

Hydrogen & Fuel Cell-Related Activities at EPA

Susan Burke

Office of Transportation and Air Quality
United States Environmental Protection Agency

June 14, 2018

Overview

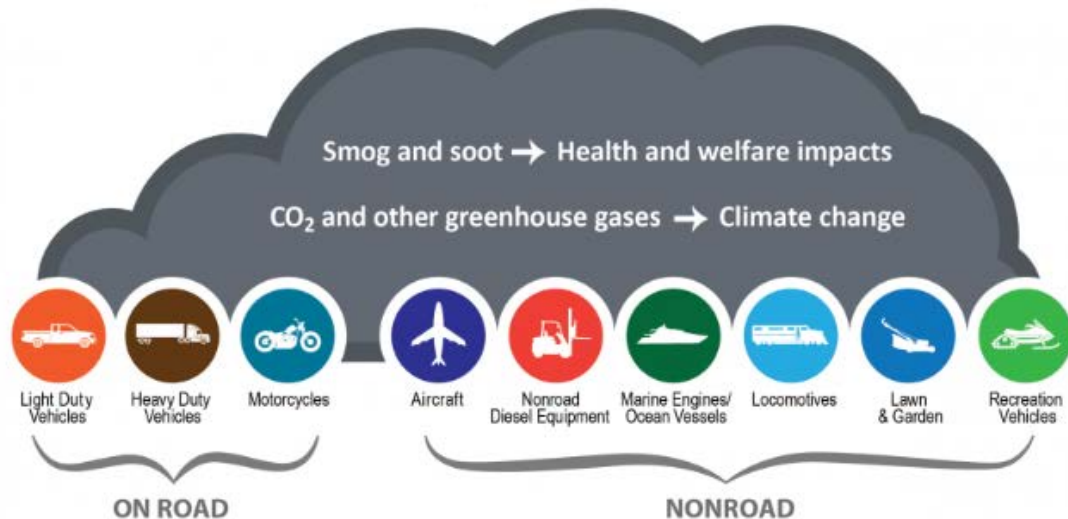
- EPA Office of Transportation and Air Quality
- Clean Diesel Funding Assistance Program
- Renewable Fuel Standard
- Partnerships & External Engagement
- Consumer Education & Resources

EPA Office of Transportation and Air Quality (OTAQ)

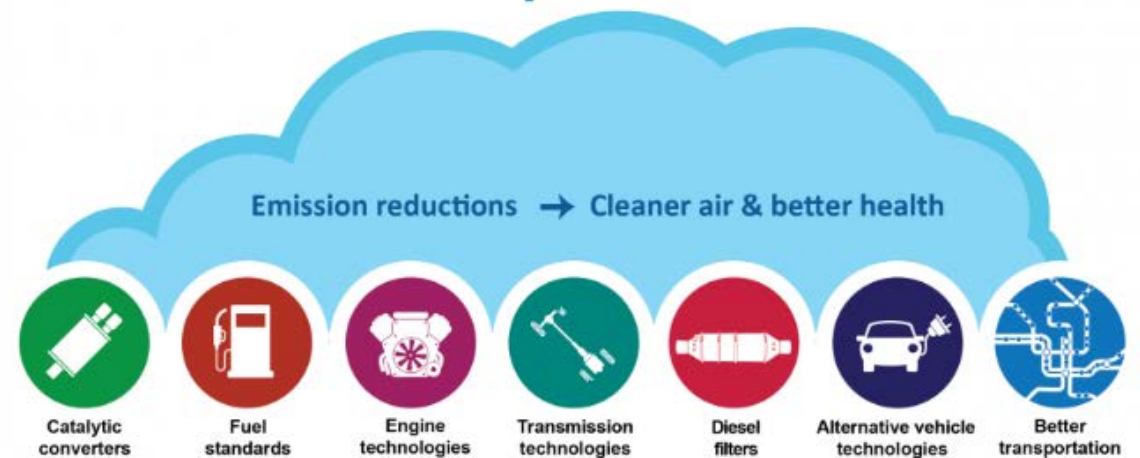
OTAQ's mission is to protect human health and the environment by:

- reducing air pollution from mobile sources and the fuels that power them
- advancing clean fuels and technology and
- encouraging business practices and travel choices that minimize emissions

Sources of Transportation Air Pollution



Solutions for Transportation Air Pollution



OTAQ's Programs

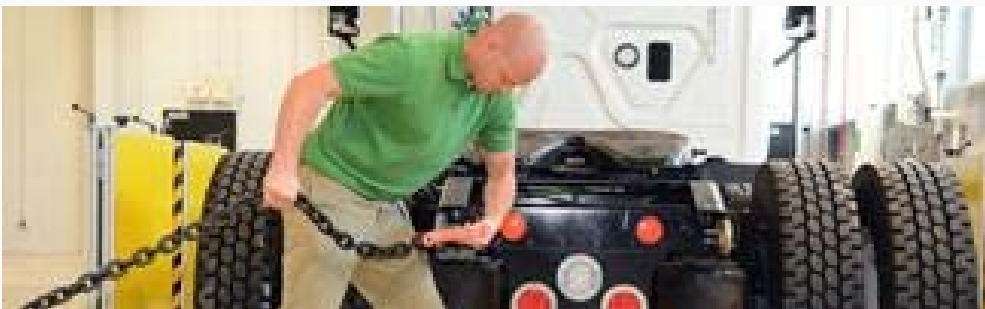
Assessment and Standards



Compliance



Vehicle and Engine Testing



Transportation Activity and Planning



Clean Diesel Funding Assistance Program

- Enables EPA to offer funding assistance for projects that achieve significant reductions in diesel emissions and exposure, particularly from fleets operating at or servicing goods movement facilities located in areas designated as having poor air quality.
- Includes grants and rebates funded under the Diesel Emissions Reduction Act (DERA)
 - FY18 RFP for Clean Diesel National Grants (\$40 Million) closed on June 12
 - Eligible Entities
 - Regional, state, local, tribal or port agency with jurisdiction over transportation or air quality; and
 - Nonprofit organization or institution which
 - Represents or provides pollution reduction or educational services to persons or organizations that operate diesel fleets; or
 - Has, as its principle purpose, the promotion of transportation or air quality

Clean Diesel Funding Assistance Program

Eligible Vehicles, Equipment & Engines

May include, but are not limited to

- Buses;
- Class 5 – Class 8 heavy-duty highway vehicles;
- Marine engines;
- Locomotives engines; and
- Non-road engines, equipment or vehicles used in:
 - Construction; Handling of cargo (including at a port or airport); Agriculture; Mining; or Energy production (including stationary generators and pumps)

Eligible Projects

- Verified Exhaust Control Technologies
- Verified/Certified Engine Upgrades and Remanufacture Systems
- Verified Cleaner Fuels
- Verified Idle Reduction Technologies
- Verified Aerodynamic Technologies & Low Rolling Resistance Tires
- Certified Clean Alternative Fuel Conversion
- **Certified Engine Replacement**
- **Vehicle and Equipment Replacement**

Clean Diesel Funding Assistance Program

- Certified Engine Replacement:

- EPA will fund up to 60% of the cost (labor and equipment) of replacing a diesel engine with a zero emission power source, including hydrogen fuel cells for the following applications

- Urban Transit Bus
- Shuttle Bus
- Drayage Truck



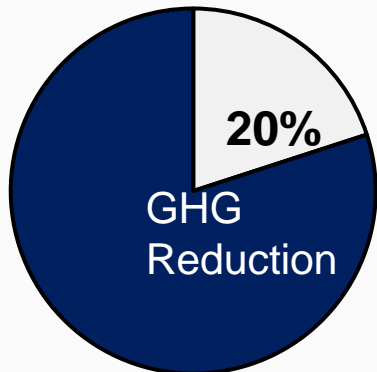
- Certified Vehicle and Equipment Replacement

- EPA will fund up to 45% of the cost of a new fuel cell transit bus, shuttle bus, terminal tractor/yard hostler, stationary generator or forklift
- EPA will fund up to 50% of the cost of a fuel cell drayage truck

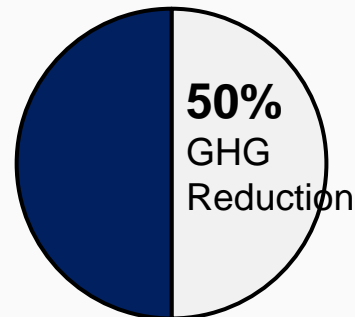
Renewable Fuel Standard (RFS)

- Requires a certain volume of renewable fuel to replace or reduce the quantity of petroleum-based transportation fuel, heating oil or jet fuel
 - Volume requirements vary by category and year
- Each category of renewable fuel must meet a minimum lifecycle GHG reduction compared to the baseline gasoline or diesel

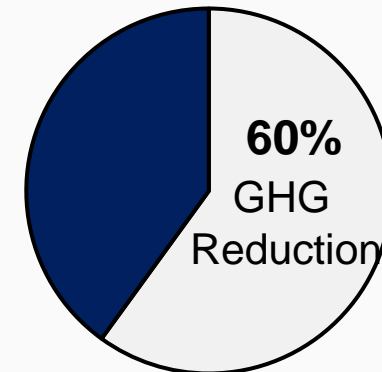
Renewable Fuels



Advanced & Biomass-based Diesel Fuels



Cellulosic Fuels



- Obligated parties: refiners or importers of gasoline or diesel fuel
- Renewable identification numbers (RINs) are credits that obligated parties use to demonstrate compliance with the standard

RFS: What is a Fuel Pathway?

- A fuel pathway in the RFS includes three components:



Feedstock

A feedstock is a type of “**Renewable biomass**,” as defined under CAA 211(o)(1), that is converted into a renewable fuel.



Production Process

The production process is the type(s) of technology used to convert renewable biomass into renewable fuel.



Fuel

Renewable fuels include liquid and gaseous fuels and electricity derived from renewable biomass energy sources. To qualify for the RFS program, the fuel must be used as transportation fuel, heating oil, or jet fuel.

RFS: Pathway Approval Options

1

1. Generally applicable pathway

- Listed in Table 1 to 40 CFR 80.1426
- Requires rulemaking

Environmental Protection Agency

§ 80.1426

TABLE 1 TO § 80.1426—APPLICABLE D CODES FOR EACH FUEL PATHWAY FOR USE IN GENERATING RINS—Continued

Fuel type	Feedstock	Production process requirements	D-Code
Ethanol	Corn starch	All of the following: Dry mill process, using natural gas, biomass, or biogas for process energy and at least one of the advanced technologies from Table 2 to this section plus drying no more than 65% of the distillers grains with solubles it markets annually.	6
Ethanol	Corn starch	All of the following: Dry mill process, using natural gas, biomass, or biogas for process energy and drying no more than 50% of the distillers grains with solubles it markets annually.	6
Ethanol	Corn starch	Wet mill process using biomass or biogas for process energy.	6

2

2. Facility-specific pathway

- Approved through a letter signed by Office Director, posted on EPA website
- Originally used only for slightly different processes for plants using previously-evaluated feedstocks (e.g., corn ethanol)
- After LEAN, we began to use a Federal Register Notice to provide public notice and comment opportunity on the upstream analysis for new feedstocks (e.g., biomass sorghum)
- After public notice process, could then approve a facility-specific petition using this new feedstock



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAY 9 2017

OFFICE OF
AIR AND RADIATION

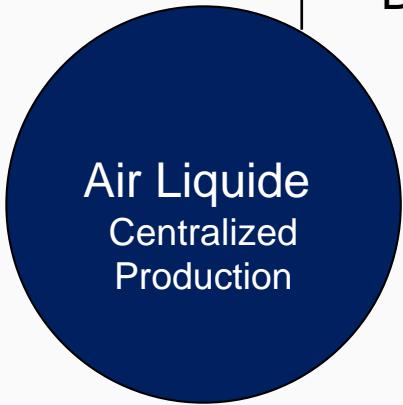
Mr. Dow Didion
Owner and Founder
Didion Ethanol, LLC
520 Hartwig Blvd.
Johnson Creek, Wisconsin 53038

Dear Mr. Didion:

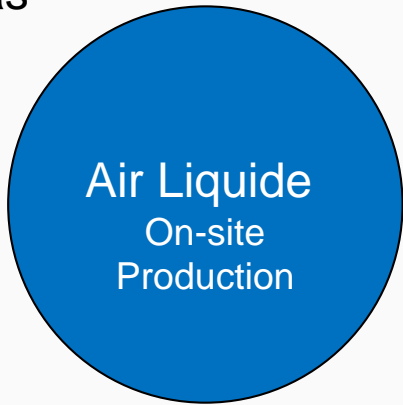
RFS: Hydrogen Petitions Under Review

- Currently there are no approved hydrogen pathways eligible for RINs
- Four petitions are under review

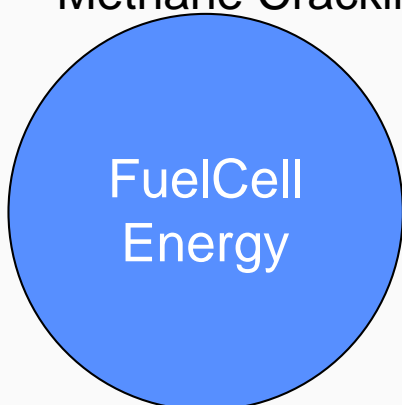
Fuel	Feedstocks	Production Processes	RIN Code Requested
Hydrogen	<ul style="list-style-type: none"> • Landfill Biogas • Agricultural Digester Biogas 	<ul style="list-style-type: none"> • Steam Methane Reformation (SMR) • Methane Cracking 	D3—Cellulosic



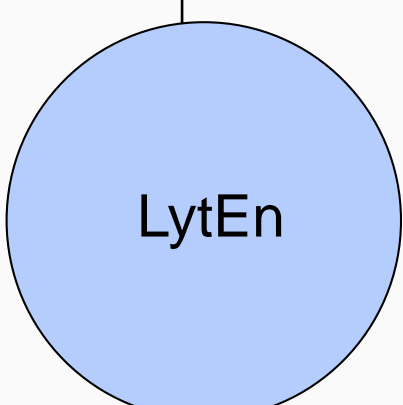
Air Liquide
Centralized
Production



Air Liquide
On-site
Production



FuelCell
Energy



LytEn

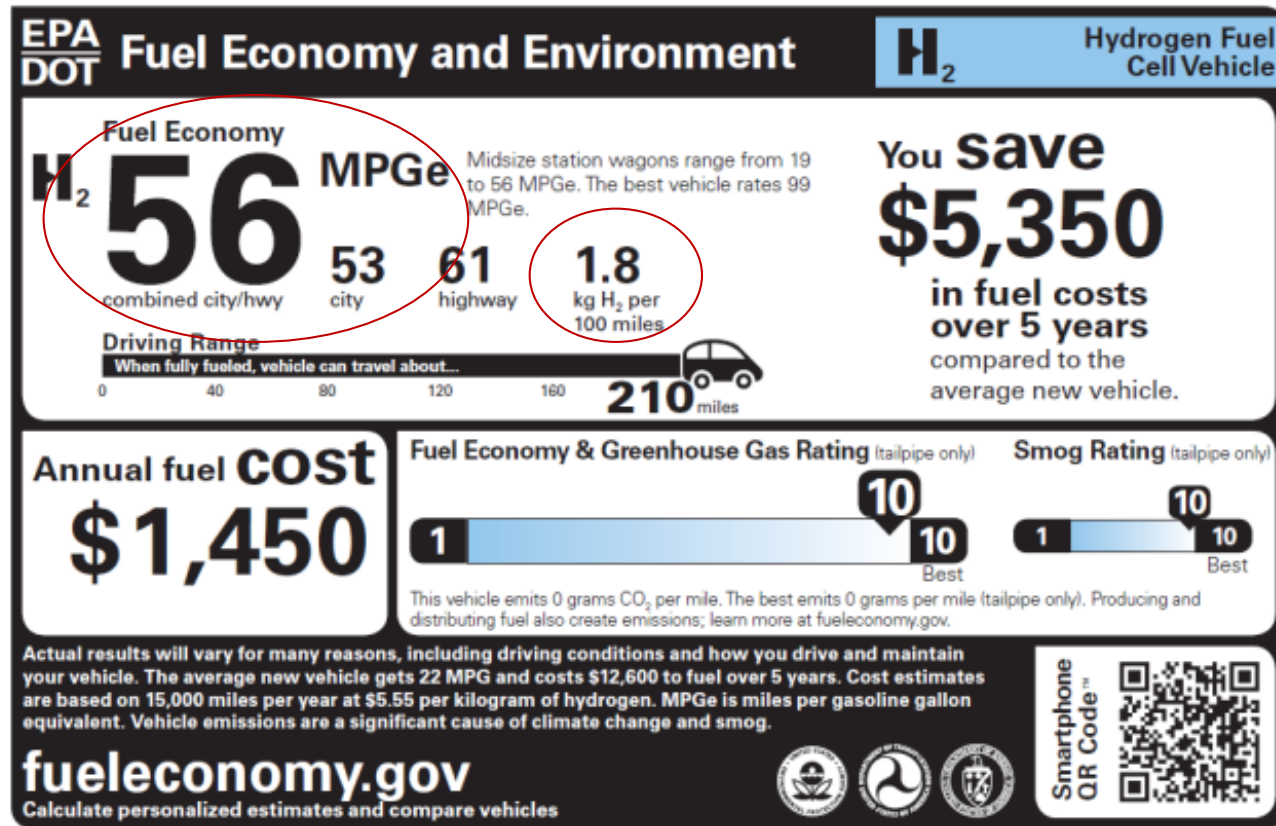
- To learn about the petition process, or to submit a petition:

www.epa.gov/renewable-fuel-standard-program/fuel-pathways-under-renewable-fuel-standard

Partnerships & External Engagement

- **California Fuel Cell Partnership (CAFCP)** – EPA chaired the medium- and heavy-duty Fuel Cell Electric Truck Workgroup, which published an action plan in 2016
<https://cafcp.org/mdhd-action-plan-2016>
- **Clean Air Technology Initiative (CATI)** – EPA is a partner agency & helps support various zero emission vehicle (ZEV) demonstration projects
- **UC Davis Sustainable Transportation Energy Pathways (STEPS) Program** – EPA co-funds related research projects through STEPS membership including:
 - Hydrogen infrastructure needs for California freight
 - Medium- and heavy-duty vehicle low/zero emission technology & fuel assessment
 - Consumer awareness & education on ZEV technologies

Consumer Education

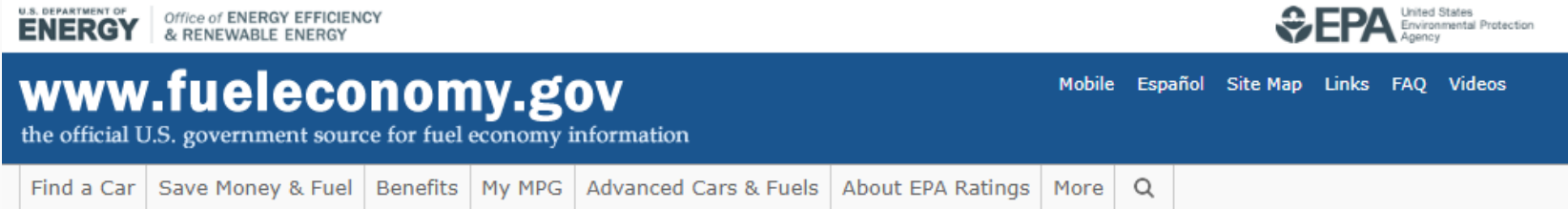
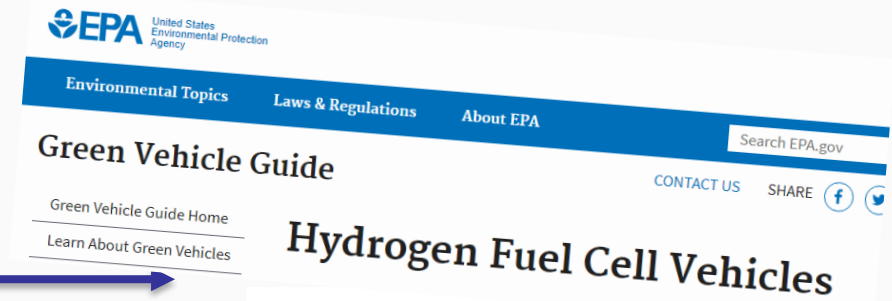


- Fuel Economy & Environment Label—Includes
 - Both MPGe & kg H₂ per 100 miles
 - Driving Range
 - Fuel cost information
 - GHG & Smog Ratings (tailpipe only)
- Compare vehicles at joint DOE–EPA website fuel economy.gov
- General information on hydrogen & fuel cell vehicles at EPA’s Green Vehicle Guide website

Example label for illustrative purposes; does not represent a real automobile

Resources

- OTAQ's Main Page: www.epa.gov/aboutepa/about-office-air-and-radiation-oar#otaq
- DERA: www.epa.gov/cleandiesel
- RFS: www.epa.gov/renewable-fuel-standard-program
- Volkswagen Settlement information: www.epa.gov/vw
- Green Vehicle Guide: www.epa.gov/greenvehicles
- DOE – EPA website: www.fueleconomy.gov



Compare Fuel Cell Vehicles

Fuel cell vehicles (FCVs) are now for sale or lease in the United States although availability is limited to areas with an adequate number of hydrogen refueling stations. Fuel economy estimates and other information are provided below.


2018 Honda Clarity	2017 Hyundai Tucson Fuel Cell	2018 Toyota Mirai
		

ALSO IN THIS SECTION...

- Fuel Cell Vehicles
- Compare Side by Side**
- How They Work
- Benefits and Challenges
- Videos
- Links

Did you know?

Hydrogen fuel can be produced from water. In a process called electrolysis, electricity is used to split water into H₂ and O₂. The electricity can come from renewable energy sources such as wind and solar power.

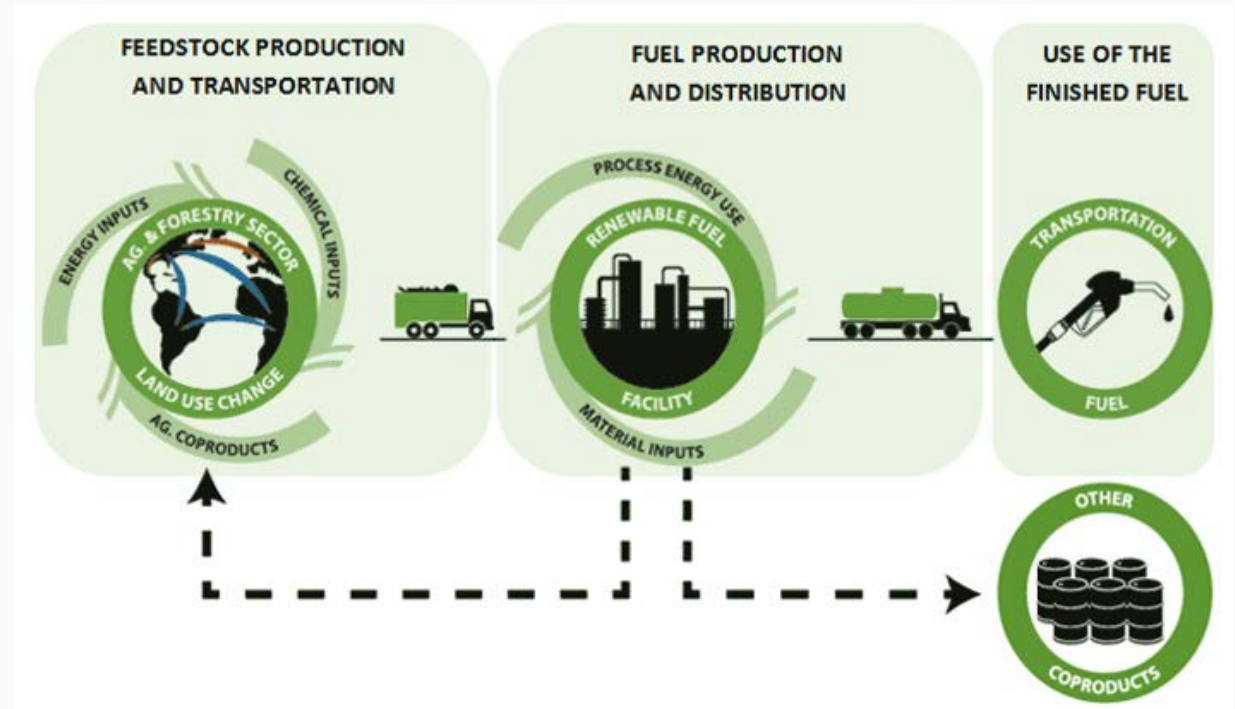


Appendix



Clean Air Act Definition of Lifecycle GHG Emissions

- CAA 211(o)(1) Definitions
- The term 'lifecycle greenhouse gas emissions' means the aggregate quantity of greenhouse gas emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes), as determined by the Administrator, related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished fuel to the ultimate consumer, where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential.



The term 'baseline lifecycle greenhouse gas emissions' means the average lifecycle greenhouse gas emissions, as determined by the Administrator, after notice and opportunity for comment, for gasoline or diesel (whichever is being replaced by the renewable fuel) **sold or distributed as transportation fuel in 2005**.