



Biodiesel bill could have negative effect on global sustainability.

[SB20-038 Statewide Biodiesel Blend Requirement Diesel Fuel Sales](#) requires that starting in June of 2021, diesel fuel sold in Colorado (with some exceptions) be blended with at least 5% biodeisel, and after June 2023, be required to be at least 10% biodeisel in the summer months. This bill was amended to restrict the requirements for diesel fuel blends only to the EPA air pollution non-attainment area (the Front Range). Palm oil was excluded as a starting material.

The Legislative Action Committee of the League of Women Voters of Colorado opposes SB20-038.

Bio-fuels, including biodeisel, can replace fossil fuels with fuels produced from renewable organic material. This is technically feasible, life-cycle studies do show that the energy content of the biodeisel is greater than the energy required to grow the crop and produce the fuel. For soy the Fossil Energy Ratio is 4.5.

<https://www.usda.gov/oce/reports/energy/ELCAofSoybeanBiodiesel91409.pdf>

This biodeisel/fossil fuel mixture is claimed to have the potential to reduce some undesirable aspects of fossil fuel production. It is said that (on a long term basis), the renewability gives the potential of approaching a near zero increase in greenhouse gas emissions. Biodeisel burns more cleanly than fossil fuel diesel, which could reduce some air pollutants. It also gives farmers an alternative market for crops.

However, the conversion of cropland to fuel production can have grave ecological consequences. The vast majority of current production of liquid bio-fuels is based on crops that can also be used as food. Because many of our commercial crops are global commodities, the impact of market changes are worldwide. Air quality improvements from the use of a biodeisel/fossil fuel diesel mixture are not clear cut. This fuel mixture change does not aid in the replacement of older, more polluting diesel engines. It does not address the conversion of commercial vehicles from diesel to electric, or other alternative fuels. It does not aid farmers and truckers in upgrading to these newer technologies.

One desirable element in the amended bill is that it directs the Regional Air Quality Council and CDOT to consider replacement of diesel trucks and commercial vehicles manufactured before 2010, which generally have less effective pollution controls in engine designs. This along with raising standards for fossil fuel diesel, or lowering fossil fuel diesel consumption overall would yield greater positive results.

There are several parts of the League's Positions for Action that are applicable. The overarching

consideration is:

The League of Women Voters of the United States supports: Energy goals and policies that acknowledge the United States as a responsible member of the world community.

More specifically:

The League of Women Voters of the United States supports: Measures to reduce vehicular pollution, including inspection and maintenance of emission controls, changes in engine design and fuel types and development of more energy-efficient transportation systems

And

Prime agricultural land and the water to make it productive should be preserved for economic, social, health, land use planning, and aesthetic purposes.

Biodeisel, Food Security and Agricultural Sustainability

As reported for 2019, 52% of biodeisel produced in the US came from a soy feed-stock, followed by corn at 12%: <https://www.eia.gov/biofuels/biodiesel/production/>, table 3.

Soy is a global commodity. The trade war between the US and China stopped US farmers from accessing their largest market, China. During this time, many of the largest producers have been accepting subsidies to not grow their crop. Meanwhile, China has been busy developing alternative markets. This effort has vastly expanded the deforestation of the Amazon Basin in Brazil, and accelerated conversion of smaller diversified farms in other countries into larger scale export oriented soy production. If US farmers return to full production, these newly created competitors don't just disappear. Soybean farmers world-wide need to cut back or diversify. Alternatively, the development of a new market for soy based fuels could cause further expansion. The analyses that attempt to demonstrate that bio-fuels work on a life-cycle basis, assume large scale production. This includes GMO soy grown with "no till" methods, that utilize weed killers such as glyphosate.

"In some parts of the world, large areas of natural vegetation and forests have been cleared and burned to grow soybeans and palm oil trees to make biodeisel. The negative environmental effects of this land clearing and burning may be greater than the potential benefits of using biodeisel produced from soybeans and palm oil trees."

<https://www.eia.gov/energyexplained/biofuels/biodiesel-and-the-environment.php>

"The use of food crop species to produce bio-fuels will remain problematic as the world struggles to increase food production to better feed an increasing population that currently includes roughly 1 billion who are severely underfed. Special energy crops are not an effective way to avoid competition with food production, because they too require land, water, nutrients, and other inputs and thus compete with food production. There is no evidence that non-food crops can be grown efficiently for energy production on land that could not also grow crops for food.

<https://ecommons.cornell.edu/bitstream/handle/1813/46286/scope.1245782004.pdf?sequence=2&isAllowed=>

Biodeisel and Air Pollution

Evidence for improvements in air quality is not clear cut. Results vary depending on the feedstock used, engine characteristics and also engine operating conditions, such as cold

weather.

In 2002, the EPA published “ A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions:”

https://cfpub.epa.gov/ols/catalog/advanced_full_record.cfm?&FIELD1=SUBJECT&INPUT1=Fuels&TYPE1=EXACT&LOGIC1=AND&COLL=&SORT_TYPE=MTIC&item_count=25. See: <https://archive.epa.gov/ncea/biofuels/web/pdf/p02001.pdf>

While this EPA report never made it passed the draft stage, it is commonly cited. For a 20% by volume soy based biodeisel, emission impacts for particulate matter (PM) decreased by 10%, volatile hydrocarbons decreased by 21% and carbon monoxide decreased by 11%. But for Nitrous oxides, NO_x, emissions actually increased by 2%. The chart on page ii of the EPA report shows that for 5% biodeisel, the decrease in volatile hydrocarbons would only be around 5%.

Particulates and Volatile Hydrocarbons

A number of studies show that burning biodeisel, or a biodeisel/petroleum diesel mix, leads to a reduction in particulate matter (PM), CO and total hydrocarbons in tailpipe exhaust. However, some studies showed particulate particle size decreased, which may make the particles penetrate more deeply into the lungs. Links between exposure, composition and toxicity are not straightforward. See for example

2012 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3622266/>,

2019 <https://www.ncbi.nlm.nih.gov/pubmed/30481717>,

2008 <https://www.sciencedirect.com/science/article/pii/S0360128507000421> and

2000 <https://pubs.acs.org/doi/10.1021/es990543c>

Conversion to a biodeisel/fossil fuel diesel mix can reduce particulates and volatile hydrocarbons and may reduce some of the harmful effects of particulates. But for a 5 or 10 % mix, as in SB 20 038, such improvements would be small. Other policies, such as cleaner diesel fuel, upgrading engines, filters or reducing use, could have a much greater effect. See for example this report on California’s efforts to reduce diesel particulate emissions: <https://ww3.arb.ca.gov/diesel/factsheets/dieselpmfs.pdf.hide-inaccurateinfo>. Colorado has a diesel emissions test program. This could be expanded.

Ozone

This bill, as amended, applies only in the EPA non-attainment (Front Range) zone. This implies that this action is intended to reduce ground-level ozone concentrations which is the cause of the air quality non attainment. <https://www.epa.gov/newsreleases/epa-reclassifies-denver-area-serious-nonattainment-ozone>, map here: https://www3.epa.gov/airquality/greenbook/co8_2008.html

Ozone is not emitted directly into the atmosphere. Nitrogen oxides (NO_x) and volatile non-methane hydrocarbon compounds react with heat and sunlight in chain reactions one of the products of which is ground-level ozone. As noted above, while, as compared to fossil fuel diesel, hydrocarbon emissions are generally lower with biodeisel, NO_x emissions are higher.

The NO_x increase depends on the type of the biodeisel feedstock; the highest NO_x emissions were reported with the most highly unsaturated fuels (soybean, rapeseed, and soapstock-based

Biodiesel from more saturated feedstocks, such as animal fats, yields a smaller NO_x increase. 2003 <https://www.nrel.gov/docs/fy03osti/31461.pdf>

Conversion to a biodeisel/fossil fuel mix does not appear to be a meaningful way to reduce ground-level ozone.

Biodeisel and Greenhouse Gas Emissions

In Colorado, transportation related emissions are projected to amount to 25% of 2020 emissions, making them the largest source of greenhouse gas emissions in the state.

This bill asks for only a 5% or 10% biodeisel mix, and only in the Colorado Front Range attainment area, other methods of reducing diesel fuel consumption by the same amount (or more) would also be effective.

According to the Greenhouse Gas Emissions Report prepared by the Legislative Staff for SB20-038, a 5% biodeisel blend results in a 2.0% CO₂ emissions reduction, and a 10% blend gives a 5.4% reduction. Overall, under SB20-038, the percent emissions savings from 2021 through 2030 would be 5%.

Nitrogen based fertilizers and Greenhouse Gas Production

The impact of crop based biodeisel fuel on greenhouse gas emissions are highly impacted by the rate of nitrogen based fertilizer use. N₂O, a byproduct of nitrogen based fertilizer application is a potent greenhouse gas. This is applicable to those crops that need additional nitrogen based fertilizer application. This is one area in which soy, a nitrogen fixing legume, has advantages. This paper claims that previous life-cycle analyses did not adequately take this effect into account: 2008 P. J. Crutzen, A. R. Mosier, K. A. Smith, W. Winiwarter. N₂O release from agro-biofuel production negates global warming reduction by replacing fossil fuels. Atmospheric Chemistry and Physics, European Geosciences Union, 2008, 8 (2), pp.389-395.

Alternatives

The Greenhouse Gas Emissions Report, prepared by the Legislative Council Staff, bases its transportation energy projections on a report by the US Energy Information Agency's transportation report here:

<https://www.eia.gov/outlooks/aeo/pdf/AEO2020%20Transportation.pdf>. This report predicts that gasoline vehicles remain the dominant vehicle type through 2050, with an 81% market share.

"The combined share of sales from gasoline and flex-fuel vehicles (which use gasoline blended with up to 85% ethanol) declines from 94% in 2019 to 81% in 2050 in the AEO2020 Reference case because of growth in sales of battery electric vehicles (BEV), plug-in hybrid electric vehicles (PHEV), and hybrid electric vehicles. BEV sales increase faster than any other type of vehicle sale, growing on average by 6% per year"

US EIA estimates have been quite low. As recently as 2017, the EIA was predicting a \$35,200 EV wouldn't arrive until 2025. <https://qz.com/1620614/electric-car-forecasts-are-all-over-the-map/>

There are forms of bio-fuels that displace fossil fuel diesel using waste products and create reductions in greenhouse gas emissions. For example, the City of Longmont uses bio-gas that previously had been flared off at its wastewater treatment plant to fuel trash trucks:

<https://www.biocycle.net/2019/05/06/fueling-trash-trucks-rng/>.

Policies that would increase electric vehicle use, and that would accelerate electricity generating utilities conversion to renewable energy sources could be much more effective means of achieving greenhouse gas reductions. This could be aided by policies that support sustainable agricultural practices, and the production of healthy foods for the world's growing population.

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