The Biofuel Lie: Why Americans Haven't Ditched the Pump for the Plug

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Despite advantages of electric vehicles over biofuels to reduce the use of fossil fuels in powering automobiles, why are biofuels still seen as viable alternatives to gasoline by the American public? It's an accepted fact that the use of fossil fuels in automobiles has contributed substantially to climate change, and environmentalists agree that reducing the carbon footprint of the transport sector is necessary to achieve climate goals set in the Paris Agreement (SLoCaT, 2018). Together, promotion and better accommodation of walking, cycling, transit, and alternative power sources may make such change possible, but experts, policymakers, and interest groups disagree about how a sustainable transport sector can best be achieved. Many advocate for biofuels to replace petroleum at the pump to reduce emissions, whereas others argue that ditching the pump entirely and switching to electricity is more effective. The latter, electric vehicles (EVs), have many economic, logistic, and environmental advantages over biofuels.

So why are biofuels still on the table? Why doesn't society accept electric vehicles as the future of transport? In the competition between biofuels and electric vehicles, interest groups have often concealed their material interests behind scientific ideas or environmental values. For biofuels, profit can be made by both lobbyists and the corn growers they represent. Therefore, biofuels are seen as a potentially better alternative to gasoline than electric vehicles because of aggressive promoting techniques by special interest groups who have economic ambitions in the acceptance of biofuels as the answer to the climate crisis.

Review of Research

Fossil fuels supply about 95 percent of the world transport sector's total energy demand (EIA, 2020). Greenhouse gas emissions are rising faster in transport than in other sectors, and account for about 25 percent of total world GHG emissions (T4<2°, 2020). Since the transport

sector accounted for 28 percent of U.S. energy consumption in 2019, a reduction in its dependence on fossil fuels could contribute significantly to the fight against climate change (EIA, 2020). A 70-80 percent reduction in carbon emissions from the transport sector by 2050 may be necessary to reach the climate change goals of the 2015 Paris Agreement (SLoCaT, 2018). In order to accomplish this reduction in emissions, the usage of fossil fuels must be reduced or eliminated from automobiles.

Like fossil fuels, biofuels release carbon dioxide to the atmosphere when they are burned in an automobile. However, instead of using a carbon source that has been sequestered in the earth for thousands of years, biofuels draw their carbon material from plant matter that can be grown within a person's lifetime. Thus, net carbon emissions by biofuel use may be lower, and in theory could approach carbon neutrality if the production scheme is optimized. However, farming practices matter, and hidden sources of lifecycle emissions exist. For example, Zhang and Yuan (2006) found that in practice, the overall reduction of lifecycle emissions when using corn ethanol over gasoline is greatly defeated by use of nitrogen fertilizer and electricity to water the corn fields. To make matters worse, evidence shows that ethanol biofuel may not even reduce emissions at all due to the supply and demand curves of the fuel market. For example, Allaire and Brown (2015) modeled the effects of ethanol subsidies on greenhouse gas emissions, finding they actually increased the total emissions by increasing fuel consumption.

At first glance, it would appear that electric vehicles are the optimal solution because they have zero-emissions when driven on the street. However, the American Security Project, a major proponent of nuclear fusion, found that fossil fuels supply nearly two-thirds of the U.S. energy portfolio that powers EVs (ASP, 2012). But this may soon change as renewables can produce electricity cheaper than fossil fuels. Gorski and Jeyakumar (2019) determined that as

renewables account for a greater share of the grid's power, electricity costs may fall, making EVs cheaper and less carbon intensive.

Although the power grid has a long way to go to become de-fossilized, even under current power-grid conditions, emission savings with EVs are substantial. For example, under the current California electric grid mix of coal, natural gas, renewable energy, and nuclear (EIA, 2021), an EV would save approximately 90 percent of net GHG emissions versus a gasoline-powered sedan (EAA, 2010; fig. 1). If the entire power grid were comprised of renewables, EVs would be completely carbon neutral (EAA, 2010).

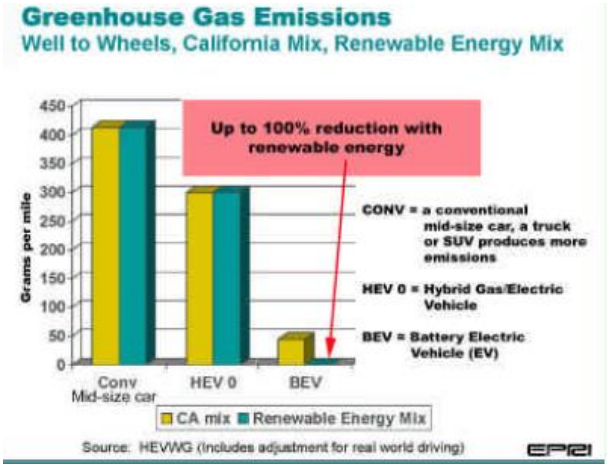

Fig. 1. Greenhouse gas emissions by vehicle type and power-grid composition (EAA, 2010).

These GHG emission reduction figures for EVs are substantially more favorable than those with ethanol as a biofuel replacement. Corn ethanol, the most common form, only reduces the GHG emissions versus regular gasoline by 34 percent, which pales into comparison to the near 90 percent achieved by EVs (AFDC, n.d. a). And the 34 percent reduction assumes that the vehicle is powered solely by corn ethanol. In reality, most cars run-on blends of 10 to 15 percent corn ethanol with the rest as gasoline, greatly minimizing the overall carbon reduction impact of biofuels in practice (AFDC, n.d. a). Even the most ethanol-friendly vehicles, flexible-fuel

vehicles that can run on either ethanol-heavy or petroleum-heavy fuels, will run on up to only 85 percent ethanol, the rest of the blend being normal gasoline (AFDC, n.d. a).

Despite the clear advantages of EVs, corn growers' associations, who represent farmers benefiting from ethanol production, frequently lobby for ethanol subsidies in Congress. Some organizations like Growth Energy also publish scientific findings on biofuels (Growth Energy, 2021a). Between 2007 and 2013, these associations spent a total of $158M to promote legislation and regulations favorable to the corn ethanol industry (TCS, 2014). Moreover, such organizations made $6.15M in campaign donations between 2008 and 2014 (TCS, 2014), including to 15 bipartisan senators who were instrumental in securing the continuation of federal corn ethanol subsidies (Beckel, 2011).

The political push for corn ethanol has permeated beyond Capitol Hill into presidential campaigns. The Iowa Caucus has long been the first, and heavily sought after, contest in the U.S. presidential primary race. Iowa happens to be the largest corn producer in the nation, growing approximately 16 percent of the country's corn (WPR, 2021). Rapier (2008) argues that presidential candidates tend to offer support of ethanol-based biofuels in the early stages of the primary race to appease to Iowa Caucus goers. For example, Hillary Clinton and John McCain, who had previously opposed corn ethanol policies, embraced them during the early stages of the 2008 primary campaign (Rapier, 2008). Senator McCain's transformation on the issue is particularly striking when compared to a 2003 comment on the corn ethanol industry, stating, "Ethanol is a product that would not exist if Congress didn't create an artificial market for it" (Rapier, 2008). But in 2006, just before the 2008 campaign went underway, Senator McCain referred to ethanol biofuels as a "vital alternative energy source" due to "its greenhouse gas reduction effects" and to help curb "our dependency on foreign oil" (Rapier, 2008).

Biofuel advocates publishing scientific reports include those who represent corn growers

Big biofuel advocates like Growth Energy, who represents corn farmers, provide studies that are skewed to favor more ethanol production, increasing society's confidence in biofuels. In referencing the impacts of the Renewable Fuels Standard, which called for ethanol to be blended in with gasoline, Growth Energy misleads readers to greatly overstate the impact of the legislation on reducing carbon emissions. "Since 2010, biofuels like ethanol have been responsible for cumulative carbon dioxide savings of nearly 600 million metric tons in the U.S., or the equivalent of removing 130 million cars from the road, roughly half of our nation's fleet" (Growth Energy, 2021b). First of all, this figure is inflated, the original article cited by Growth Energy estimates that the equivalent number of cars removed is only 124 million (BIO, n.d.). However, even more alarming, this figure is very misleading. Growth Energy makes it seem as if the carbon emissions of all of the cars in the United States was cut in half by the provisions of the Renewable Fuels Standard. However, this figure is spread over an entire decade instead of a single year. Therefore, the true equivalent number of cars removed is closer to 12.4 million cars a year, which is a mere 4.5 reduction (Statista, n.d.), paling in comparison to the 50 percent figure that a typical reader would infer from the statement made by Growth Energy.

These organizations leave out information on electric vehicles because of their hidden agenda, neglecting to show the more promising results of EVs. For instance, in an informational flyer titled "Establish Ethanol As A Low Carbon Solution" published by Growth Energy, a chart comparing the carbon intensity of gasoline versus ethanol (Fig. 2) appears (Growth Energy, 2021c).

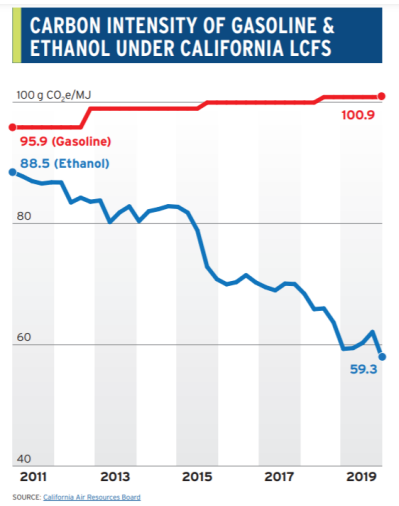

Fig. 2. Graphic from the Growth Energy flyer "Establish Ethanol As A Low Carbon Solution" comparing the relative carbon intensities of gasoline and ethanol (Growth Energy, 2021c).

Fig. 2 appears to show promising results of ethanol-based biofuels with a reduction in carbon intensity of approximately 41 percent for ethanol compared to gasoline. However, it deceives the casual viewer in that ethanol rarely comprises more than 15% of fuel, greatly mitigating the carbon reduction effects to a mere 6.2 percent. Moreover, since Growth Energy represents corn growers, they neglect to compare the carbon reduction to that of electric vehicles. For example, according to Fig. 1, in California, the same state in which Fig. 2 ethanol data was obtained, a battery electric vehicle will have approximately 90 percent reduction in greenhouse gas emissions (EAA, 2010). Clearly, EVs have superior carbon reducing abilities, but the public will continue to be swayed by biased and misleading scientific reports such as the article authored by Growth Energy that published Fig. 2. Another example of literature produced by ethanol groups that unfairly neglects to make comparisons to electric vehicles is Growth Energy's press release "To Decarbonize Transportation, America Must Turn to Biofuels" (Growth Energy, 2021d). The name of the press release itself is biased in that it offers a conclusion to the reader before they even have time to examine the research referenced within. In this press release, Growth Energy exaggerates the total carbon emissions reduced as a result of the Renewable Fuels Standard and

falsely concludes that biofuels are the solution when much greater carbon reduction can be achieved through electric vehicles. If instead of adding ethanol to gasoline under the Renewable Fuels Standard, the entire nation switched to only electric vehicles, the reduction in carbon emissions would be on the order of 90 percent, or roughly 20 times greater reduction than under the provisions of the standard (fig. 1). By leaving out the more promising data from electric vehicle studies and greatly exaggerating the effect of ethanol on reducing carbon emissions, Growth Energy all but forces the uneducated reader to agree with their assertion that "America Must Turn to Biofuels" when in reality electric vehicles offer much more attractive carbon-reducing capabilities.

These corn ethanol interest groups have engaged in emotional advertising campaigns to sway the public opinion towards biofuels

Corn ethanol interest groups advertise that biofuels make America more energy independent, greatly exaggerating the importance of energy independence in the current trade environment. The fact that ethanol is a domestic energy product is frequently vocalized by biofuel groups in their outreach to the public. For example, the front page of Growth Energy reads in big letters, "Supporting American Ethanol: Renewable, homegrown biofuels are moving America forward" (Growth Energy, n.d.). Another interest group, the National Corn Growers Association (NCGA), emphasizes that "most ethanol facilities being centrally located in the United States, providing more economic independence and energy security to our country while supporting local jobs" (NCGA, n.d.). In another example, Growth Energy recently brought on Chris Soules, one of the stars of The Bachelor and an Iowa farmer, in a television commercial in which he highlighted, "Biofuels mean more jobs, less foreign oil, and cleaner air" (ISpot.tv, n.d.). Although it is true that ethanol is produced in the United States, making the nation more

energy independent, the notion espoused by biofuel groups that "foreign oil" (Growth Energy commercial) is hurting our "energy security" (NCGA webpage) is no longer a serious issue due to increased production of domestic petroleum to offset imports from nations of concern located on the Persian Gulf (Blackmon, n.d.). From the beginning of 2017 to October 2019, oil production in the United States increased by 42.7 percent, allowing imported oil from the Persian Gulf to be reduced by roughly two-thirds, greatly alleviating energy dependence on that region of insecurity (Blackmon, n.d.). Therefore, the claims from interest groups that biofuels are essential for American energy security are exaggerated under current market conditions.

Ethanol groups heavily invoke patriotic tactics and label biofuels as being pro-American agriculture, emotionally capturing the public's support. Pro-farmer and pro-American statements such as those from NCGA often refer to ethanol as a "homegrown" solution, straight from "America's heartland," and emphasize things like "economic boost to farmers and rural communities" (NCGA, n.d.). Such language is loaded and partial towards both rural regions of the country, specifically the Midwest when referring to "America's heartland," and to corn farmers. These emotional tactics fail to put the needs of the country as a whole above those of corn farmers. Issues such as greenhouse gas emissions and sustainability should take precedent over farmer profits when making key environmental policy decisions. The NCGA goes on to attack electric vehicles for their lack of domestic manufacturing in statements like, "No vehicles currently exist that are battery EV and meet the American-made threshold of at least 50% of U.S. materials and assembled by union labor" (NCGA, 2021a). This argument is faulty since there are plenty of foreign-made gasoline-powered vehicles that run on ethanol blends that biofuel groups support. Like the corn grown to produce ethanol, the electricity that is used to power EVs was produced in the United States and many more domestic jobs can be added as the power grid

shifts to renewables. For example, the Bureau of Labor Statistics projects that wind technicians and solar panel installers will be the fastest-expanding occupations to 2026 at growth rates of 96 percent and 105 percent, respectively (Marcacci, 2019). Other biofuel groups are even more direct with their patriotic messages to invoke support. For example, as shown in Fig. 3, the Renewable Fuels Association (RFA) simply has a large American flag waving over the entire screen of their homepage to invoke patriotic support of corn ethanol (RFA, n.d. a).

Fig. 3. Image of the homepage of the Renewable Fuels Association (RFA, n.d. a).

Ethanol groups promote the cost-effectiveness of ethanol without mentioning that electricity is cheaper

Biofuel advocates mislead the public into thinking that ethanol is the best way to lower the cost of powering automobiles, when in reality electricity is substantially cheaper. Although ethanol is indeed somewhat cheaper than gasoline, making higher blended fuels cheaper than pure gasoline, biofuel groups often neglect to mention that ethanol only has approximately two-thirds as much power as gasoline, reducing a vehicle's MPG by 3-5% for E10 and E15 blends (DOE, n.d.). This means the price at the pump is often deflated compared to the amount of power

a consumer would expect to get out of a gallon of pure gasoline by 3 to 5 percent for common ethanol-gasoline blends. Due to the power reduction when substituting petroleum for ethanol, the cost savings for blended fuels is minimal. Despite this, the Renewable Fuels Association website openly advertises, "How Much Money Can You Save By Choosing Ethanol? Find out here with our Ethanol Savings Calculator" to get the public excited about high-ethanol blends (RFA, n.d. b). In reality, high ethanol blends only save marginally per mile due to their low MPG, with E10 costing 10.2 cents per mile, E15 costing 9.9 cents per mile, and E85 costing 9.4 cents per mile (RFA, 2017). To put in perspective, E85, an extremely high-ethanol blend fuel that requires a special engine to burn, only saves 7.8 percent versus the standard E10 blend. Electric vehicles easily beat cost-savings over ethanol by a large margin with the Alternative Fuels Data Center giving an estimate of 4 cents per mile, which is less than half the cost of driving the highest-ethanol blend (AFDC, n.d. b). Clearly, the uneducated consumer could easily be misled into thinking that ethanol is the best way of reducing the cost of driving by media produced by ethanol supporters, such as the calculator provided by RFA. An unbiased calculator would also include a comparison for costs of powering electric vehicles alongside the ethanol estimates.

Biofuel advocates lobby for policies favoring biofuel production

Biofuel groups heavily push for legislation that is favorable for the production and sale of biofuels in Congress and state legislatures, artificially increasing the demand for ethanol in the United States. For example, the National Corn Growers Association (NCGA) lobbies in Congress for "Passage of the Next Generation Fuels Act: Legislation to transition the gasoline supply to higher octane fuel in order to reduce greenhouse gas emissions, improve air quality, increase fuel efficiency, and grow future demand for corn" (NCGA, 2021a). In addition to this proposed legislation targeted to drive up demand for corn ethanol, NCGA is currently taking

advantage of the opportunity to add biofuel supporting measures in President Biden's planned infrastructure package by lobbying Congress for favorable treatment (NCGA, 2021b). On the state level, the American Coalition for Ethanol (ACE) is lobbying the Minnesota legislature to pass the Future Fuels act to increase the sale of higher ethanol blends such as E15 among other objectives supporting corn ethanol to "enact first clean fuel standard in the Midwest" (ACE, n.d. a). The president of the ACE says that the Future Fuels Act in Minnesota is just the first step and that the lobbying organization "expect[s] other states to follow in the future" (ACE, n.d. a). These state and federal bills are pushed by lobbyists who influence the votes of legislators and secure favorable legislation for the ethanol industry despite the proven advantages of electric vehicles.

Biofuel lobbying goes beyond Congress and state houses and into both the courts and federal agencies to influence the interpretive and regulatory arms of government to increase ethanol demand. For example, Growth Energy and the American Farm Bureau recently collaborated in the filing of an amicus curiae brief to the Supreme Court in the case *HollyFrontier Cheyenne Refining, LLC, et al., v. Renewable Fuels Association, et al*. (Growth Energy, 2021e). In regards to this brief, the CEO of Growth Energy stated the interest groups sought for the court to "reject attempts by a handful of oil refiners to avoid blending obligations, and ensure the integrity of the [Renewable Fuels Standard] is upheld nationwide" (Growth Energy, 2021e). Through this brief, Growth Energy and the American Farm Bureau influenced the court to enforce legislation mandating that ethanol be blended into gasoline to protect the demand for ethanol-based biofuel nationwide. Outside the courts and in the realm of regulatory agencies, ACE recently lobbied the Environmental Protection Agency (EPA) to reject waivers that would allow refiners to suspend blending ethanol into their finished product as required

under the Renewable Fuels Standard (RFS) (ACE, n.d. b). In the comment the ACE made to the EPA, the ethanol lobbying group argued that financial hardship on refiners from the Covid-19 pandemic was not sufficient to allow for a waiver, stating "The waiver petition from NWF and others claims severe environmental harm but similarly fails to produce evidence to prove implementation of the RFS is the cause of any severe environmental harm" (ACE, n.d. b).

Conclusion

Despite the proven advantages of electric vehicles, biofuels are still considered to be a potentially better alternative to gasoline because of aggressive promoting techniques by special interest groups with hidden motives. Due to the prevalence of interest groups that permeate the public, political, and even scientific discourse behind the biofuel versus electric vehicle debate, care must be taken to ensure that information received by decisionmakers is impartial. Statements must be taken into full context to ensure fairness and minimize the impact of any hidden interests in a study. Therefore, environmental groups, auto companies, and the government should carefully consider what stake authors of biofuel research and advocates of biofuels have in the biofuel industry before making informed policy decisions. Only by background checking groups involved in research and promotion campaigns for their ulterior motives can the full, impartial picture be revealed and proper conclusions drawn. Conclusions behind biofuel research should be drawn by the readers and not the authors in order for an unbiased decision to be made.

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