuel vehicle refueling equipment at a taxpayer's business or residence.[267] Clean fuel is defined as a fuel that consists of 85% or more of ethanol, natural gas, compressed natural gas, liquefied natural gas, liquefied petroleum gas, hydrogen, and any mixture of diesel fuel and biodiesel containing at least 20% biodiesel.[268]

The mandate to use ethanol has a significant impact on the agricultural economy and the environment. Corn is the feedstock for 97% of the ethanol produced in the United States.[269] About 27% of the corn crop was used to produce ethanol in 2007, therefore, federal subsidies for corn could be considered to be one of the many subsidies provided to the ethanol industry. At a corn-to-ethanol conversion rate of 2.7 gallons of ethanol per bushel, which is close to the theoretical maximum conversion efficiency and is higher than most plants actually achieve, U.S. ethanol production will require 3.33 billion bushels of corn to meet the 2008 requirement for nine billion gallons of renewable fuel.[270] Corn production in 2008 is estimated at 12.4 billion bushels.[271] While increased efficiency in conversion may slightly reduce growth in the demand for corn, increased use of ethanol will require an increasing percentage of the corn crop to be diverted to alcohol production, which limits the

because alcohol costs less than gasoline. If vehicles are not designed as flex-fuel vehicles the use of blends higher than E10 can damage engines and void warranties. The fuel can also damage boat engines and other small engines. *Engine Producers Seek EPA Help to Limit Ethanol Tort Suits*, 25 ENVTL. POL'Y ALERT 19 (2008).

266 David Luhnow & Geraldo Samor, *As Brazil Fills Up on Ethanol, It Weans Off Energy Imports*, WALL ST. J., Jan. 9, 2006, at A1.

267 Pub. L. No. 109-58, § 1342, 119 Stat. 1049 (2005) (codified at 26 U.S.C. § 30C (2006)).

268 *Id.* § 1342(c).

269 USDA, *supra* note 31, at 1.

270 The corn-to-ethanol conversion rate is 2.7 gallons per bushel. Allen Baker & Steven Zahniser, *Ethanol Reshapes the Corn Market*, AMBER WAVES, Apr. 2006, *available at* http://www.ers.usda.gov/AmberWaves/April06/Features/Ethanol.htm.

271 Julie Douglas, *Expert Predicts 2008 Corn Crop Won't Be Enough; Need to Ration*, PURDUE U. NEWS, Jan. 2, 2008, *available at* http://news.uns.purdue.edu/x/2008a/080102HurtEthanol.html (last visited July 14, 2009).

supply of corn for other uses. Much of the demand for ethanol feed stock is expected to come from decreased corn exports, which may become a threat to the world's food supply. Some of the increased production may come from increased yields per acre. In the decade from 1996 to 2005 corn yields averaged 138 bushels per acre, which is up from 115 bushels per acre during the prior decade. Increased corn production also could be accomplished by using lands less suited to corn production, although it will result in decreasing the yield per acre and will probably increase the negative impacts on the environment.

Total federal subsidies to corn producers from 1978 to 1995 exceeded $32 billion.[272] Ethanol proponents argue that higher corn prices will lead to lower crop subsidy payments, but the history of crop subsidy payments is to the contrary. Agricultural subsidies were more than $25 billion in 2005.[273] Price supports accounted for $6.2 billion of these subsidies, and 80% went for loan deficiency payments ("LDP"), which have cost taxpayers $29 billion since 1998. LDP are neither loans nor are they necessarily payments for a deficiency. The government establishes a guaranteed price for each crop for each county. The nationwide average for corn in 2005 was $1.95 per bushel. Each day the U.S. Department of Agriculture publishes a "posted county price." If the posted price is below the guarantee, the farmer may claim the difference as an LDP. Farmers may take the LDP any time after harvest and prior to the sale of the corn. After taking the LDP the farmer can subsequently sell the corn for any price that can be obtained. Farmers are skilled at using contracts and the commodity markets to minimize their financial risks while timing their LDP claims to maximize their subsidy. In 2005 farmers sold corn for an average of $1.90 per bushel, which was five cents per bushel below the national price floor. But, by timing their LDP claims they received an average of $0.44 per bushels, at a cost to taxpayers of $3.8 billion.[274] In addition, during the past decade

[272] Bovard, *supra* note 154, at 14. An interesting aspect of the agribusiness subsidies is that they receive substantial support from urban members of Congress because farm legislation includes the food stamp program. Elizabeth Becker, *Corporate Farming's Best Friend*, WASH. POST, Oct. 22, 2007, at A23.

[273] DAN MORGAN, GILBERT M. GAUL & SARAH COHEN, *Farm Program Pays $1.3 Billion to People Who Don't Farm*, WASH. POST, July 2, 2006, at A1, *available at* http://www.washingtonpost.com/wp-dyn/content/article/2006/07/01/AR2006070100962.html.

[274] *See* Dan Morgan, Sarah Cohen & Gilbert M. Gaul, *Growers Reap Benefits Even in Good Years*, WASH. POST, July 3, 2006, at A1.

farmers increased corn yields by 20% per acre.[275] But, the subsidy continues on a per-bushel basis. If ethanol demand drives up the price of corn, farmers may still find a way to continue to receive their welfare payments. In the nine months after September 2005, LDP costs were $4.8 billion.[276] However, with corn selling in the high $4 per bushel in 2008, crop payments should decrease substantially.[277]

On June 18, 2008, the Food, Conservation, and Energy Act of 2008 became law despite the veto by President Bush.[278] The bill is primarily a subsidy for the agriculture industry with the bulk of the money going to the wealthiest farmers. The new law has provisions designed to limit the amount of subsidies going to the wealthy, but most reviewers believe the restrictions will be easily avoided. Title I of the act provides income support to farmers, and most of the provisions relating to corn appear to continue the prior approach of the 2002 farm bill.[279]

In addition to purchase mandates and limits on imports, Congress, for more than two decades, responded to the lobbying efforts of the renewable fuels industry with tax incentives that made ethanol blends of gasoline competitive in the energy market. Without government intervention ethanol cannot compete with gasoline, and ethanol production would be substantially reduced or cease.[280] Because of tax incentives, ethanol production increased from 175 million gallons in 1980 to 900 million gallons in 1990.[281] Due to federal and state subsidies, in 2005, 3.9 billion gallons of ethanol were produced and in 2009 production rose to nine billion gallons.[282] In 1990 ADM had 55% of the industry's capacity.[283] ADM has continued to increase its

275 *Id.*

276 *Id.*

277 *Id.*

278 Pub. L. No. 110-234, 122 Stat. 923 (2008). The law was enacted over the veto of the President on May 22, 2008, as H.R. 2419. Congress failed to transmit the bill in proper form to the President so the process had to be repeated. A new bill, H.R. 6124, was vetoed by the President and then passed by Congress and became law on June 18, 2008.

279 *See* U.S. DEP'T OF AGRIC., 2008 FARM BILL SIDE-BY-SIDE, TITLE I: COMMODITY PROGRAMS, http://www.ers.usda.gov/FarmBill/2008/ (last visited July 14, 2009).

280 *See* U.S. GEN. ACCOUNTING OFFICE, GAO/RCED-84-1, IMPORTANCE AND IMPACT OF FEDERAL ALCOHOL FUEL TAX INCENTIVES 1 (1984).

281 Renewable Fuels Ass'n, Statistics, http://www.ethanolrfa.org/industry/statistics/#A (last visited July 14, 2009).

282 Renewable Fuels Ass'n, Biorefinery Locations, http://www.ethanolrfa.org/industry/locations (last visited July 14, 2009); USDA, *supra* note 31, at 1.

283 Renewable Fuels Ass'n, Statistics, http://www.ethanolrfa.org/industry/statistics/#A (last visited July 14, 2009).

capacity, but because the industry grew more rapidly than ADM its portion of the industry's capacity has dropped.[284] ADM continues to dominate the industry, however, because its next largest competitors are much smaller: Aventine (3.72%), Vera (2.71%), New Energy Corp. (2.7%), and Cargill, Inc. (2.26%).[285] In 2008 there were 170 ethanol biorefineries; thirty-four more were under construction and five were being expanded.[286] The rapid infusion of capital to expand an industry that is completely dependent on government distortions of the free market for its survival adds the banking industry to the list of supporters of continuing subsidies and could lead to the bursting of another economic bubble if subsidies are terminated.[287]

Tax benefits for ethanol began with The Energy Tax Act of 1978,[288] proposed by President Carter that exempted blended gasoline (gasohol) from the then-four cents per gallon federal gasoline excise tax that funds the Highway Trust Fund, which finances the federal-aid highway program. This was an effective subsidy of $0.40 per gallon of ethanol. The Crude Oil Windfall Tax of 1980 expanded the $0.40 per gallon subsidy to other blend levels including E84 blend.[289] Over the years the subsidy has been raised and lowered.[290] The estimated reduction in government revenues from 1978 to 2004 was $14 billion.[291] Since then, the Internal Revenue Code ("IRC") has been amended many times to increase the tax incentives for renewable fuel production.[292]

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284 Renewable Fuels Ass'n, Biorefinery Locations, http://www.ethanolrfa.org/industry/locations (last visited July 14, 2009).

285 *Id.*

286 *See id.*

287 The Energy Policy Act of 2005, § 1501(a)(2), 42 U.S.C. § 7545(o) (2006), requires the Federal Trade Commission to annually perform a market concentration analysis. The FTC's 2006 analysis concluded that the ethanol market was "not highly concentrated" primarily because of the many new entrants to the market. FED. TRADE COMM'N, 2006 REPORT ON ETHANOL MARKET CONCENTRATION 1 (2006).

288 Pub. L. No. 95-619, 92 Stat. 3174 (1978) (codified at 42 U.S.C. § 6426).

289 Pub. L. No. 96-223, 94 Stat. 229 (1980).

290 Surface Transportation Assistance Act of 1982, Pub. L. No. 97-424, 96 Stat. 2097 (1983); Tax Reform Act of 1984, Pub. L. No. 98-369, 98 Stat. 494 (1984); Tax Reform Act of 1986, Pub. L. No. 99-514, 100 Stat. 2085 (1986); Technical and Miscellaneous Revenue Act of 1988, Pub. L. No. 100-647, 102 Stat. 3342; Omnibus Budget Reconciliation Act of 1990, Pub. L. No. 101-508, 104 Stat. 1388; Energy Policy Act of 1992, Pub. L. 102-486, 106 Stat. 2776.

291 LAZZARI, *supra* note 205, at CRS–7.

292 *Id.*

Congress provides three income tax credits that benefit the ethanol industry. Credits can be aggregated so the total IRC section 40 alcohol fuels credit is the sum of the three credits: the alcohol mixtures credit, IRC section 40(a)(1); the alcohol credit, IRC section 40(a)(2); and the small ethanol producer credit, IRC section 40(a)(3). The most important tax credit is the alcohol mixtures excise tax credit.[293] It allows petroleum industry blenders to reduce their motor fuels excise taxes by $0.51 for each gallon of biomass ethanol used in their blended fuel for the years 2005 through 2008 and $0.45 per gallon for 2009 and 2010. The law also allows the Volumetric Ethanol Excise Tax Credit to be passed through to farmer-owners of ethanol cooperatives. The excise tax credit in 2009 of $0.45 per gallon multiplied by the statutory requirement to use 11.1 billion gallons of fuel will cost the treasury almost $5 billion, which exceeds the EPA's annual operating budget of $4.3 billion.[294] In 2022, the requirement to use thirty-six billion gallons of renewable fuel could cost the government more than $16 billion.

The American Jobs Creation Act ("AJCA")[295] changed the way taxes are collected on gasohol and other ethanol blends. Prior to the act's passage, the tax credit allowed ethanol blenders to avoid part of the fuel excise tax, which reduced the funds available for highway construction. Ethanol blenders now must pay the full $0.184 per gallon on each gallon of gasohol which goes into the Highway Trust Fund. They are then entitled to take the fuels mixture excise tax credit (or an income tax refund if the blenders have no excise tax liability) for each gallon of ethanol used through December 10, 2010. The $0.183 per gallon excise tax on gasoline is deductible as an ordinary business expense,[296] thus the value of the excise tax credit is combined with the income tax deduction. It has dropped modestly in 2009 because Congress overrode President Bush's veto of the farm reauthorization bill (H.R. 2419).[297] Among its many provisions, the bill reduces the ethanol credit to $0.45 per gallon, but provides a tax

[293] Transportation Equity Act for the 21st Century, Pub. L. No. 105-178, 112 Stat. 107 (1998); IRC § 40(h)(2), as amended by the American Jobs Creation Act of 2004, Pub. L. No. 108-357, § 301-03, 118 Stat. 1459 (2004).

[294] U.S. ENVTL. PROT. AGENCY, EPA-205-S-08-001, FY 2009: EPA BUDGET IN BRIEF v (2008), *available at* http://www.epa.gov/ocfo/budget/2009/2009bib.pdf.

[295] Pub. L. No. 108-357, § 301-03, 118 Stat. 1418, 1459 (2004).

[296] James E. Maule, *Tax Credits: Concepts and Calculations*, 505-2d BNA Tax Management Portfolios A-56(1) (Feb. 16, 2009).

[297] Heather M. Rothman & Brett Ferguson, *Incomplete Farm Bill with $1.7 Billion in Tax Incentives Becomes Law on Override*, 39 ENV'T REP. 1070 (2008).

credit of up to $1.01 per gallon, through 2012, for the production of cellulosic biofuels from agricultural waste or nonfood feedstock.[298]

The AJCA resulted in the ethanol subsidy no longer removing money from the Highway Trust Fund when ethanol is used as fuel. Now general tax revenues cover the subsidy, but because some of the pre-2005 revenue went to the general fund rather than the highway trust fund, the loss to the treasury for the Trust Fund subsidy was projected to be about $1.5 billion for FY 2006.[299] The rapid increase in the price of petroleum in 2008 led to a decrease in fuel consumption, which reduced the revenues available for highway construction because the tax is a per-gallon tax and does not increase when the price of gas rises. This is threatening the viability of the nation's transportation infrastructure because highways traditionally have been financed from user taxes (e.g., gas taxes). This tax may no longer be sufficient. But, politicians fear increasing the gas tax. To cope with the lack of political courage in Congress, the 2008 tax legislation proposed to transfer $8.017 billion from the general budget to the Highway Trust Fund, which would add to the largest budget deficit in the nation's history.[300] In 2009, the support for transportation infrastructure is expected to be affected by the economic stimulus efforts, but massive deficit financing is not sustainable.

The rapid expansion of the ethanol industry is also stressing the railroad system. Ethanol cannot be transported in existing pipelines because of its corrosive qualities and its ability to react with water. A new dedicated pipeline infrastructure is a priority of the industry. The industry will look to the taxpayer to fund it, and legislation has already been introduced.[301] The Energy Independence and Security Act of 2007 in section 243 authorizes $2 million for an ethanol pipeline feasibility study.

Other tax benefits for ethanol include an alcohol credit that provides a credit against income taxes for each gallon of alcohol sold as neat alcohol (E85) at retail and delivered into the buyer's fuel tank,

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298 *Id.*

299 LAZZARI, *supra* note 205, at CRS–8; *see also* Editorial, *Highway Robbery*, WALL ST. J., Mar. 31, 1998, at 1.

300 Jobs, Energy, Families, and Disaster Relief Act of 2008, S. 3335, 110th Cong. § 401 (2008).

301 *See generally* H.R. 2426, 110th Cong. (2007), *available at* http://www.govtrack.us/congress/billtext.xpd?bill=h110-2426.

or that is used in the business of the taxpayer.[302] This credit is limited to ethanol or methanol that is not produced from fossil fuels, so it is effectively limited to ethanol. Because the U.S. market for neat alcohol is small, this tax credit is not presently very important. The per gallon tax credit is $0.51 for 2005 through 2008 and $0.45 for 2009 through 2010.

Small ethanol producers whose production capacity does not exceed sixty million gallons per year receive a $0.10 per gallon tax credit.[303] Most ethanol plants, and virtually all new ethanol plants under construction, qualify for the $0.10 per gallon credit for up to fifteen million gallons of renewable fuel.[304] The 2005 Energy Act also added a provision allowing the tax benefits to farm cooperatives to pass through to the members of the cooperative.[305] This allows new ethanol facilities to be built with an additional federal subsidy that does not require an expenditure that appears in a budget or that needs a subsequent appropriation.

In addition to tax benefits, the federal government subsidizes ethanol production infrastructure development. The Energy Security Act of 1980 provided loan guarantees for up to 90% of the construction costs of ethanol plants.[306] The Bioenergy Program administered by the Commodity Credit Corporation reimburses ethanol and biodiesel producers for expanding their productive capacity.[307] The Renewable Energy Systems and Energy Efficiency Improvements Program administered by the Rural Business Cooperative Service provides grants, loans, and loan guarantees for development of renewable energy projects.[308] The Value-Added Producer Grants Program, also run by the Rural Business Cooperative

302 Maule, *supra* note 296, at A.60.

303 Section 40(g) of the Internal Revenue Code was amended by the Energy Act of 2005, Pub. L. No. 109-58, § 1347, 119 Stat. 594 (2005), which after 2005 increased the maximum productive capacity from the prior thirty million gallons.

304 Eric Washburn & Brian Jennings, *Signature Legislation: RFS Becomes Law*, ETHANOL TODAY 20, 23 (2005). After 2008 the fifteen-million-gallon limit is determined without counting qualified cellulosic biofuel production. IRC § 40(b)(4)(C) as amended by the Food, Conservation, and Energy Act of 2008, Pub. L. No. 110-246, § 15321(e), 122 Stat. 1651 (2008).

305 Pub. L. No. 109-58, § 1302, 119 Stat. 989 (2005) (amending the Internal Revenue Code of 1986, § 45(e)).

306 Pub. L. No. 96-294, 94 Stat. 611 (1980).

307 BRENT D. YACOBUCCI, CONG. RESEARCH SERV., RL33572, BIOFUELS INCENTIVES: A SUMMARY OF FEDERAL PROGRAMS CRS–3 (2006).

308 *Id.* at CRS–4.

Service provides grants for value-added agricultural activities including biofuel production.[309] The Department of Energy in FY 2006 had $91 million for its biomass program that funds biorefinery projects.[310] The Food, Conservation, and Energy Act of 2008, adds numerous subsidies for biofuels in its Title IX.[311] The Act provides loan guarantees for biorefinery development and provides funding for demonstration and commercial biorefineries.[312] The Act's provisions are discussed in more detail in *infra* Part 7. These programs aimed at encouraging domestic production of ethanol divert capital to an industry that is attractive to investors primarily because of government subsidies.

Ethanol provides no benefit, except political, that justifies the large subsidies given to corn farmers and ethanol producers. In October 2007, a report by the Geneva-based International Institute for Sustainable Development estimated that U.S. subsidies for biofuel production amounted to $6.3 billion to $7.7 billion in 2006.[313] Another study placed the estimated 2006 cost at between $6.334 billion and $8.679 billion.[314] The renewable tax credit benefits of the 2007 energy legislation will cost the Treasury in excess of $4 billion in 2008 and will increase substantially as the production of renewable fuel increases. While the renewable fuel program goal for 2022 will involve losses to the Treasury of about $18 billion for the alcohol fuel credits, the statute's goal of reducing gasoline consumption by twenty-four billion gallons (three gallons of ethanol replaces two gallons of gasoline) could be achieved at minimal cost and far more quickly by increasing the fuel efficiency of motor vehicles by four miles per gallon. But Congress is more interested in subsidizing the ethanol industry than effectively addressing the nation's need to reduce its consumption of liquid fuel.

309 *Id.*

310 *Id.* at CRS–6.

311 Pub. L. No. 110-234, 122 Stat. 923 (2008).

312 *Id.* § 9003.

313 Rick Mitchell, *EPA Administrator Says Biofuel Subsidies Not Chief Cause of Global Food Shortages*, 39 ENV'T REP. 870 (2008).

314 KOPLOW, *supra* note 224, at 51.

VI
OTHER RENEWABLE FUELS

In 1970 the United States imported 3.42 million barrels of oil per day.[315] In 1974, after the 1973 OPEC petroleum cut-off, President Nixon said that by the end of the decade "the United States will not be dependent on any other country for the energy we need."[316] In 1980 the nation imported 6.91 million barrels per day.[317] After the second petroleum cutoff in 1979, President Carter said "[b]eginning this moment, this nation will never again use more foreign oil than we did in 1977."[318] After a dip to 5.07 million barrels per day in 1985, oil importation began to increase, reaching nine million barrels in 1994 and 13.46 billion barrels per day in 2006.[319] In 2006, President George W. Bush said America can "move beyond a petroleum-based economy and make our dependence on Middle Eastern oil a thing of the past."[320] In his State of the Union address he called for a program to limit reliance on foreign oil and to develop alternative fuel supplies.[321] For more than thirty years Congress and the President made only half-hearted efforts to reduce the nation's petroleum dependence.

The few initiatives enacted by Congress to encourage the use of renewable fuels include the Alternative Motor Fuels Act of 1988 that requires the federal government to acquire as many light-duty alcohol-powered, natural gas-powered, and duel fuel vehicles as is practicable.[322] The Energy Policy Act of 1992 requires the purchase of alternative fuel vehicles.[323] It applies to federal vehicles of 8500 pounds or less in fleets of twenty or more located in 125 consolidated

315 DAVIS, DIEGEL & BOUNDY, *supra* note 1, at 1–8, tbl.1.7.

316 Justin Blum, *Making an Oil Pledge*, WASH. POST, Feb. 2, 2006, at D1.

317 DAVIS, DIEGEL & BOUNDY, *supra* note 1, at 1–8, tbl.1.7.

318 Blum, *supra* note 316.

319 DAVIS, DIEGEL & BOUNDY, *supra* note 1, at 1–8, tbl.1.7.

320 Blum, *supra* note 316.

321 President Bush's State of the Union Address, Jan. 31, 2006, *available at* http://www.washingtonpost.com/wp-dyn/content/article/2006/01/31/AR2006013101468.html.

322 Alternative Motor Fuels Act of 1988, Pub. L. No. 100-494, sec. 400AA, 102 Stat. 2441, 2442 (1988) (codified 42 U.S.C. § 6374); CAA § 246, 42 U.S.C. § 7586.

323 Energy Policy Act of 1992, Pub. L. 102-486, sec. 302, § 400AA, 106 Stat. 2776, 2868 (1992) (codified at 42 U.S.C. § 6374 (1994)).

statistical areas.[324] Beginning in 1996, state entities and "alternative fuel providers" were subject to the Act.[325]

The 1990 Clean Air Act Amendments continued the movement by the federal government to encourage the use of alternative fuels such as compressed natural gas, liquefied natural gas, liquefied petroleum gas, methanol, ethanol, vegetable oils, hydrogen, liquid fuels derived from coal, and blends of gasoline and alcohol known as gasohol.[326] Changes concerning alternative fuels include: (1) a program for clean alternative fuels in sections 241–245,[327] (2) requirements applicable to centrally fueled fleets in sections 246–248,[328] (3) a pilot program in California to require clean alternative fueled vehicles be made available in sections 249–50,[329] and (4) a program to regulate urban bus emissions in section 219 that includes low polluting fuel requirements.[330]

The Energy Policy Act of 2005[331] is a comprehensive energy statute that includes many provisions dealing with alternative energy. It authorized $50 million annually for a biomass program. It also requires federal fleet vehicles that are capable of operating on alternative fuels to operate on these fuels exclusively.

The Energy Independence and Security Act of 2007 continued the federal effort to encourage the use of renewable fuel, primarily through modification of the CAA's section 211(o).[332]

The most important subsidy is the mandated use of ethanol at any price the ethanol industry can impose. Ethanol production and use is to increase each year until it reaches thirty-six billion gallons by 2022 and twenty-one billion gallons is to be advanced biofuel, which is to include sixteen billion gallons of cellulosic biofuel.[333] The legislation

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324 Pub. L. 102-486, sec. 301(11), 106 Stat. at 2867–68.

325 Pub. L. 102-486, title IV and V.

326 HUGH WILSON ET AL., ALTERNATIVE FUELS: A CASE STUDY REPORT, NATIONAL CONFERENCE OF STATE LEGISLATURES 9 (1996); OFFICE OF TECH. ASSESSMENT, U.S. CONG., OTA-E-364, REPLACING GASOLINE: ALTERNATIVE FUELS FOR LIGHT-DUTY VEHICLES 5 (1990).

327 Act of Nov. 15, 1990, Pub. L. No. 101-549, §§ 241–45, 104 Stat. 2399, 2511–20 (1990) (codified at 42 U.S.C. § 7581(2006)).

328 *Id.* §§ 246–48, 104 Stat. at 2520–25 (codified at 42 U.S.C. §§ 7586–7588).

329 *Id.* §§ 249–50, 104 Stat. at 2525–29 (codified at 42 U.S.C. § 7589).

330 *Id.* § 219, 104 Stat. at 2505–17 (codified at 42 U.S.C. § 7554 (2006)).

331 Pub. L. No. 109-58, 119 Stat. 594 (2005).

332 *See* Pub. L. No. 110-140, 121 Stat. 1492, 1519–28 (2007).

333 *Id.* sec. 202, § 211(o), 121 Stat. at 1522.

supports the development of the next generation of biofuel production with a program authorized at $500 million.[334] The 2007 act modifies the CAA to define advanced biofuels as: ethanol from cellulose, hemicellulose, or lignin; ethanol from sugar or starch (other than corn starch); and ethanol derived from waste material, including crop residue, other vegetative waste material, animal waste, food waste, and yard waste.[335] It provides grants for the development of ethanol blends of 11% to 85% ethanol that is authorized at $200 million a year from 2008 through 2014.[336] It authorizes $25 million for university research and development[337] and $50 million for cellulosic ethanol and biofuel research at an 1890 institution as defined in 7 U.S.C. § 7061, at historic black colleges and universities, tribal college or university, and at Hispanic-serving institutions.[338] Other authorizations are scattered through the legislation.

The Food, Conservation, and Energy Act of 2008[339] continues the multibillion-dollar subsidy program for agriculture in its Title I provisions. How much of this money will go to the production of biofuel feedstock is unknown. Title IX of the bill has a dozen sections that provide or authorize money for renewable fuels. Section 9002 provides $9 million for federal procurement of biobased products and authorizes another $6 million.[340] Section 9003 provides $320 million for biorefinery loan guarantees and authorizes an additional $600 million for biorefineries.[341] Section 9004 provides $35 million to subsidize replacement of fossil fuel used in biorefineries with biomass-based fuel and authorizes an additional $60 million for fuel replacement.[342] This may also become a subsidy for animal feeding operations because CAA section 211(o)(1) was changed in 2007 to make animal waste an "advanced biofuel."

Section 9005 supports the production of feedstock for advanced biofuels with $245 million and authorizes an additional $100

334 *Id.* § 207, 121 Stat. at 1531.

335 *Id.* sec. 201, § 211(o)(1), 121 Stat. at 1519–21.

336 *Id.* § 244, 121 Stat. at 1541–46.

337 *Id.* § 234, 121 Stat. at 1538.

338 *Id.* § 230, 121 Stat. at 1536.

339 Pub. L. No. 110-234, 122 Stat. 923 (2008).

340 U.S. DEPT. OF AGRIC., 2008 FARM BILL RENEWABLE ENERGY PROVISIONS 1, http://www.usda.gov/documents/FB08_Pub_Mtg_Renew_Energy_Factsheet.pdf (last visited July 14, 2009).

341 *Id.*

342 *Id.*

million.[343] Section 9006 provides $5 million to educate the public about the benefits of biodiesel fuel use.[344] Section 9007 provides $255 million for the Rural Energy for America Program and authorizes an additional $100 million.[345] Section 9008 provides research and development grants that are funded at $118 million with an additional $140 million authorized.[346] Section 9009 provides $20 million for rural communities to increase their energy self-sufficiency.[347] Section 9010 "[s]ubsidizes the use of sugar for ethanol producers through purchases of surplus sugar for sale to ethanol producers."[348] Funds are to be provided that are sufficient to accomplish this mandate, but no dollar amount is specified. Presumably this will also help to increase the price that consumers pay for sugar.

Section 9011 provides support to produce crops for bioenergy that will be implemented by the Farm Service Agency, but no dollar amount is specified.[349] Section 9012 authorizes research and development work by public and private entities to be administered by the Forest Service in an effort to develop the use of forest biomass for fuel, but no dollar amount is specified.[350] Section 9013 authorizes $20 million for state and local government to develop community wood energy systems.[351] The farm bill provides more than $1 billion in federal money to subsidize biofuel development between FY 2009 and FY 2012 and has the potential to cost many additional billions of dollars if the open-ended directives and authorizations are funded.

In addition to statutory requirements, executive orders are used to expand the federal alternative fuels policy. Executive Order 12844 required federal agencies to adopt plans to exceed the requirements of the Energy Policy Act.[352] It was superseded by Executive Order 13031,[353] which required federal agencies to meet the requirements of the Energy Policy Act regardless of their budget, and it required

343 *Id.*

344 *Id.*

345 *Id.*

346 *Id.*

347 *Id.*

348 *Id.* at 2.

349 *Id.*

350 *Id.*

351 *Id.*

352 Exec. Order No. 12844, 58 Fed. Reg. 21,885 (Apr. 21, 1993).

353 Exec. Order No. 13031, 61 Fed. Reg. 66,529 (Dec. 13, 1996).

yearly progress reports on alternative fuel purchases. It was revoked by Executive Order 13149 that sought to reduce the federal government's petroleum consumption, and encourages the use of alternative fuels and hybrid vehicles.[354] On January 24, 2007, Executive Order 13149 was revoked and replaced by Executive Order 13423.[355] Executive Order 13423 requires federal agencies to use energy from new renewable resources. It requires agencies that operate at least twenty vehicles to reduce petroleum consumption by 2% annually and increase the use of nonpetroleum-based fuel by 10% annually.[356] These requirements are binding on government tenants and government contractors.[357]

Despite the publicity given to alternative energy, funding has remained flat during the Bush Administration. Moreover, more than 50% of the biomass, 33% of the wind energy, and 27% of the hydrogen research budget (approximately $170 million) was "earmarked" for projects in the home districts of members of Congress.[358] The budget for biomass and biorefinery systems research and development was $198.18 million in FY 2008 and an estimated $225 million in FY 2009.[359]

A. Ethanol from Sugar and Grains

The OPEC petroleum export embargo in 1973 did not lead to an effective energy policy in the United States, but it did in Brazil, which introduced its "Pro-Alcohol" program in 1975. "[B]y the mid-1980's, more than three quarters of the 800,000 cars made in Brazil each year could run on [sugar]cane-based ethanol," although trucks, buses, and work vehicles continued to operate primarily on diesel fuel.[360] But, in 1989 when prices for sugar substantially increased, mill owners stopped making ethanol in order to process cane into sugar, and

354 Exec. Order No. 13149, 65 Fed. Reg. 24,607 (Apr. 21, 2000).

355 Exec. Order No. 13423, 72 Fed. Reg. 3919 (Jan. 24, 2007).

356 *Id.*

357 *Id.*

358 Marianne Lavelle, *A Lack of Energy*, U.S. NEWS & WORLD REP., Mar. 6, 2006, at 50–51.

359 U.S. Dept. of Energy, Energy Efficiency and Renewable Energy, Planning, Budget, & Analysis, *available at* http://www1.eere.energy.gov/ba/pba/budget_09.html (last visited July 14, 2009).

360 Larry Rohter, *With Big Boost from Sugar Cane, Brazil Is Satisfying Its Fuel Needs*, N.Y. TIMES, Apr. 10, 2006, at A1.

motorists' confidence in the ethanol program plummeted.[361] In 2003, Volkswagen introduced a "flex fuel" vehicle in Brazil.[362] This allows vehicle owners to use either alcohol- or petroleum-based fuel, depending on their relative price and availability.[363] "[O]f the total of 9.4 billion liters of ethanol used in 2005 . . . 4.1 billion were purchased [for] alcohol-powered or flex-fuel vehicles," and 5.3 billion liters were purchased for use in vehicles designed to operate on gasoline.[364] Ethanol accounts for 40% of Brazil's motor vehicle fuel, and it exports ethanol to the United States, India, Venezuela, and Nigeria.[365] Brazil and the United States each account for about 35% of global ethanol production.[366]

Brazil used about 53% of its 2005–2006 sugarcane crop to produce the approximately 25% ethanol blend used nationwide and a 100% hydrous ethanol used to fuel four million vehicles.[367] Brazilian "total flex" vehicles can use any pure or blended fuel from 100% gasoline to 100% ethanol.[368] Because corn must be turned into sugar before it can be distilled, Brazil can produce ethanol with substantially less energy inputs than used for corn-based options and is much less expensive to produce.[369] Brazil could produce ethanol for $0.81 per gallon when it cost $1.03 per gallon for U.S. ethanol produced from corn by wet milling and $1.05 from dry milling.[370] Moreover, Brazil's distilleries burn sugarcane waste (bagasse), which allows

361 *Id.*

362 *Id.*

363 *Id.*

364 USDA FOREIGN AGRIC. SERV., GAIN REPORT NO. BR6001, BRAZIL SUGAR ETHANOL UPDATE—FEBRUARY 2006, at 2 (2006).

365 David Sandalow, *Ethanol: Lessons from Brazil*, *in* A HIGH GROWTH STRATEGY FOR ETHANOL 67, 67 (Aspen Institute 2006), *available at* http://www.aspeninstitute.org/sites/default/files/content/docs/energy%20and%20environment%20program/FINALEthanolText.pdf.

366 USDA, *supra* note 31, at 1; *see also* Claudia Orellana & Ricardo Bonalume Neto, *Brazil and Japan Give Fuel to Ethanol Market*, 24 NATURE BIOTECHNOLOGY 232, 232 (2006).

367 *See* USDA, *supra* note 31, at 1.

368 *See Flexible-Fuel Vehicle*, WIKIPEDIA, http://en.wikipedia.org/wiki/Flex_fuel (last visited July 14, 2009).

369 *See* Rohter, *supra* note 360 (the author claims Brazil-produced ethanol requires one-eighth the energy of corn-based ethanol). *But see* Marcelo E. Dias de Oliveira et al., *Ethanol as Fuel: Energy, Carbon Dioxide Balances, and Ecological Footprint*, 55 BIOSCIENCE 593, 594 (July 2005) (The authors conclude that U.S. ethanol production has a 1.1 output-input ratio while Brazil's ethanol enjoys a 3.7 advantage.).

370 USDA, *supra* note 31, at iv.

ethanol production to be energy self-sufficient.[371] Brazil is ahead of the United States in developing ethanol technology, and it expects to increase its energy efficiency using genetically modified sugarcane.[372] Brazil can produce ethanol from sugarcane at about one-third of the estimated costs of producing ethanol from sugarcane in the United States.[373] But, in 2006, strong demand led to significant price increases in Brazilian ethanol.

In the United States, 97% of the domestic ethanol production uses corn as the feedstock, and minor quantities of ethanol are produced from sorghum, cheese whey, and beverage waste.[374] But corn-based ethanol with its high production costs, its need for high-quality farmland to produce corn, and the importance of corn for food, limits the potential expansion of ethanol production. Nevertheless, as the prior discussion has shown, Congress is doing its best to distort the market economy through laws designed to force ethanol to be purchased and by subsidizing its production. Whether food crops other than corn could be used for commercial ethanol production will depend on their cost of production, the cost of petroleum-based fuels, and, most importantly, the extent of government "carrots and sticks."

Ethanol can be produced from sugarcane, sugar beets, raw sugar, cane molasses, other molasses, wheat grain, sweet sorghum, Jerusalem artichokes, and other grains.[375] A grain that has promise for ethanol production is hull-less barley.[376] It can be grown in the winter, and if fertilizer is used efficiently the crop can "reduce erosion and nitrogen leaching from the field."[377] There is not much experience in the United States using other food crops for ethanol so no cost data is available to use to accurately project costs.

The U.S. Department of Agriculture estimated the costs of production of ethanol per gallon (excluding capital costs) at $2.40 for sugarcane, $2.35 for sugar beets, $1.27 for molasses, and $3.48 for

371 De Oliveira et al., *supra* note 369, at 594.

372 *See id.*

373 USDA, *supra* note 31, at iv.

374 *Id.* at 1–2.

375 UNITED NATIONS CONFERENCE, *supra* note 38, at 4.

376 CHESAPEAKE BAY COMM'N & THE COMMONWEALTH OF PA., NEXT GENERATION BIOFUELS: TAKING THE POLICY LEAD FOR THE NATION 25–26 (2008), *available at* www.chesbay.state.va.us/Publications/nexgen9.20biofuels.pdf.

377 *Id.* at 26.

U.S. raw sugar.[378] Costs for corn-based ethanol are about $1.05 per gallon.[379] Capital costs for a corn-based ethanol facility are estimated at $1.50 per gallon of annual capacity; capital costs for a sugarcane or sugar beet feedstock facility are estimated at $2.10 to $2.20 per gallon of annual capacity.[380] Molasses is clearly the least expensive sugar feedstock, but molasses is a byproduct of sugar production, and ethanol production would be limited by the supply of this feedstock. Corn-based ethanol is only competitive with petroleum-based fuels if it is heavily subsidized, but corn-based ethanol is far less costly to produce in the United States than ethanol from other food feed stock. Therefore, to use sugarcane or other foods to produce ethanol will require even more costly subsidies. In addition, its use will have to be mandated or subsidized at the pump because consumers may not use a product that is inferior to petroleum-based fuel.

The Energy Policy Act of 2005 established a sugarcane ethanol program within the EPA so that farmers and ethanol producers in Florida, Louisiana, Texas, and Hawaii can benefit from federal subsidies, and $36 million was authorized.[381] But, the sugar industry, although heavily subsidized by taxpayers, was not granted any significant new subsidies to produce alcohol. The Energy Independence and Security Act of 2007 amended the CAA's section 211(o)(1) to include sugar as an advanced biofuel, which could assist the sugar industry's quest for more subsidies. This is discussed *infra* Part 7(b). The farm bill of 2008 continues the preexisting subsidies for the sugar industry, but does not offer any new programs aimed at biofuel production from the sugar industry.[382]

B. Ethanol from Cellulose

Ethanol produced from cellulose or other nonfood inputs is a promising source of biofuels. But, the political decision to use cellulosic ethanol and other advanced biofuels as a significant energy source suffers from two serious problems. The 2007 energy bill mandates the use of sixteen billion gallons of cellulosic biofuel by 2022. If that target is reached, cellulosic ethanol would replace

378 James Jacobs, *Ethanol from Sugar*, USDA RURAL DEV., http://www.rurdev.usda.gov/rbs/pub/sep06/ethanol.htm (last visited July 14, 2009).

379 *Id.*

380 USDA, *supra* note 31, at iv–v.

381 Pub. L. No. 109-58 § 208, 119 Stat. 594, 657 (2005).

382 Food, Conservation, and Energy Act of 2008, Pub. L. No. 110-234, 122 Stat. 923.

5.95% of the fuel used by U.S. light vehicles in 2006.[383] This saving could be achieved more quickly and at a lower cost by increasing the fuel efficiency of the light vehicle fleet from 18.5 mpg to about 19.6 mpg.[384] The 2007 energy bill also mandates the production of twenty-one billion gallons of advanced biofuel by 2022. The benefits of achieving this goal could be met with an 8% increase in fuel efficiency that could be achieved by increasing light vehicle fuel efficiency to about 22 mpg.[385] The second problem is that the program is predicated on the use of large federal and state subsidies to producers and on consumer mandates to use the fuel in order to have a market for cellulosic ethanol. Advanced biofuels, such as perennial grasses, wood, and corn stover may be used to produce fuel for transportation with less adverse social and environmental impacts than using food for fuel. But obtaining fuel from second generation feedstock is only in the early stages of development, and there is not yet commercially viable production. There were, however, fifty-five pilot plants and limited commercial facilities under construction in the United States in 2007.[386]

Ethanol can also be produced from trees, forest residues, and agricultural residues not specifically grown for food. This is an important source of ethanol feedstock because if we devoted all the U.S. corn and soybean harvest to ethanol and biodiesel production it would offset 12% of U.S. gasoline and 6% of U.S. diesel demand. Because of the energy input requirements, the net energy from ethanol and biodiesel would be about 2.4% and 2.9% of U.S. gasoline and diesel fuel.[387] Nonfood inputs would allow marginal lands to be used for feedstock production that would not adversely affect food production. Moreover, cellulosic ethanol requires less pesticides and fertilizer than corn-based ethanol and offer the potential for a significant net energy balance.[388] But, demand for cellulosic ethanol

383 Petroleum consumption in 2006 was 20.69 million barrels per day or 7.55 billion barrels per year at forty-two gallons per barrel is more than 317 billion gallons. *See* DAVIS, DIEGEL & BOUNDY, *supra* note 1, at 1–1. Since ethanol has less energy than gasoline the benefits would be further reduced.

384 Highway use of gasoline in 2006 was 174.9 billion gallons. DAVIS, DIEGEL & BOUNDY, *supra* note 1, at 2–13, tbl.2.11; sixteen billion gallons of ethanol has the energy of 10.4 billion gallons of gasoline, which is 5.95% of the gasoline consumed. *See supra* Part 1.

385 See the calculation at *supra* notes 117–19 and accompanying text.

386 CHESAPEAKE BAY COMM'N, *supra* note 376, at 8.

387 Hill et al., *supra* note 134, at 11,208.

388 *Id.*

may result in adverse impacts on forests if they are cut to produce fuel and/or converted to plantations of fast-growing trees. If corn stover is used the benefits of using this material for soil conditioning and erosion control may be lost. Further, if abandoned lands, reclaimed mined land, or other lower value lands are utilized to produce cellulosic ethanol feedstock, the environment could benefit through improved soil conservation practices.[389]

The Energy Policy Act of 2005, section 932, identifies cellulosic material as lignocellulosic feedstock and lists barley grain, rapeseed, rice bran, rice hulls, rice straw, soybean matter, and sugarcane bagasse as being lignocellulosic. The 2005 act, section 941, amends the Biomass Research and Development Act of 2000 to expand biobased fuel research and development programs in an effort to overcome the "recalcitrance of cellulosic biomass."[390] These programs are needed because using plant cellulose and extracting sugar to make ethanol is more difficult than getting sugar from grains.[391] Wood cellulose used for ethanol production requires more energy than is needed for converting other potential biomass sources. It requires 57% more energy to obtain ethanol from wood than is contained in the ethanol that is produced.[392] The cost is slightly higher than using switchgrass.[393] But, the energy needed for producing cellulosic ethanol can come from the feedstock rather than from fossil fuels.[394] The lignin component of the feedstock cannot be fermented into ethanol, but it does have more than enough energy value to power the ethanol production process.[395]

To convert these cellulosic biomass sources to ethanol involves significant pretreatment or mechanical separation before conversion, which increases the capital costs of these facilities.[396] Steam is usually used to help break apart the glucose molecule. This is followed by enzymatic hydrolysis, which uses enzymes to break cellulose chains down to fermentable sugar. Then the lignin separated from the mixture, which may be burned for power production. At this point the sugar is treated in the same way as corn-

389 CHESAPEAKE BAY COMM'N, *supra* note 376, at 27.

390 Pub. L. No. 109-58, 119 Stat. 594 (codified at 7 U.S.C. § 8101 (2006)).

391 Pimentel & Patzek, *supra* note 159, at 70.

392 *Id.* at 71.

393 *Id.*

394 Greene, *supra* note 129, at 50.

395 *Id.*

396 CHESAPEAKE BAY COMM'N, *supra* note 376, at 12.

based alcohol production. Yeast is added and allowed to ferment. Then the alcohol is separated from the fermented mash, and a by-product called stillage is left. The ethanol is dehydrated to produce fuel-grade ethanol. In 2006 the industry was hoping to produce ethanol at $0.60 per gallon and sell it for $2 per gallon at the pump, but such economic efficiency is unproven.[397]

Four studies of cellulosic ethanol concerning the energy return on investment (r_E), which is the ratio of energy in ethanol compared to the nonrenewable energy required to make it, were surveyed and compared in a 2006 report.[398] The Pimentel & Patzek study in 2005 found a negative energy return of 0.69, but a study published in 1993 found an r_E of 6.61 and two studies published in 2004 reported an r_E of 4.55 and 4.40.[399] The low r_E reported in the Pimental & Patzek 2005 study may be attributable to their assumption that fossil fuel is used, but cellulosic production is expected to combust the lignin in the feedstock for the power needed for the ethanol conversion process. Thus, cellulosic ethanol could be produced using less nonrenewable energy than corn-based ethanol.[400] A 2007 life-cycle study found that the energy requirements and adverse environmental impacts associated with chemicals used for production are low for switchgrass and hybrid poplar when compared to corn crops. If hybrid poplar or switchgrass are gasified to produce electricity, rather than being used to produce ethanol, the net energy obtained is doubled because process of converting switchgrass to gas and then producing electricity is much more efficient that converting swithchgrass to ethanol. But this does not produce the liquid fuel needed by the transportation sector.[401]

The price of the enzymes needed for the cellulosic ethanol process has dropped from $5 per gallon to $0.30 per gallon.[402] But, it still is more expensive to produce cellulosic ethanol from biomass than it is to produce gasoline. In addition, the feedstock for this biomass alcohol is usually a seasonal product, and the economics of collecting and storing the material in the quantities needed to obtain the

397 *See id.*

398 Hammerschlag, *supra* note 158, at 1748–50.

399 *Id.* at 1748.

400 *Id.*

401 Paul R. Adler et al., *Life-Cycle Assessment of Net Greenhouse-Gas Flux for Bioenergy Cropping Systems*, 17 ECOLOGICAL APPLICATIONS 675, 681 (2007).

402 Justin Gillis, *New Fuel Source Grows on the Prairie*, WASH. POST, June 22, 2006, at A1.

economies of scale of a large plant is unknown.[403] However, Amory B. Lovins writes that by using genetically engineered bacteria and enzymes, woody material can be converted to biofuels at a price that is competitive with gasoline. But, he uses the 2050 to 2100 time frame as the time needed for significant replacement of transportation fuels to biofuels.[404] Biofuels are the most promising alternative fuels for use by the transportation sector, but will require substantial development efforts before they become significant sources of useable energy. Genetic engineering advances to increase the efficiency of ethanol production and improved feedstocks may substantially lower the cost per gallon of cellulosic ethanol. Digestion and subsequent fermentation of cellulose has the potential for being able to yield significantly more ethanol than can be produced using corn as the feedstock.[405] Nevertheless, cellulosic conversion technology is rudimentary and expensive, even though a great deal of money and effort is being made to make advanced biofuels economically viable.[406] Whether this will ever happen is unknown, but first-generation ethanol continues to expand its market with the help of federal mandates and large subsidies. The supporters of advanced biofuel production presumably will not object to receiving a continuous flow of federal dollars.

Switchgrass (Panicum virgatum) or fast-growing woody crops such as hybrid willow and poplar are potential fuel sources. Switchgrass is a perennial Midwest and Southeast grass that can be harvested like hay once or twice a year, but has nearly three times the yield of hay.[407] Switchgrass does not need water-supplied irrigation, and requires less fertilizer and pesticides than most crops. It requires no tillage, and its extensive root system reduces soil erosion and uses water efficiently. It grows up to ten feet in height, which provides habitat for wildlife.[408] It can be used to produce a fuel with about three-quarters the energy of gasoline.[409] Switchgrass, proponents

403 *Id.*

404 AMORY B. LOVINS ET AL., WINNING THE OIL ENDGAME 104 (Beatrice Aranow ed. 2004).

405 Richard Hamilton, *Biotechnology for Biofuels Production*, *in* A HIGH GROWTH STRATEGY FOR ETHANOL 55 (Aspen Institute 2006).

406 For more information see http://www.iogen.ca/; *see also* SCHNEPF, *supra* note 164, at CRS–21–22.

407 David Bransby, Switchgrass Profile, *available at* http://bioenergy.ornl.gov/papers/misc/switchgrass-profile.html (last visited July 14, 2009).

408 Greene, *supra* note 129, at 45.

409 Bransby, *supra* note 407.

claim, it can be harvested for fuel and still provide soil conservation benefits. Its use could be designed to complement the Conservation Security Program in the 2003 farm bill. But, environmentalists are concerned that soil and water conservation values and wildlife habitat will be undermined to encourage biofuel production.[410]

Switchgrass has been pelletized and used to fuel stoves at a favorable rate of one kilocalory ("kcal") of fossil energy to obtain eleven to fourteen kcal of usable heat energy.[411] To use switchgrass as a feedstock for ethanol, according to some experts, results in a negative energy return of about 50%, which is a greater loss than the 29% energy loss for ethanol produced from corn.[412] A more recent study found that if switchgrass or hybrid poplar is gasified and used to produce electricity, the GHG reduction benefits are double the benefits of using the biomass to produce alcohol, but both uses have positive reductions in GHG emissions.[413] The cost of ethanol produced from switchgrass is claimed to be about 20% higher than corn-based ethanol.[414] Other experts claim cellulosic ethanol has a 100% energy gain, compared to the 34% energy gain for corn.[415]

The 2005 Energy Policy Act's section 942 cellulosic biofuel program aimed to have an annual production of 250 million gallons per year by 2013. Section 943 aims to increase federal procurement of biobased products, section 944 provides grants to small farms that market such products, section 945 provides regional bioeconomy development grants, and section 946 provides preprocessing and harvesting demonstration grants. The Bush Administration worked to obtain substantial increases in the DOE's budget for cellulosic ethanol in order to help develop this technology.

The Energy Independence and Security Act of 2007[416] expands federal support for advanced biofuel, which is defined broadly in an amended CAA section 211(o)(1)[417] to include ethanol from feedstocks other than corn and includes cellulosic ethanol, biodiesel,

410 *Activists Eye New Farm Bill Conservation Plan to Foster Renewable Fuel*, 33 ENVTL. POL'Y ALERT (Inside Wash. Publishers, D.C.), June 9, 2006.

411 Pimentel & Patzek, *supra* note 159, at 70.

412 *Id.* at 67, 70 (calculations from the data are by the author).

413 Adler et al., *supra* note 401, at 681.

414 Pimentel & Patzek, *supra* note 159, at 70.

415 SCHNEPF, *supra* note 164, at CRS–23 (citing a 1999 Argonne National Laboratory study).

416 Pub. L. No. 110-140, 121 Stat 1492 (2007).

417 42 U.S.C. § 7545(o)(1).

biogas (including landfill gas and sewage treatment gas), and other fuel derived from biomass including algae. Advanced biofuel must have lifecycle GHG emissions that are at least 50% less than baseline GHG emissions. Moreover, renewable biomass is defined in CAA section 211(o)(1)(I) to prevent existing forests from being cut to provide renewable biomass cultivation. In 2009 the 11.1 billion gallon renewable fuel requirement must be met using 0.6 billion gallons of advanced biofuel, and the amount of advanced biofuel required to be used increases until in 2022 when it is to comprise twenty-one billion gallons of the thirty-six-billion-gallon renewable fuel requirement.[418] The 2007 act in section 203 requires the secretary of energy to study the impact CAA's section 211(o) renewable fuel requirements on the agriculture industry, food, forest products, and energy. Section 204 requires the administrator of the EPA to assess and report to Congress the impact of the renewable fuel requirements on the environment and natural resources. CAA section 211(o)(12) is created to make clear that the renewable fuel provisions in subsection (o) does not affect the regulatory status of carbon dioxide or any other greenhouse gas.

Cellulosic biofuel is a subset of advanced biofuel and is defined in the 2007 energy act's section 201, which modifies CAA's section 211(o)(1), as renewable fuel derived from cellulose, hemicellulose, or lignin "that has lifecycle greenhouse gas emissions, as determined by the Administrator, that are at least 60 percent less than the baseline lifecycle greenhouse gas emissions" from gasoline or diesel, whichever is being replaced by the fuel. The renewable fuel standard and the advanced biofuel standard must be met using 100 million gallons of cellulosic biofuel in 2010 and production is to increase each year until it reaches sixteen billion gallons in 2022.[419] The administrator of the EPA is given limited power in CAA section 211(o)(4) to modify the renewable fuel and advanced biofuel requirements. The 2007 Act in section 230 authorizes $50 million for cellulosic ethanol and biofuel research. The 2007 Energy Bill in sections 207, 223, 230, 231–34 provides authorizations for research and development efforts concerning renewable fuels. Section 230 authorizes $50 million for cellulosic ethanol and biofuels research.

The 2008 farm bill continues the federal efforts to subsidize renewable fuel development, but with new emphasis on advanced

418 Pub. L. No. 110-140, § 202, 121 Stat 1492, 1522.

419 *Id.*

biofuels that do not use corn as a feedstock.[420] Section 9005 of the act provides $55 million in FY 2009 and 2010, $85 million in FY 2011 and $105 million in FY 2012. The bill also authorizes additional funds of $25 million a year from FY 2009 to 2012. Section 9008 provides $118 million for research, development, and demonstration project for biofuels in FY 2009 through FY 2012 and authorizes an additional $35 million a year during FY 2009 through FY 2012. Section 9011 provides crop assistance for bioenergy projects and section 9012 provides for the development of programs to use forest biomass for energy.[421] Cellulosic ethanol receives a producer credit of $1.01 per gallon for fuel produced after 2008, but it is reduced by the alcohol credit and the ethanol credit. In 2010 this credit could cost the treasury $101 million; in 2022, if the law does not change, it will cost more than $16 billion per year.[422]

An advantage of using cellulosic feedstock is it can be grown on marginal or degraded land and provide increased regional agricultural income without utilizing land that is being used for food production.[423] However, the potential for soil erosion, soil quality degradation, loss of wildlife habitat, the introduction of non-native plant species, and nutrient releases to water bodies need to be evaluated and addressed before large-scale development occurs.[424] As cellulosic biofuel production expands other industries may be adversely affected in a manner similar to the meat and poultry industry that has had to deal with a jump in feed prices in response to higher fuel costs and the use of corn to produce ethanol. The paper industry, for example, is concerned that noncorn fuel mandates will move raw material they use into the production of fuel.[425] Federal incentives are encouraging capital to flow to biofuel development category. The Voyager ethanol plant in Emmetsburg, Iowa, for example, is being expanded to a 125-million-gallon-per-year facility

420 Food, Conservation, and Energy Act of 2008, Pub. L. No. 110-234, 122 Stat. 923 (2008).

421 U.S. DEPT. OF AGRIC., 2008 FARM BILL SIDE-BY-SIDE, TITLE IX: ENERGY http://www.ers.usda.gov/FarmBill/2008/Titles/TitleIXEnergy.htm (last visited July 14, 2009).

422 IRC § 40(b)(6), added by the Farm, Conservation, and Energy Act of 2008, Pub. L. No. 110-246, § 15321(b)(1), 122 Stat. 1651 (June 18, 2008).

423 David Tilman et al., *Carbon-Negative Biofuels from Low-Input High-Diversity Grassland Biomass*, 314 SCI. 1598 (2006).

424 CHESAPEAKE BAY COMM'N, *supra* note 376, at 25–29.

425 *Non-Corn Biofuels Group Fear Broad RFS Waiver Precedent*, 25 ENVTL. POL'Y ALERT (Inside Wash. Publishers, D.C.), July 16, 2008.

that is to begin production in 2009.[426] It will produce cellulosic ethanol from corn fiber and corn stover.[427] Developing this fuel source without excessive loss of soil fertility or soil erosion will require careful oversight.[428]

The potential of cellulosic ethanol and other advanced biofuel technologies should result in federal support for research and development. To mandate production and use of cellulosic biofuel is premature given the state of the technology and the uncertainties concerning the benefits and costs of cellulosic ethanol production. Algae-based biofuel, for example, has far more long-term potential as a fuel source, and can be processed to produce both ethanol and biodiesel. Current annual crop-based biofuel production is thirty gallons of fuel per acre using corn; sixty gallons per acre using soybeans; 150 gallons per acre from canola; 650 gallons per acre from palm; and 2000 to 5000 gallons per acre from algae.[429] Moreover, algae needs 1% of the water of other crops used for ethanol production.[430] Despite the need for basic research and development efforts, the 2007 federal energy bill and the 2008 farm bill mandate that cellulosic ethanol and biofuel programs increase production. Thus, Congress has expanded the size and the regional diversity of ethanol-based welfare recipients and encourages new groups to lobby for large federal subsidies. The biofuels program demonstrates that serious money in agriculture comes from cultivating Congress.

C. Biodiesel

Biodiesel is usually made from soybean oil, but it can be made from rapeseed oil (canola), palm kernal oil, sunflower seed oil, castor oil (i.e., mamona), groundnut oil, cotton seed oil, and coconut oil (copra). More recently, Jatropha has begun to be used as a biodiesel feedstock because it can be grown in tropical and semiarid regions. Germany is the world's largest producer of biodiesel, primarily from

426 *Broin Companies to Expand Voyager Ethanol Plant in Emmetsburg, IA to Include Cellulose to Ethanol Commercial Production*, RENEWABLE FUEL NEWS, Nov. 20, 2006, *available at* http://www.biofuelsjournal.com/articles/Broin_Companies_to_Expand_Voyager_Ethanol_Plant_in_Emmetsburg_IA_to_Include_Cellulose_to_Ethanol_Commercial_Production_11_20_2006-39305.html.

427 *Id.*

428 *Cellulosic Ethanol Production Estimates Do not Account for Soil Health, Study Says*, 38 ENV'T REP. 2620 (2007).

429 CHESAPEAKE BAY COMM'N, *supra* note 376, at 18.

430 *Id.*

rapeseed (canola). It produced more than six times the U.S. production in 2005.[431] In 2005 the United States produced seventy-five million gallons of biodiesel, which was about 0.02% of the 40.1 billion gallons of diesel fuel used for highway transport, but in 2008 biodiesel production was 700 million gallons.[432] Feedstocks for biodiesel also are used for food, so there is a conflict as markets expand for biodiesel between food and fuel.

There are two types of biodiesel fuel which is a monoalkly ester of long chain fatty acids. The most common type is made from virgin vegetable oils. Soybean oil accounts for 90% of U.S. vegetable oil biodiesel production. The other type of biodiesel is made from nonvirgin vegetable oils or animal fats.[433] To produce biodiesel from soybean oil, it is mixed with alcohol and a catalyst, such as caustic soda, and boiled at about 160°F to create an ester. After boiling, the glycerin created by the process is allowed to settle, and it is then separated from the mixture. The excess alcohol and the catalyst is then removed, and the clear amber-colored biodiesel is ready to be used or mixed with conventional diesel fuel. The most common biodiesel blend is 20% biodiesel.[434]

Biofuels do not contain sulfur or toxic metals. Soybean-based diesel results in 1% of the nitrogen, 8.3% of the phosphorus, and 13% of the pesticide releases per unit of energy gained in comparison to ethanol produced from corn.[435] Their use can reduce CO_2 emissions by 59% for biodiesel in comparison to petroleum-based diesel fuel, because burning bio-based fuels recycles atmospheric carbon rather than releasing fossilized carbon into the air.[436] However, the life-cycle environmental impacts of biodiesel may or may not be lower than with ethanol production. The work of Dr. Delucchi at the University of California indicates that if emissions of N_2O from soy fields and changes in land use are considered, biodiesel use results in

431 WORLD WATCH INST., BIOFUELS FOR TRANSPORTATION 6 (2006).

432 DAVIS, DIEGEL & BOUNDY, *supra* note 1, at 2–13, tbls.2.11, 2–5 & 2.3; Biodiesel.org, Estimated US Biodiesel Production by Fiscal Year, http://www.biodiesel.org/pdf_files/fuelfactsheets/Production_Graph_Slide.pdf (last visited July 14, 2009).

433 *See* U.S. Dept. of Energy, United States Biodiesel Production Facilities, http://www.afdc.energy.gov/afdc/pdfs/biodiesel_plants.pdf (last visited July 14, 2009).

434 Shailagh Murray, *Will a 'Temporary' Fuel Subsidy Ever Die? A Biodiesel Tax Break Could Enjoy a Long Life, as 25-Year-Old Ethanol Grants Show*, WALL ST. J., May 9, 2002, at A4.

435 Hill et al., *supra* note 134, at 11,207.

436 *Id.* at 11,207.

higher lifecycle greenhouse gas emissions than does conventional diesel.[437] His study also shows that using lifecycle analysis, convention pollutant emissions (NO_2, NMOC, SO_2, and PM) are significantly higher for biodiesel than for reformulated gasoline.[438] A National Renewable Energy Laboratory report found that emissions of conventional pollutants from diesel engines does not increase when biodiesel is used, except for a small increase or decrease of 0.5% for NO_x emissions.[439] But, this study is focused on engine emissions not lifecycle emissions. Biodiesel development also is associated with problems created by deforestration, land conversion, and loss of biodiversity.[440]

The environmental benefits of using biodiesel, if any, apply only to the net energy of biofuels after the energy used to produce the feedstock and convert it to alcohol is subtracted. Soybean diesel is claimed in a NAS report to have a net energy balance ("NEB") ratio of 1.93.[441] In contrast, the NEB ratio for ethanol is about 1.25. Thus, biodiesel may provide 93% more energy than is required to produce it.[442] Other scholars disagree that biofuels provide a net energy gain. Pimental and Patzek found if soy oil is used for biodiesel production the net energy loss is 8% even after allowing credit for the soy meal that is produced in the process. For sunflower biodiesel the net energy loss is 118%, and the cost to produce it is about $6 per gallon, nearly double the cost of soy biodiesel.[443] Thus, these crops, according to Pimentel and Patzek, are poor sources for producing biomass energy.

Whether or not biodiesel use benefits the environment, it is unlikely to be commercially viable without massive subsidies. In 2005 estimated soybean biodiesel production costs were $0.55 per energy equivalent liter compared to $0.46 for diesel, but the cost of the soybean oil input is increasing dramatically.[444] Using waste fats and greases is less costly, about $1 per gallon for the feedstock, but the limited supply prevents its use for large-scale biodiesel

437 MARK A. DELUCCHI, LIFECYCLE ANALYSES OF BIOFUELS 17 (2006).

438 *Id.* at 24–26

439 R.L. MCCORMICK ET AL., NREL/MP-540-40554, EFFECTS OF BIODIESEL BLENDS ON VEHICLE EMISSIONS iii (2006).

440 UNITED NATIONS CONFERENCE, *supra* note 40, at 20.

441 Hill et al., *supra* note 134, at 11,206.

442 *Id.*

443 Pimentel & Patzek, *supra* note 159, at 72.

444 Hill et al., *supra* note 134, at 11,208.

production.[445] In April 2008, soybean oil, which is the major cost to biodiesel producers, was selling for $5.25 a gallon, which represents a tripling of its cost in one year. The reason for the rapid cost increase is that the decline in the value of the U.S. dollar has made soybean oil cheap in the world market, and soybean oil is being exported.[446]

The biodiesel industry uses the ethanol industry as its business model, which is based on profitability resulting from government subsidies and mandated use requirements. There are three biodiesel tax credits that may be aggregated. They are the biodiesel mixture credit, the biodiesel credit, and the small agri-biodiesel producer credit.[447] The biodiesel mixture credit provides most of the tax benefit. IRC section 40A(b)(1) provides a federal excise tax or income tax credit of $0.50 per gallon of biodiesel, as defined in IRC section 40A(d)(1), used to produce a qualified biodiesel mixture.[448] But, IRC section 40A(d)(2) provides agri-biodiesel with a $1 per gallon credit. Agri-biodiesel is defined at IRC section 40A(d)(2) as biodiesel derived solely from virgin oils, including esters derived from virgin vegetable oils, from corn, soybeans, sunflower seeds, cottonseed, canola, crambe, rapeseed, safflower, flaxseed, rice bran, and mustard seeds or that is derived from animal fat. Recycled oils such as yellow grease receive a $0.50 per gallon credit.

The biodiesel credit is a $1 per gallon of biodiesel not used in a mixture with diesel fuel, but that is used in the taxpayer's trade or business or that is sold at retail and placed in the buyer's vehicle fuel tank after January 1, 2009. Prior to that date the credit was $0.50.[449] The small agri-biodiesel producer credit is $0.10 for up to fifteen million gallons of biodiesel produced from a facility whose capacity does not exceed sixty million gallons per year.[450] There are pass through provisions for partnerships, subchapter S corporations and

445 INFORMA ECONOMICS, INC., THE STRUCTURE AND OUTLOOK FOR THE US BIOFUELS INDUSTRY 31 (2005).

446 Biodiesel Blog, http://www.biodieselblog.com/2008/04/biodiesel-price-increases.shtml (last visited July 14, 2009).

447 Maule, *supra* note 296, at A–104.

448 IRC § 40A was added by the American Jobs Creation Act of 2004, Pub. L. No. 108-357, § 392, 118 Stat. 1418, 1463 (2004) (as amended by the Energy Policy Act of 2005, Pub. L. No. 109-58, § 1345, 119 Stat. 594, 1052 (2005)).

449 Maule, *supra* note 296.

450 *See* IRC § 40A(e), as added by the Energy Policy Act of 2005, Pub. L. No. 109-58, § 1314, 119 Stat. 594, 1052 (2005).

cooperatives.[451] Biodiesel that is produced from biomass is called renewable diesel and it receives a $1 per gallon credit.[452]

The Energy Independence and Security Act of 2007 continued the federal program to encourage development of biodiesel production.[453] The 2007 act in section 201 changes the CAA section 211(o) to include a program for advance biofuels that is defined to be biofuel, including biomass-based diesel fuel that has lifecycle GHG emissions at least 50% less than petroleum-based diesel fuel. Section 202 has a biomass-based diesel production requirement of 0.5 billion gallons in 2009, which increases each year until it reaches one billion gallons in 2012. It also allows the administrator to adjust the percentage reductions in lifecycle GHG emissions that were added to CAA section 211(o). Section 205 of the 2007 act provides for biodiesel labeling. Section 221 requires a study to be completed in May 2008 that informs Congress of any challenges inherent in increasing the proportion of biodiesel fuel sold in the United States. Section 226 requires a study on engine performance associated with using biodiesel. Section 247 creates a new CAA section 247(s) that will establish a uniform standard for biodiesel. Most of the 2007 act applies more generally to biofuels, which are defined to include biodiesel. The 2008 farm bill in its section 9008 provides funding for biofuel production, which includes biodiesel. Section 9006 provides $1 million a year from FY 2008 to FY 2012 for education about the benefits of biodiesel fuel use.[454] But, the cost to the treasury for the biodiesel mixture credit will be about $250 million in 2009 and will increase to $500 million in 2012.

In addition to federal subsidies and purchase mandates, the biodiesel producers seek state subsidies. Minnesota, for example, requires all diesel fuel sold in the state to include 2% biodiesel. ADM contributes money to legislators supporting subsidies for biodiesel, but soybean farmers also are using the political system to provide a new market and presumably higher prices for soybeans. Recently,

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451 Maule, *supra* note 296, at A–104; *see also* the definition of renewable diesel in the Energy Policy Act of 2005, Pub. L. No. 109-58, § 1344, 119 Stat. 594, 1052 (2005). The tax credits for biodiesel fuels at IRC § 40A(f)(1) & (2) were extended by the Energy Policy Act of 2005.

452 IRC 40A(f)(1) & (2) as added by the Energy Policy Act of 2005, Pub. L. No. 109-58, § 1346, 119 Stat. 594, 1502 (2005).

453 Pub. L. No. 110-140, 121 Stat. 1492 (2007).

454 Food, Conservation, and Energy Act of 2008, Pub. L. No. 110-234, 122 Stat. 923 (2008).

Pennsylvania enacted its Biofuel Development and Instate Production Incentive Act (H.B. 1202). It mandates that diesel fuel contain 2% biodiesel and the biodiesel content is to increase as the productive capacity of the industry increases. Another measure gives biodiesel producers a $0.75 per gallon subsidy.[455]

Another source of alternative energy is to use animal waste (i.e., manure) to produce methane, which is combined with animal fat or plant oil (often soybeans or corn) to produce biodiesel fuel. But, digesters, incinerators, and biodiesel plants are expensive to build and run. Because methane's Btu value is low in relation to the energy needed for its production, operating costs are high in relation to the value of the product. For this reason, anaerobic digestion of animal wastes is not considered an economically viable renewable energy source unless it is cost competitive with conventional waste management practices.[456] Biodiesel production from manure, moreover, can be expected to have many adverse environmental and social impacts. The manure slurry created by biodiesel operations may exceed the volume of manure used in the process, and its disposal can create significant environmental problems. Moreover, these plants are likely to be an additional subsidy to industrial farms that can generate the volume of waste needed for efficient biodiesel production as well as producing significant water and air pollution. The Energy Independence and Security Act of 2007, section 201 defines advanced biofuels to include biogas produced through the conversion of organic material from renewable biomass. This provision allows factory farms to provide biogas to ethanol plants and both operations would qualify for federal subsidies. The biodiesel program encourages the expansion of factory farms to the detriment of small farmers and the environment. One of the first major biodiesel plants in the United States is a facility servicing 500,000 pigs owned by Smithfield Foods in Utah.[457]

The relatively insignificant contribution to the nation's diesel fuel supply made by biodiesel and the adverse impacts of using food for fuel should lead to caution when considering the desirability of federal subsidies and other incentives that distort the free market. The

455 Lorraine McCarthy, *Governor Signs Legislation to Promote Alternative Energy, Biofuel Development*, 39 ENV'T REP. 1461 (2008).

456 SCHNEPF, *supra* note 164, at CRS–16.

457 Nicolette Hahn Niman, *A Load of Manure*, N.Y. TIMES, Mar. 4, 2006, at A13.

benefits of the biodiesel program can be achieved at nearly no cost with an increase in fuel efficiency of a fraction of one mile per gallon.

CONCLUSION

The CAA's mobile source program has regulated fuel additives to improve air quality for nearly forty years. Initially the program focused on restricting what could be added to fuel. This approach led to the phase out and subsequent ban on the use of lead in gasoline. After 1990, the CAA's fuel program focused primarily on reformulated gasoline. The EPA's effort to control the composition of gasoline to improve air quality is useful and cost effective. But, the oxygenate requirement for RFG imposed by Congress was a mistake. It led to water pollution from MTBE, and the use of ethanol created costly subsidies with little environmental benefit. The requirement to use ethanol in RFG was based primarily on the need to placate members of Congress seeking subsidies for corn and ethanol producers. By 2005 when it became difficult for anyone to seriously claim environmental benefits from using ethanol or MTBE in RFG, Congress removed the oxygenate requirement from the CAA but added new requirements to the 2005 energy act to mandate the use of ethanol. Since then, Congress has approved ever increasing benefits of ethanol producers, and now biodiesel producers have been added to the agriculture welfare beneficiaries.

The use of ethanol does not improve air quality and may increase pollution levels. Because ethanol production requires nearly as much fossil-fuel energy as is found in ethanol, it has little beneficial effect on the nation's emissions of greenhouse gases. Until the technology is available to produce a significant net energy gain from using ethanol its use will not be a viable way to deal with climate change. The ethanol industry benefits each year from tax credits that exceed the EPA's budget; in addition, consumers pay a higher price for alcohol blends of gasoline. The congressional mandate to use ethanol does not benefit the environment, the nation's economy, or provide a meaningful reduction in our dependency on foreign petroleum, but it benefits political interests as billions of tax dollars are forgone in order to provide these programs with subsidies. If we are serious about using alcohol fuel to reduce our reliance on petroleum we would be encouraging the importation of less costly foreign ethanol rather than limiting the supply through trade restrictions and tariffs. Biodiesel has fewer environmental problems associated with its use,

but it too is a viable fuel only if it is heavily subsidized. Its overall potential contribution to reducing petroleum demand is minimal, and its use adds to the problems created by using food as fuel.

The danger is that renewable fuel programs are supported as a political substitute for effective programs to improve motor vehicle fuel efficiency that would actually reduce the growth of petroleum imports. Alternative fuel programs should not be a substitute for programs to reduce vehicle miles traveled by making the cost of fuel more representative of the real cost to the nation and by land use planning that reduces the need to drive. This is important because it takes seven times as much agricultural production to produce fuel for one year of driving as is required to feed a person. Agricultural land must feed six billion people today, but we may need to feed nine billion by 2050.[458] Therefore, energy conservation is an essential component of a renewable fuels program.

A mix of higher fuel prices (e.g., gasoline taxes) as well as requiring improved fuel efficiency of motor vehicles would provide almost immediate results, although increased fuel economy can result in increases in vehicle miles traveled. But, there has been little popular support for measures to reduce consumption. Automobile manufacturers offer more than 100 models that get thirty miles per gallon or better. But, these are not the vehicles that most people, until recently, have been willing to purchase. Nevertheless, it should not be ignored that an increase in fuel economy of about four miles per gallon for passenger vehicles in the United States will reduce fuel consumption by more than all alternative fuels and replacement fuels combined. To avoid dealing with the politically unpopular need to reduce fossil fuel consumption, our political leadership has created an expensive program to mandate the use of alternative fuels that involves the distortion of market forces and is unlikely to provide benefits for decades, if ever. As the program expands to include biodiesel and advanced biofuels it demonstrates that it is easier to get a position at the pig trough than to prevent others from getting there. The costly ethanol program now competes with the petroleum industry for massive federal subsidies. The 2005 energy act provided as much as $5 billion in tax benefits to the oil industry, and the industry is estimated to have been given tax breaks that are worth at least $10 billion over five years.[459] But, the ethanol and biodiesel

458 David Connor & Ines Minguez, *Letters*, 312 SCIENCE 1743 (June 23, 2006).

459 *Soaring Gas Prices Hit Washington*, WALL ST. J., Apr. 29, 2006, at A7.

interests are working hard to catch up. Ethanol proponents have successfully substituted a government run, planned economy for the free market. This has not benefited either the taxpayer or the environment.

Congress should slash its subsidies for corn-based ethanol and focus its efforts on research and development efforts to advance the technologies needed to reduce our need for foreign petroleum. We should be working to lower the costs of cellulosic ethanol production as well as working on promising alternative transportation energy sources including plug-in electric vehicles powered by electricity from wind or solar technologies. Energy derived from microbial energy conversion is another promising technology for the longer term that deserves more research and development effort.[460] Second, if we are to use ethanol, barriers to its importation of ethanol should be abolished in order to enhance the nation's fuel diversity, although policies concerning ethanol from all sources need to give serious scrutiny to its impact on the environment and food prices. Third, the government should not be working to build an ethanol infrastructure whose economic viability depends on government subsidies. We do not need another economic meltdown because massive amounts of capital were used to develop an industry that is not sustainable. Fourth, the EPA, DOE, DOT, and other relevant executive agencies should be tasked with developing a national fuel policy using a process that is open and transparent. This would include measures to reduce the distortion of the economic system caused by subsidies to the energy industry that would help place the alternative energy industry on a level playing field. A renewable fuels program should be an important part of a national energy policy, but it must be sustainable, and it should not be based on long-term government subsidies.

[460] *See generally* MERRY BUCKLEY & JUDY WALL, MICROBIAL ENERGY CONVERSION (American Academy of Microbiology 2006).