

Transportation Recommendations to Climate Emergency Mobilization Work Group for Frederick County and City

- a. **Recommendation: Require renewable/low carbon intensity fuels availability and use by existing vehicles (Light duty and Heavy Duty/Long Haul) in the city and county government and encourage their use in private fleets and by those owned by residents and vehicles traveling through.**
- b. **Expected GHG Impact:** Light duty vehicles use E10 gasoline (10% ethanol) as that is the main fuel sold in the US. It is possible to purchase E0 fuel at higher prices and specific locations; but E10 is the standard, regular and premium fuel. Some fueling stations in the region offer E15 (15% ethanol) that, consistent with US Environmental Protection Agency guidance, can be used in vehicles built in 2001 and later. This applies to about 95% of the light duty vehicles in the US fleet. Flex fuel vehicles can use blends of gasoline and ethanol up to 85%.

Because there is only one fueling station in Frederick City or County that offers E15 (Rutters), increasing the availability of E15 could lower the carbon footprint of the vast majority of vehicles in the city and county. Only two retail stations offer E85 (Rutters and W Express).

Currently, most ethanol in fuel is made from corn. The latest report from USDA indicates that corn ethanol's current greenhouse gas emissions profile at 39–43% lower than gasoline with significant improvements on the horizon.¹ In the future, as the market expands, ethanol made from a wide variety of other feedstock with lower carbon intensities will become available.²

Some light duty vehicles in the city and county and many long haul heavy duty vehicles use diesel fuel. It is possible for those to use up to 5% biodiesel (B5) or 100% renewable diesel which is a complete drop-in replacement for petroleum diesel. Biodiesel up to 5% is considered an additive approved for all diesel engines. Some manufacturers approve biodiesel blends up to 20% (B20) for some engines.

Frederick City and County also have major heavy duty and long haul vehicles and many light duty vehicles passing through on major highways and stopping to refuel.

Analysis by the US Department of Energy's Argonne National Laboratory indicates that emissions for 100% biodiesel (B100) are 74% lower than those from petroleum diesel. The California Air Resources Board has reported similar values for its life cycle analysis of biodiesel from various sources.³

¹ Jan Lewandrowski, Jeffrey Rosenfeld, Diana Pape, Tommy Hendrickson, Kirsten Jaglo & Katrin Moffroid (2020) The greenhouse gas benefits of corn ethanol – assessing recent evidence, *Biofuels*, 11:3, 361-375, DOI: [10.1080/17597269.2018.1546488](https://doi.org/10.1080/17597269.2018.1546488)

² Advanced Biofuels USA, "Just a minute (or so) about renewable fuels. Episode 1: Renewable Fuels: What Are They Made From?" presentation narration with references: <https://advancedbiofuelsusa.info/wp-content/uploads/2020/04/Narration-text-for-Feedstock-for-Renewable-Fuels-Episode-1-April-2020.pdf> video presentation: <https://advancedbiofuelsusa.info/advanced-biofuels-usa-starts-just-a-minute-educational-series/>

³ U.S. Department of Energy Alternative Fuels Data Center, "Biodiesel Vehicle Emissions" https://afdc.energy.gov/vehicles/diesels_emissions.html

Some light duty and heavy duty vehicles may also use compressed natural gas. Depending on the source of renewable natural gas, the carbon intensity can be negative; for example when manure that would otherwise have emitted methane into the air is captured and converted to renewable natural gas (RNG).⁴

c. Recommended Timeline for Action: We recommend that the county and city proceed as quickly as possible to encourage and facilitate private fueling stations to offer more renewable fuel options and that private fleets, as well as the city and county fleets, also transition to renewable fuels as quickly as possible.⁵

d. Rationale:

d1 Findings are based on research and data: Recent US Department of Agriculture and Department of Energy studies, as well as California Air Resources Board materials, indicate significant carbon intensity reductions from petroleum fuels for light duty vehicles.⁶

For research related to specific statements, see footnotes.

d2 Equity considerations: This graphic⁷ from the US Department of Energy's Energy Information Administration clearly shows that even in 2050, a great many people will be driving liquid-fueled vehicles. Due to the high price of electric vehicles, lower to moderate income individuals can be expected to use older vehicles and to purchase used vehicles that are most likely to be vehicles that use liquid fuels. That fuel should be as low polluting, low carbon and affordable as possible.

If low income and poor air quality areas get priority for upgraded fuel pumps, then cleaner, less-polluting⁸ and less expensive⁹ options will benefit those most in need of these advantages of renewable fuels.

⁴ Sanchez, Erick "Renewable Natural Gas Achieves Majority NGV Motor Fuel" NGV America. <https://ngvamerica.org/2021/04/14/renewable-natural-gas-achieves-majority-ngv-motor-fuel/>

⁵ Advanced Biofuels USA, How to De-Fossilize Your Fleet: Suggestions for Fleet Managers Working on Sustainability Programs. <https://advancedbiofuelsusa.info/how-to-de-fossilize-your-fleet/>

⁶ Jan Lewandrowski, Jeffrey Rosenfeld, Diana Pape, Tommy Hendrickson, Kirsten Jaglo & Katrin Moffroid (2020) The greenhouse gas benefits of corn ethanol – assessing recent evidence, *Biofuels*, 11:3, 361-375, DOI: [10.1080/17597269.2018.1546488](https://doi.org/10.1080/17597269.2018.1546488) and U.S. Department of Energy Alternative Fuels Data Center, "Biodiesel Vehicle Emissions" https://afdc.energy.gov/vehicles/diesels_emissions.html

⁷U.S. Department of Energy Energy Information Agency, "Transportation sector energy consumption" <https://www.eia.gov/outlooks/aeo/> Transportation PDF https://www.eia.gov/outlooks/aeo/pdf/05_AEO2021_Transportation.pdf PPT https://www.eia.gov/outlooks/aeo/ppt/05_AEO2021_Transportation.pptx

⁸ Trinity Consultant and National Biodiesel Board, "Health Benefits Study -- New Biodiesel Study Highlights Fuel's Ability to Make Impact: NOW" <https://www.biodiesel.org/news-resources/health-benefits-study> and Skor, Emily "Replacing toxic additives in our fuel" *Growth Energy and Biofuels International* <https://biofuels-news.com/news/replacing-toxic-additives-in-our-fuel/> and Nigel N. Clark, David L. McKain Jr., Tammy Klein & Terence S. Higgins (2021) Quantification of gasoline-ethanol blend emissions effects, *Journal of the Air & Waste Management Association*, 71:1, 3-22, DOI: [10.1080/10962247.2020.1754964](https://doi.org/10.1080/10962247.2020.1754964)

⁹ For examples of price comparisons in the US of current regular gasoline (E10) and high ethanol blends (E15, E30, E85), see the website E85Prices (<https://e85prices.com/>).

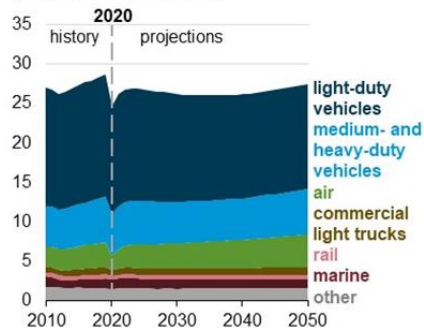


Transportation sector energy consumption

Transportation sector consumption by mode

AEO2021 Reference case

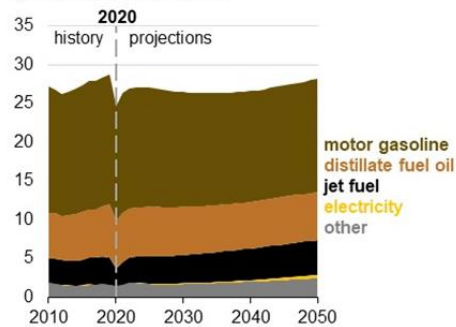
quadrillion British thermal units



Transportation sector consumption by fuel

AEO2021 Reference case

quadrillion British thermal units



Source: U.S. Energy Information Administration, Annual Energy Outlook 2021 (AEO2021)

www.eia.gov/aeo

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<https://www.eia.gov/outlooks/aeo/> [Transportation PDF](#) [PPT](#)

d3 Co-Benefits Cleaner, less-polluting¹⁰ and less expensive¹¹ options will be available to residents, businesses and visitors.

In the transportation sector, benefits included a potential 45% reduction in cancer risk when heavy-duty trucks such as semis use B100 and 203,000 fewer or lessened asthma attacks.¹²

Concerns about particulate matter and hydrocarbon emissions from diesel engines which may be toxic and/or carcinogenic are mitigated by use of biodiesel¹³.

¹⁰ Trinity Consultant and National Biodiesel Board, "Health Benefits Study -- New Biodiesel Study Highlights Fuel's Ability to Make Impact: NOW" <https://www.biodiesel.org/news-resources/health-benefits-study> and Skor, Emily "Replacing toxic additives in our fuel" Growth Energy and Biofuels International <https://biofuels-news.com/news/replacing-toxic-additives-in-our-fuel/> and Nigel N. Clark, David L. McKain Jr., Tammy Klein & Terence S. Higgins (2021) Quantification of gasoline-ethanol blend emissions effects, Journal of the Air & Waste Management Association, 71:1, 3-22, DOI: [10.1080/10962247.2020.1754964](https://doi.org/10.1080/10962247.2020.1754964)

¹¹ For examples of price comparisons in the US of current regular gasoline (E10) and high ethanol blends (E15, E30, E85), see the website E85Prices (<https://e85prices.com/>).

¹² Trinity Consultant and National Biodiesel Board, "Health Benefits Study -- New Biodiesel Study Highlights Fuel's Ability to Make Impact: NOW" <https://www.biodiesel.org/news-resources/health-benefits-study>

¹³ Steiner, Sandro, Jan Czerwinski, Pierre Comte, Olga Popovicheva, Elena Kireeva, Loretta Müller, Norbert Heeb, Andreas Mayer, Alke Fink, and Barbara Rothen-Rutishauser. "Comparison of the Toxicity of Diesel Exhaust Produced by Bio- and Fossil Diesel Combustion in Human Lung Cells in Vitro." Atmospheric Environment 81 (September 21, 2013): 380–388. <https://doi.org/10.1016/j.atmosenv.2013.08.059>. And Bass, Virginia L., Mette C. Schladweiler, Abraham Nyska, Ronald F. Thomas, Desinia B. Miller, Todd Krantz, Charly King et al. "Comparative cardiopulmonary toxicity of exhausts from soybased biofuels and diesel in healthy and hypertensive rats." Inhalation toxicology 27, no. 11 (2015): 545-556. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4768834/>. and Shvedova, Anna A., Naveena Yanamala, Ashley R. Murray, Elena R. Kisin, Timur Khaliullin, Meghan K. Hatfield, Alexey V. Tkach et al. "Oxidative stress, inflammatory biomarkers, and toxicity in mouse lung and liver after inhalation exposure to 100% biodiesel or petroleum diesel emissions." Journal of Toxicology and Environmental Health, Part A 76, no. 15 (2013): 907-921. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4671493/>.

d4 Experience of other cities and counties: California’s state-wide Low Carbon Fuel Standard has provided incentives for cities and counties throughout the state to transition to more renewable fuel options for fleets and the general public.

This [link](#) takes you to posts of articles of numerous communities and businesses that have added renewable options to their local fueling stations.

Many fuel retailers have used state funding and federal USDA funds (currently the [Higher Blends Infrastructure Incentive Program](#)) to upgrade tanks and pumps to be able to sell competitive higher blends of renewable fuels.

Federal regulations described in the [Federal Fleet Management Handbook\[2\]](#) provide an example of reasonable access to renewable fuel blends for fleets.

“... within a 15-minute drive or within 5 miles (one way) from the vehicle’s garaged location. Waivers will be granted for vehicles that have a drive longer than 15 minutes even if a station is within the 5-mile barrier. Dual fueled vehicles that have access to alternative fuel along the vehicle’s usual travel route are expected to use that fuel, even if that infrastructure is more than 5 miles away from the vehicle’s garaged location.

There’s an exception related to expense:

(If) alternative fuel is unreasonably expensive. Unreasonably expensive means that alternative fuel costs more per gallon than gasoline at the same station.¹⁴

For specific examples of transition to renewable fuels by city public works fleets, see the experiences of Washington, DC and Ames, Iowa converting heavy duty vehicles to use B100 (100% biodiesel) using the Optimus System.¹⁵

Cities such as Oakland, California, have transitioned to renewable diesel with Richard Battersby, CAFM, CFP, assistant director of Oakland Public Works saying, “Although at first renewable diesel seemed too good to be true, it truly has proven to be a ‘miracle fuel. Making the switch to renewable diesel is absolutely the easiest alternative fuel implementation I have ever experienced.”¹⁶

d5 Interface with the Livable Frederick Plan and Frederick City Master Plan: The Recommendation is consistent with the objectives if both Plans.

d6 Cost-benefit- analysis: Use of higher ethanol blends should result in fuel cost savings as higher ethanol blends, up to E30, “the Sweet spot,” do not show significant mileage decrease.

¹⁴ U.S. Department of Energy, Executive Order 13514 Federal Leadership in Environmental, Energy, and Economic Performance Comprehensive Federal Fleet Management Handbook https://www.energy.gov/sites/prod/files/2017/01/f34/eo13514_fleethandbook.pdf

¹⁵ Renewable Energy Group, “Renewable Energy Group and Optimus Technologies Collaborate to Deliver Biodiesel to Fleets Nationwide” [https://www.businesswire.com/news/home/20210331005852/en/Fleets-Immediately-Reducing-Carbon-Emissions-with-100% Biodiesel](https://www.businesswire.com/news/home/20210331005852/en/Fleets-Immediately-Reducing-Carbon-Emissions-with-100%-Biodiesel)

¹⁶ Schaeffer, Allen, “All the buzz on biodiesel fuels: Fill it up please,” Progressive Dairy March 31, 2020 <https://www.progressivedairy.com/topics/barns-equipment/all-the-buzz-on-biodiesel-fuels-fill-it-up-please>

Depending on local prices, using E85 may also save fuel costs.¹⁷ Research done by the US Department of Energy on optimizing engines and fuels may result in engines that run more efficiently on higher ethanol blends.¹⁸

As Allen Schaeffer of Diesel Technology Forum located in Frederick explained, consumers of biodiesel and renewable diesel fuel will have to pay about the same for their fuel as regular petroleum diesel. Those looking for B20 will typically pay about 21 cents less per gallon compared to regular petroleum diesel, according to the most recent data collected by the Department of Energy as of October 2019 (**Table 1**).

Region	B20 prices (\$/gal)	Diesel prices (\$/gal)	Price difference*
New England	\$2.74	\$3.14	-\$0.40
Central Atlantic	\$2.64	\$2.89	-\$0.25
Lower Atlantic	\$2.52	\$2.93	-\$0.41
Midwest	\$2.90	\$2.95	-\$0.05
Gulf Coast	\$2.78	\$2.69	\$0.09
Rocky Mountain	\$3.03	\$2.91	\$0.12
West Coast	\$3.25	\$3.89	-\$0.64
National average	\$2.87	\$3.08	-\$0.21

*Negative numbers represent average B20 prices that are lower than diesel, on a \$/gal basis.

Since renewable diesel fuel volumes are lower than biodiesel, government agencies do not track prices as they do for biodiesel. Recent surveys of fleets which have made the switch to renewable diesel fuel report that they pay a 21-cent premium above petroleum diesel fuel. Much of the fluctuation in price reflects change in demand. With more interest and demand for the fuel, survey respondents expect that price fluctuation will even out. (Source: [Government Fleet – Renewable diesel still a miracle fuel](#))¹⁹

Because California and other states have enacted low carbon fuel standards or clean fuel standards or policies, fuel producers of limited quantities of renewable diesel are selling into those markets due to the advantage of their incentives. Until more production facilities are

¹⁷ E85Prices (<https://e85prices.com/>)

¹⁸ U.S. Department of Energy, “The Co-Optima FY20 Year in Review Spotlights Recent Engine and Fuel Innovations.” <https://www.energy.gov/eere/bioenergy/co-optima-fy20-year-review-report> and Jung, Howard & Shelby, Michael & Leone, Thomas & Anderson, James & Collings, Travis. (2013). Fuel Economy and CO2 Emissions of Ethanol-Gasoline Blends in a Turbocharged DI Fuel Economy and CO2 Emissions of Ethanol-Gasoline Blends in a Turbocharged DI Engine. SAE International Journal of Engines. 6. 422. 10.4271/2013-01-1321. https://www.researchgate.net/publication/265847885_Fuel_Economy_and_CO2_Emissions_of_Ethanol-Gasoline_Blends_in_a_Turbocharged_DI_Fuel_Economy_and_CO2_Emissions_of_Ethanol-Gasoline_Blends_in_a_Turbocharged_DI_Engine

¹⁹ Schaeffer, Allen, “All the buzz on biodiesel fuels: Fill it up please,” Progressive Dairy March 31, 2020 <https://www.progressivedairy.com/topics/barns-equipment/all-the-buzz-on-biodiesel-fuels-fill-it-up-please>

built, unless Maryland also adopts incentive programs for renewable fuels, renewable diesel sources will be limited.

Ethanol blends and Biodiesel do not have the same production limitations.

e. Finance:

Many fuel retailers have used state funding and federal USDA funds (currently the [Higher Blends Infrastructure Incentive Program](#)) to upgrade tanks and pumps to be able to sell competitive higher blends of renewable fuels.

Fleet transitions to renewable fuels should be part of city and county sustainability programs with funding from budgets appropriated for that purpose. However, the transition may pay for itself with savings in fuel prices as described above.

f. Recommended actions:

a. No Legislative Action Necessary

b. Administrative Action

Frederick City and County should incorporate transition to renewable fuels in fleets and equipment as part of their sustainability programs.²⁰

c. Encouragement and Facilitation

The County and City should meet with local federal fleet managers to learn from their experiences complying with the referenced requirements for use of renewable fuels. They should also meet with city and county fleet managers and with fleet managers for private local businesses to assess their potential renewable fuel use for light duty vehicles. Contact with the local Washington, DC Department of Public Works can provide practical insights about transitioning to renewable fuels for heavy duty vehicles.

The city and county should encourage and facilitate local fueling stations to offer customers more renewable options. A plan for transition to more renewables might benefit from negotiating with current fuel retailers and wholesalers, thereby saving money and reducing GHG emissions, as described in Section b above.

Write-up drafted by Joanne Ivancic

²⁰ Ivancic, Joanne “How to De-Fossilize Your Fleet Suggestions for Fleet Managers Working on Sustainability Programs,” Advanced Biofuels USA. <https://advancedbiofuelsusa.info/wp-content/uploads/2019/08/Fleets-article-v6-AdvancedBiofuelsUSA.pdf>