



Sustainable Low Carbon Fuel Use and Production in Maryland – Petition to Enable Policies and Incentives that Programatically Support the GGRA Plan

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Transport Fuels and Life Cycle GHG Emissions

- Life cycle analysis (LCA) GHG emissions of fuels and electricity used in transportation is needed to compare carbon benefits on an equal basis.
- Fuel life cycle GHG benefits can be expressed using the adjusted Carbon Intensity (CI) value of a fuel.
- CA LCFS based on ISO 14040, GREET*, & other factors.
- A low adjusted CI value fuel indicates it has lower life cycle GHG emissions when compared to the fuel it's substituting.

*GREET = ANL's Greenhouse gases, Regulated Emissions, and Energy use in Transportation wells to wheels LCA program.

“The use of life cycle analysis (LCA) fully accounts for all GHG emissions of a fuel, nullifying emissions leakage” (RicardoEE, 2018).

The GGRA Draft Plan Calls for Low Carbon Fuels

- **Electric Vehicles (EVs)** Enabling SLCF policies will support MD EV program: "The fleet-wide mix will include PHEVs and BEVs, along with traditional gasoline and diesel-powered vehicles." Page 67.
- **Regional Clean Fuel Standard:** Supports the regional clean fuels standard to achieve a 15% reduction in the carbon intensity of carbon-based fuels 2030. Page 80.
- **Lead by example - Alternative Fuel Usage in State Fleet:** Alternative fuel vehicles and fuels including ultra-low Sulphur diesel, biodiesel, and E-85. Page 96.
- **Transportation Programs:** "Transition to advanced biofuels blended into remaining diesel and natural gas uses, with 63% of diesel replaced by renewable diesel by 2050, and 25% of natural gas replaced by biomethane by 2050." Page 183.

What Policies, Incentives, and Programs would or could support this call for advanced / low carbon sustainable transportation fuels?

Heart of the 09-24-2019 SLCFs Petition¹

The Maryland Commission on Climate Change recognizes that use and future production of sustainable biofuels/low carbon transportation fuels (SLCFs) can play a beneficial role in Maryland's low carbon future. SLCFs include renewable natural gas (RNG), biodiesel and renewable diesel, ethanol and cellulosic ethanol, sustainable aviation fuel, and other sustainable fuels. SLCF related climate change mitigation interventions can make contributions to Maryland's transportation greenhouse emission reduction efforts and thus should be included in Maryland's Draft Greenhouse Gas Reduction Plan. SLCFs programs and projects can be engines for economic growth, employment, and revenue for the agricultural sector, local governments, innovators, Maryland universities, and businesses.

Please read the attached petition for more information and the list supporting stakeholders.

1. SLCF = Sustainable low carbon fuels

Why the 09-24-2019 SLCFs Petition ?¹

Because Maryland has an opportunity.

1. SLCF = Sustainable low carbon fuels

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Maryland Imports 100% of the Conventional and Alternative Transportation Fuels it Uses

“Maryland’s planners can’t predict the future; but that shouldn’t prevent them from setting science based goals and developing a plan to meet those goals.” GGRA Draft Plan

Maryland Energy and Transportation Fuels Consumption Estimates 2016 - Preliminary

Category(1)	Consumed - Trillion (1.0 ¹²) BTUs	Equivalent Liquid Fuel - Million Gallons	Consumed in Transportation - Million Gallons	% from in State Sources (Est)
Motor Gasoline excl. Ethanol	307	2,738	2,738	0%
Distillate Fuel Oil (Mostly Diesel)	99	748	692	0%
Biomass	49	N.A. (3)	N.A.	N.A.
Fuel Ethanol	24	281	281	0%
Jet Fuel	9	65	65	0%
Biodiesel	NA	NA	NA	0% (?)
Total	487	3,832	3,776	---

Potential Opportunity for Sustainable Low Carbon Fuel Use & Production?

Maryland is extremely vulnerable in transportation fuel supply – No in-state production. Can we afford that?

(1) 100% combustion eff. Source US EIA information, MDE, and GHG Eng. analysis. Natural gas/others excluded for lack of data.
 (2) Data on Biodiesel/Renewable Diesel blended with MD's Diesel Fuel not available.
 (3) NA = Not available
 (4) Totals may be different than sum because of rounding.

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CA LCFS Alternative Transport Fuels – Realized Opportunities

Alternative Fuel Credit Generation Resulting GHG ER CA LCFS Program

Credits (million MT CO2e)	2011	2012	2013	2014	2015	2016	2017	2018
Biodiesel	0.1	0.1	0.6	0.7	1.2	1.7	1.4	1.6
Biomethane	0.0	0.0	0.1	0.2	0.6	0.7	0.7	0.8
Fossil Natural Gas	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
Electricity	0.0	0.0	0.1	0.2	0.3	0.9	1.2	1.7
Ethanol	1.0	1.2	2.0	2.0	2.1	3.5	3.5	3.5
Renewable Diesel	0.0	0.1	0.8	0.8	1.0	2.2	3.0	3.5

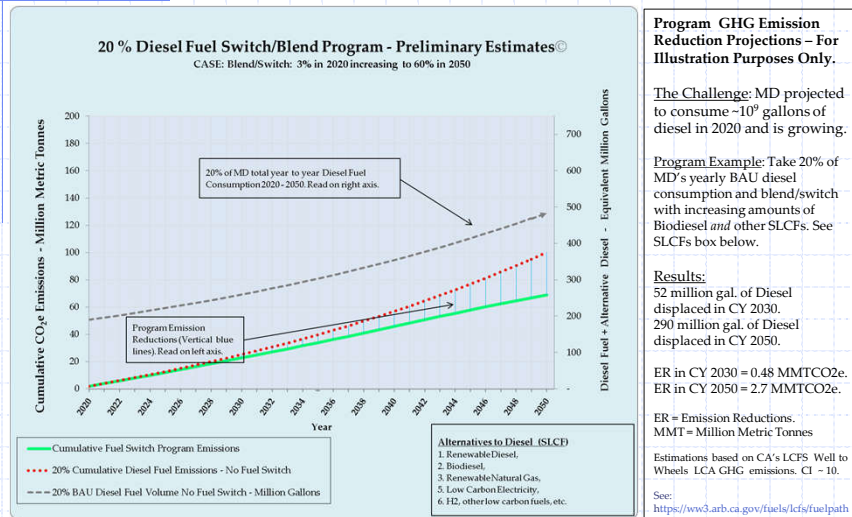
Source <https://ww3.arb.ca.gov>

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Diesel Fuel Switch/Blend Program and GHG Emission Reductions - A Tough Challenge. ©



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How Feasible is a 40 Million Gallons / Yr. Soybean Oil to Biodiesel Plant in MD?

- Low feasibility: 0.5 million acres of soybean planted in 2018. About 1.2 million acres needed.
- ...And 40MGY is only 0.4 % of the 10⁹ gals. of diesel consumption projected in 2020 !
- Imperative to assess multiple SLCFs to achieve realistic emission reductions. – Part of solution.
- Diesel demand reductions through all sustainable measures and alternatives required.
- How much will these measures cost per capita ?

Pro Forma Benefits Profile of a 40 Million Gallon per Year Biodiesel Plant in MD using Soybean Oil

ECONOMIC IMPACT ESTIMATES - OVERALL BENEFITS PROJECTIONS

40 Million Gallons per Year Biodiesel Production

SECTOR	CONTRIBUTION TO STATE GDP (Million 2018\$)	JOBS CREATED (NOT JOB YEARS)	PERSONAL INCOME (Mil 2018\$)
Biodiesel Manufacturing (Direct + Indirect + Induced)	60	500	35
Agriculture (Direct + Indirect + Induced)	\$70	750	\$ 30
R&D (Direct + Indirect + Induced)	\$15	135	\$ 10
Total	145	1,385	\$ 75

Based on <https://iowarfa.org/wp-content/uploads/2019/03/2018-low-a-Economic-Impact-Final.pdf>.
Pro forma economic projections by GHG Engineering, LLC.

Sustainable Low Carbon Fuels: Not New to Maryland

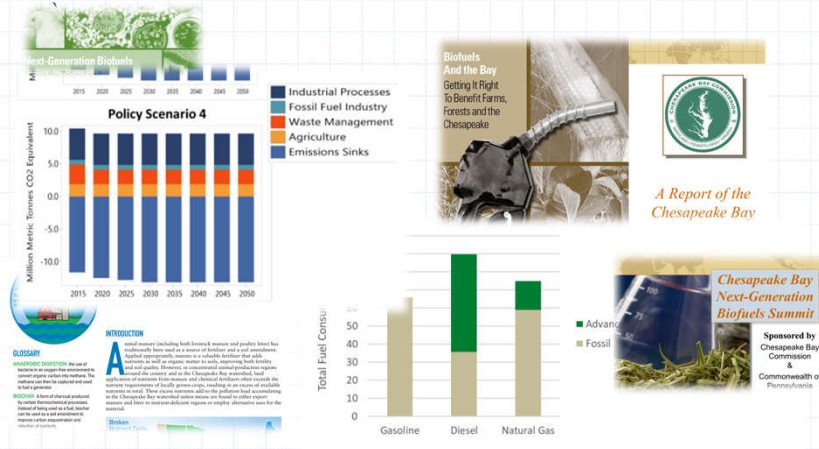


Figure 2-22. Total Fuel Consumption for Gasoline, Diesel, and Natural Gas by Primary Fuel Composition in 2050, Policy Scenario 2

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What is Next? – Some Thoughts

- Diesel emission reductions are a challenge in MD.
- Is this a priority for the MCCC ?
- If priority, consider supporting a stakeholder group to examine the state’s diesel equation.
- Group would need endorsement by the MCCC.
- Goal: Assess fuel/energy options and diesel ER timelines within context of MD’s Energy Balance.
- Provide findings and insight summary memo to support the GGRA Plan, MDOT’s goals, and TCI.
- Time to complete four-five months.

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About GHG Engineering, LLC

- **Maryland Based Water & Carbon Sustainability Engineering Consulting Firm**
- **John Mosheim, P.E. CEM, Manager:** Water & energy sustainability, corporate GHG inventories, public transport projects, RNG projects, carbon offset verifications, low carbon emissions plans reviews, HFC/CFC mitigation, QA/QC.
- **Associate Consultants:** Sustainability, energy policy, GIS, risk management, nuclear power generation, climate vulnerability & adaptation assessments, ISO management systems.
- **Project Experience in the U.S. and Mexico:** Climate change, carbon offset verification, water sustainability programs, RNG process engineering analysis, BRT project emission reduction assessments.

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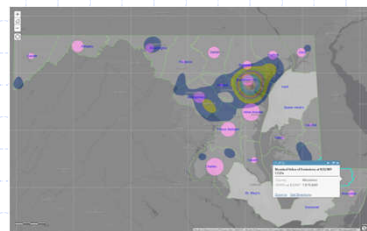
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Sample Project Depictions



Infrastructure Sea Level Rise and Flood Risk Reviews



Climate Change Regulatory Impact Visualizations.



BRT Project Emission Reductions Verification

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For Questions or Comments Please contact

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