Advanced Biofuels for a Truly Sustainable Renewable Future

Advanced Biofuels USA
www.AdvancedBiofuelsUSA.org
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Advanced Biofuels USA

501(c)3 Nonprofit
Educational Organization

Founded April 2008

Website:
www.AdvancedBiofuelsUSA.org

Frederick, MD

Advocates for the adoption of advanced biofuels as an

- energy security,
- military flexibility,
- economic development
- climate change mitigation
- pollution control

solution.

Feedstock, Process, Product Agnostic

Renewable Fuels' Role in GHG Reduction

Most Cost Effective/ Greatest Amount of GHG Reduction/ Shortest Time

- *Complement to EVs in the GHG Reduction Plan*
  (Legacy, Long Haul, Aviation)
- *Not just ethanol; Not just corn*
- *Benefits*
- *(Environmental Justice, Focus on High Pollution and Low Income Areas, Sustainability / Policy Considerations / Markets / Jobs)*
- *Our Proposals*

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From Draft Maryland Greenhouse Gas Reduction Act Plan, page 20

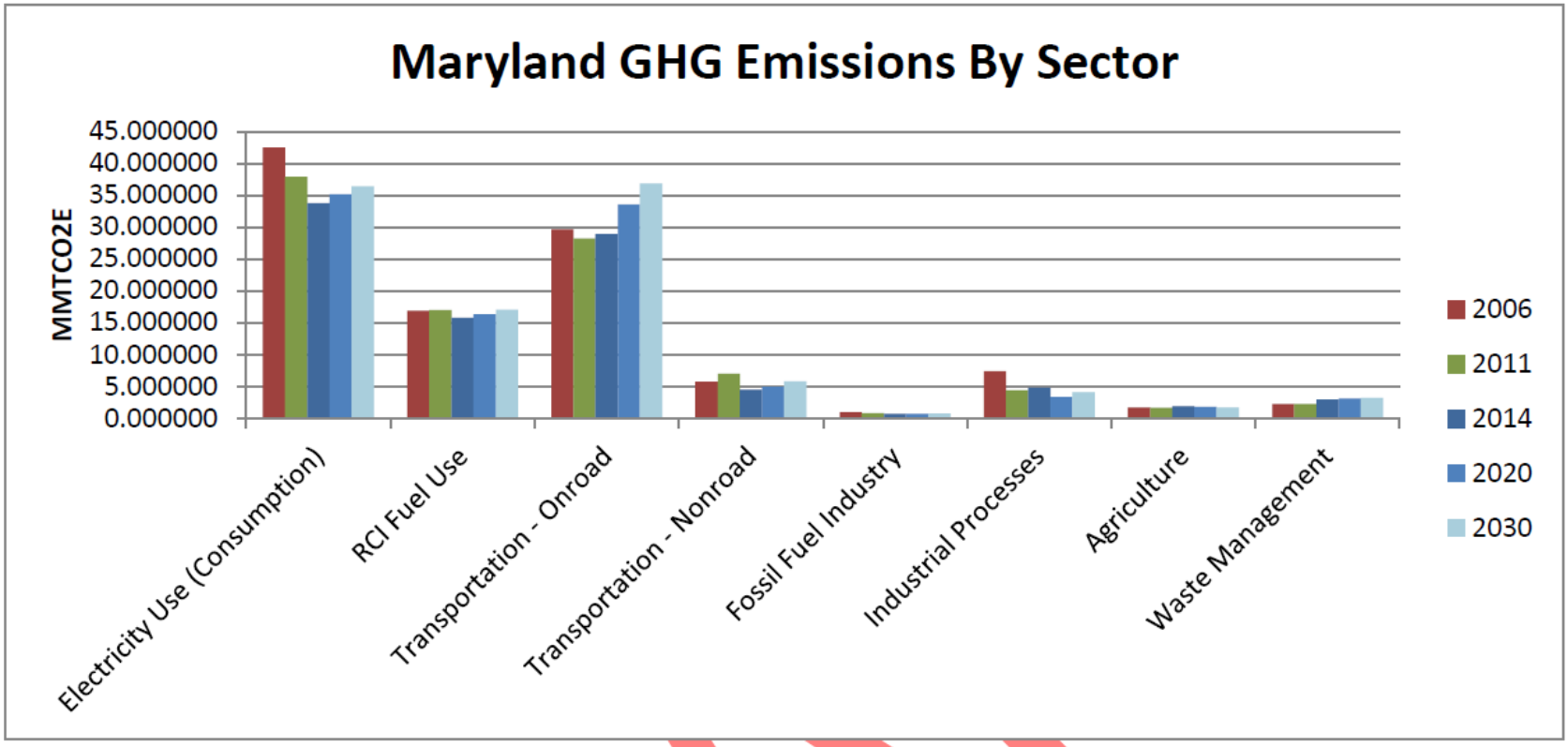


Figure 2.3-2: Maryland GHG Projected Emissions by Sector.

Maryland's projected emissions in 2030 (106.04 MMTCO$_2$E) will represent a slight decline in GHG emission from the 2006 Base Year.

RENEWABLE FUELS: the <u>most cost effective</u> way to <u>reduce the greatest amount of GHG</u> in the <u>shortest amount of time</u> and bring investments and jobs.

Maryland Electric and Hydrogen Fuel Cell Vehicle Sales Projection through 2030

(page 69 GHGA Draft Plan)

Figure 4.3-6 below presents the projected ZEV deployment curve through 2030 based on a 2017 base year. Maryland costs to facilitate this level of deployment includes up to $1.2 million annually through 2030 for the Electric Vehicle Recharging Equipment Rebate Program and other costs associated with matching federal grants to expand public EV charging infrastructure throughout Maryland.

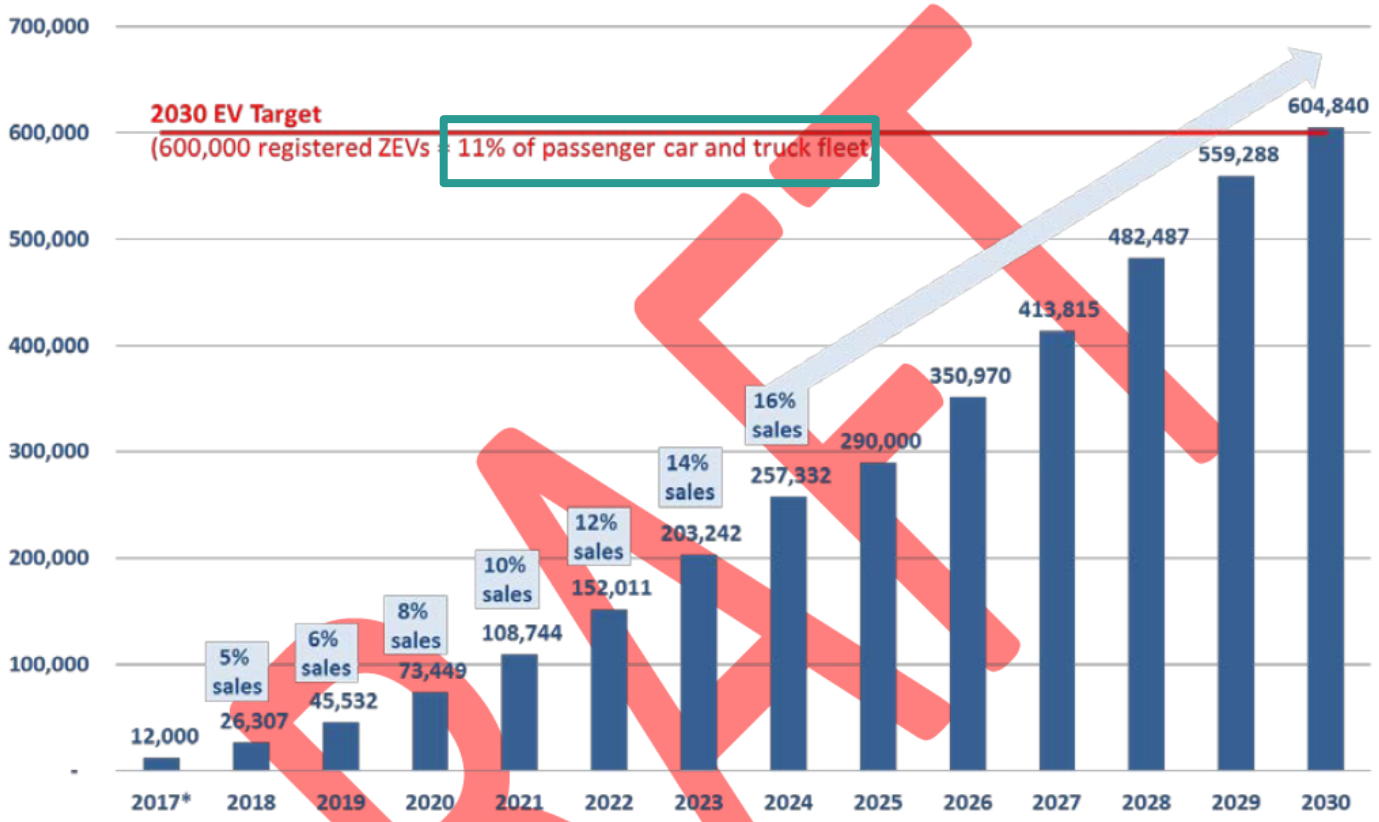
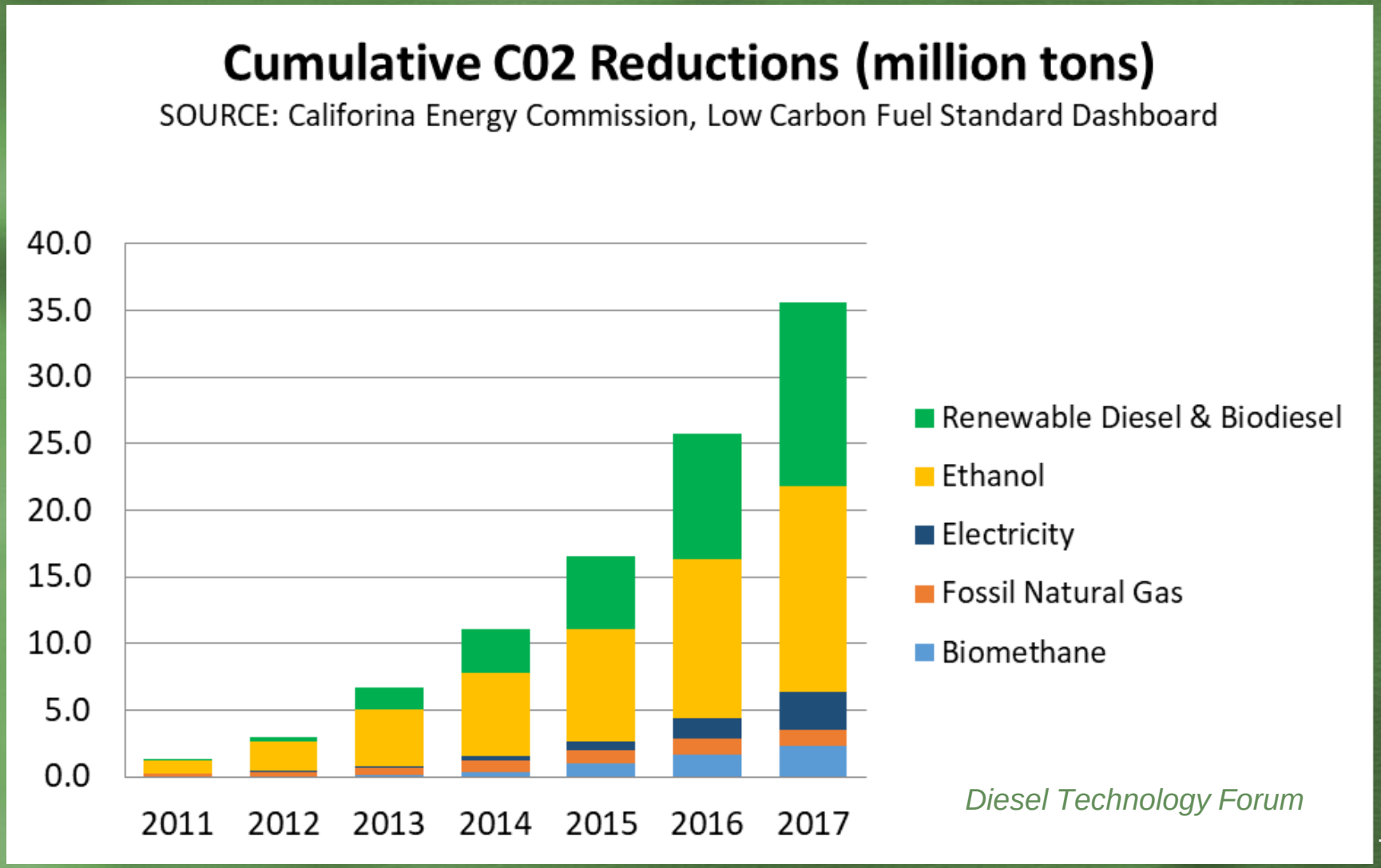


Figure 4.3-6. Electric Vehicle Deployment Approach.

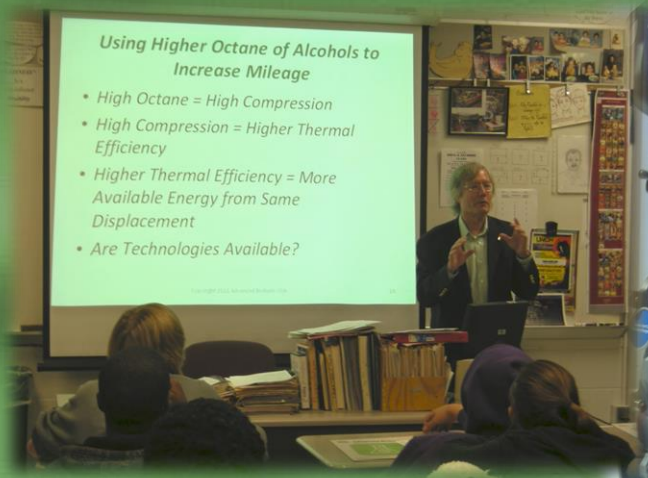
California Low Carbon Fuel Standard

Success of Renewable Fuels Reducing GHG



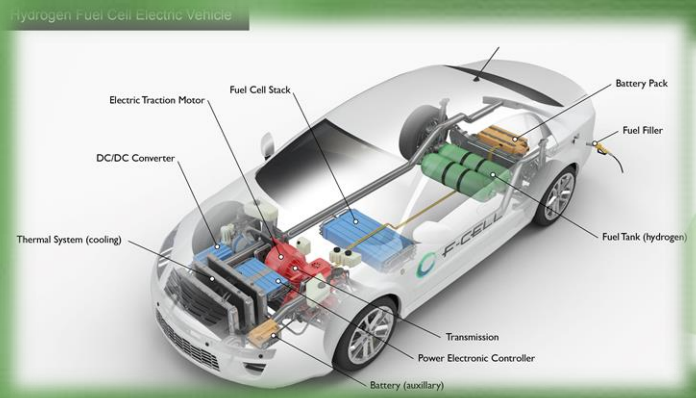
Diesel Technology Forum

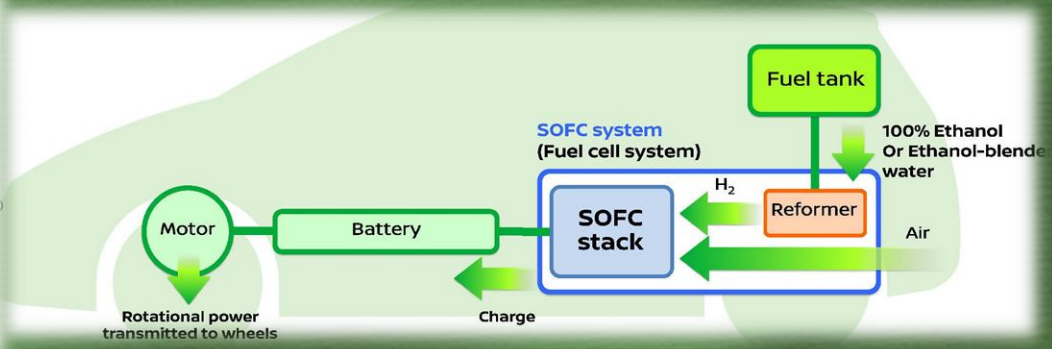
High octane fuels for high mileage vehicles



E30
Sweet
Spot

Hydrogen or Ethanol for Fuel Cells





What Are Renewable Fuels Used for Today?

- **Fueling Cars and Trucks**

Heating Fuel

- **Fueling Aircraft**

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Not just ethanol

***Ethanol** is a biofuel, not the only biofuel.*

- Biodiesel
- Renewable Diesel
- DME
- Biogas/Renewable Natural Gas
- Biojet (Sustainable Aviation Fuel (SAF))
- Biobutanol
- Renewable Hydrogen
- Drop-in Hydrocarbons
- BioHeat ®
- Cooking Fuel
- Rocket Fuel

Feedstocks: Not Just Corn

- Algae
- Corn stover
- Corn cobs
- Energy cane
- Sorghum
- Forest waste, residues
- Municipal waste
- Sawdust
- Chicken manure
- Agricultural residues
- Dairy Waste
- Food Processing Waste
- Grasses such as
  - Switchgrass
  - Miscanthus
- Sugar beets/ Energy Beets
- Coffee grounds
- Jatropha
- Camelina, Carinata, Canola
- Cassava
- Paper/pulp mill waste
- Used telephone poles
- Oil seed crops
- Thin air
- Fatbergs
- Halophytes…

Renewable Fuels and Chemicals, Not Just Bio-Based -- Recycling Carbon

- Flue Gas/Industrial Waste Gas
- Recycled Plastic, Tires
- Municipal Waste
- Carbon Capture and Reuse

Some Feedstock Conversion Processes

Biochemical

- Fermentation
- Anaerobic digestion
- Plant extraction
- Transesterification
- Hydrolysis
- Enzymatic catalysis
- CO2-to-liquid bio-catalytic conversion

Thermochemical

- Gasification
- Plasma arc gasification
- Pyrolysis
- Hydrothermal liquefaction
- Thermochemical conversion of sugars

Energy Beet Projects in Maryland, Florida

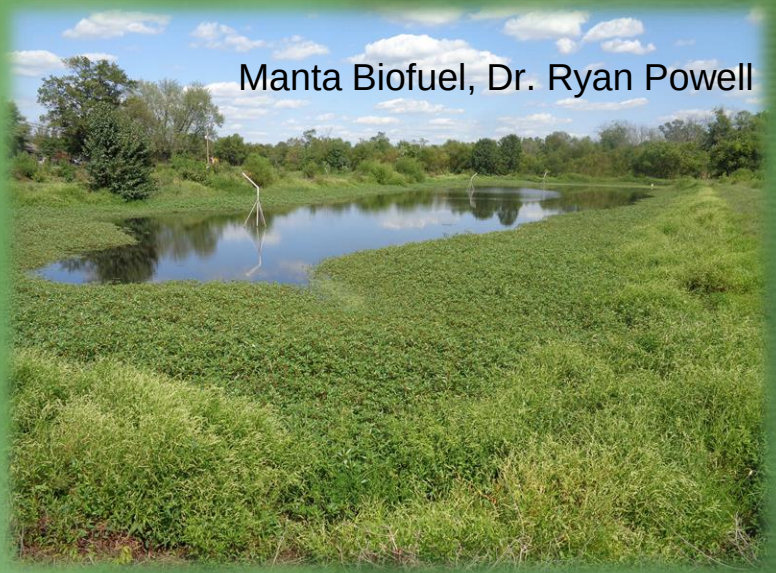
Key concepts: NO lignin
High yield (2 times corn/acre)
Animal feed co-products

Algae Projects in Maryland

- Cyanobacteria
- Wastewater Treatment
- Agricultural Algae

Dr. Viji Sitther, Morgan State

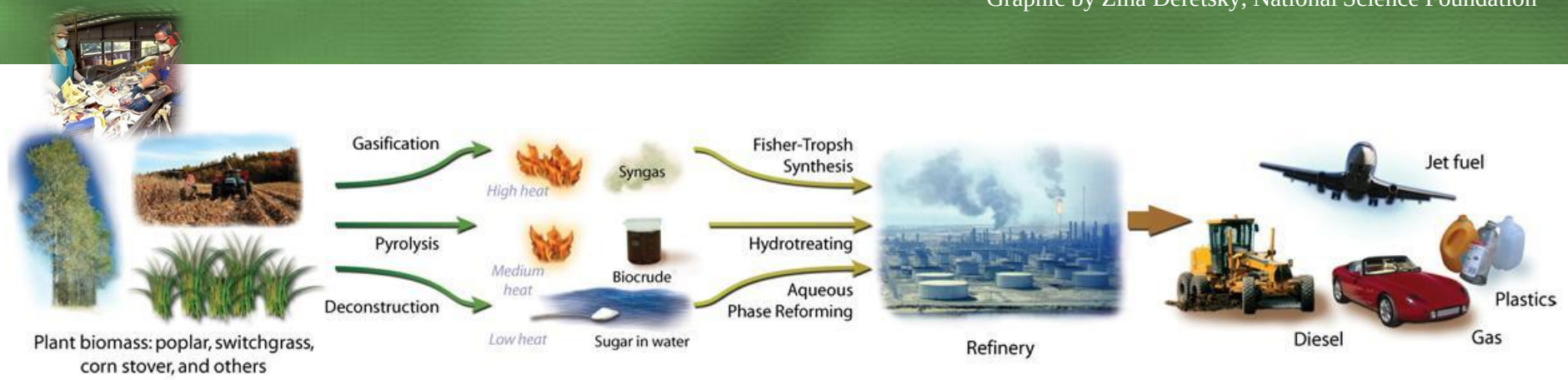
Dr. Stephanie Lansing, UMD College Park

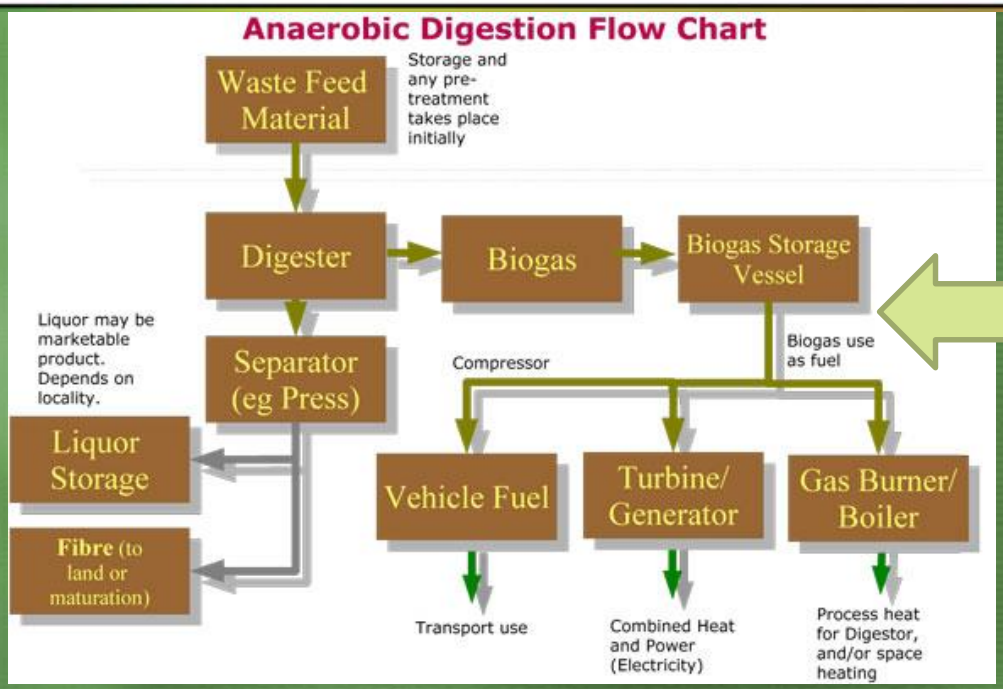


Manta Biofuel, Dr. Ryan Powell

Process Path: Feedstock-to-Fuels and Products

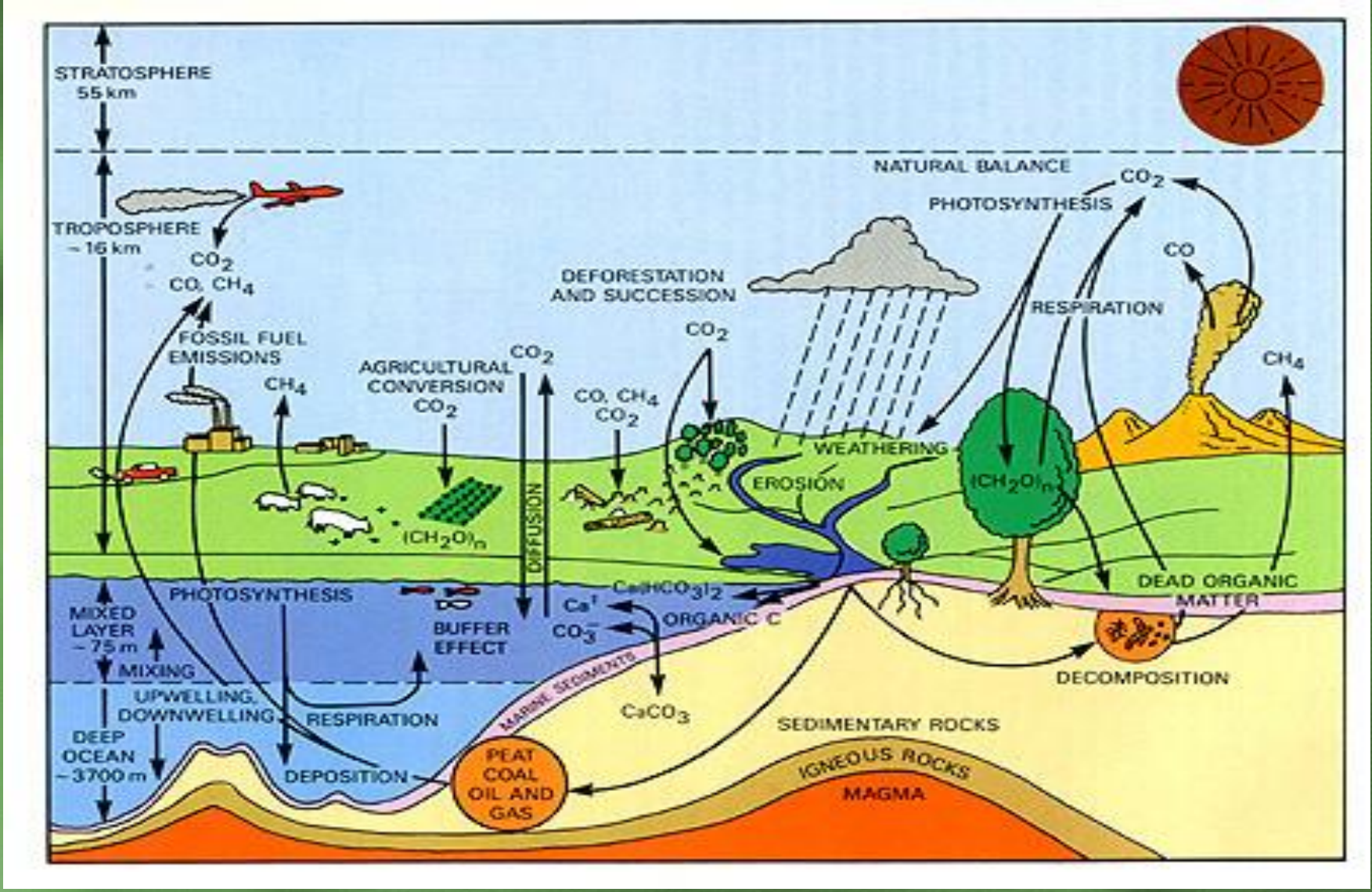
Graphic by Zina Deretsky, National Science Foundation





Biogas to Renewable Natural Gas cleanup needed

Sustainability: Recycling Carbon / Life Cycle Analysis



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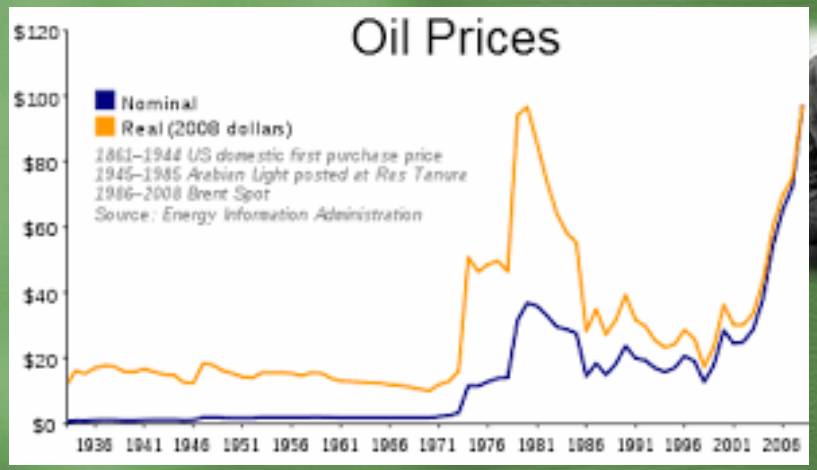
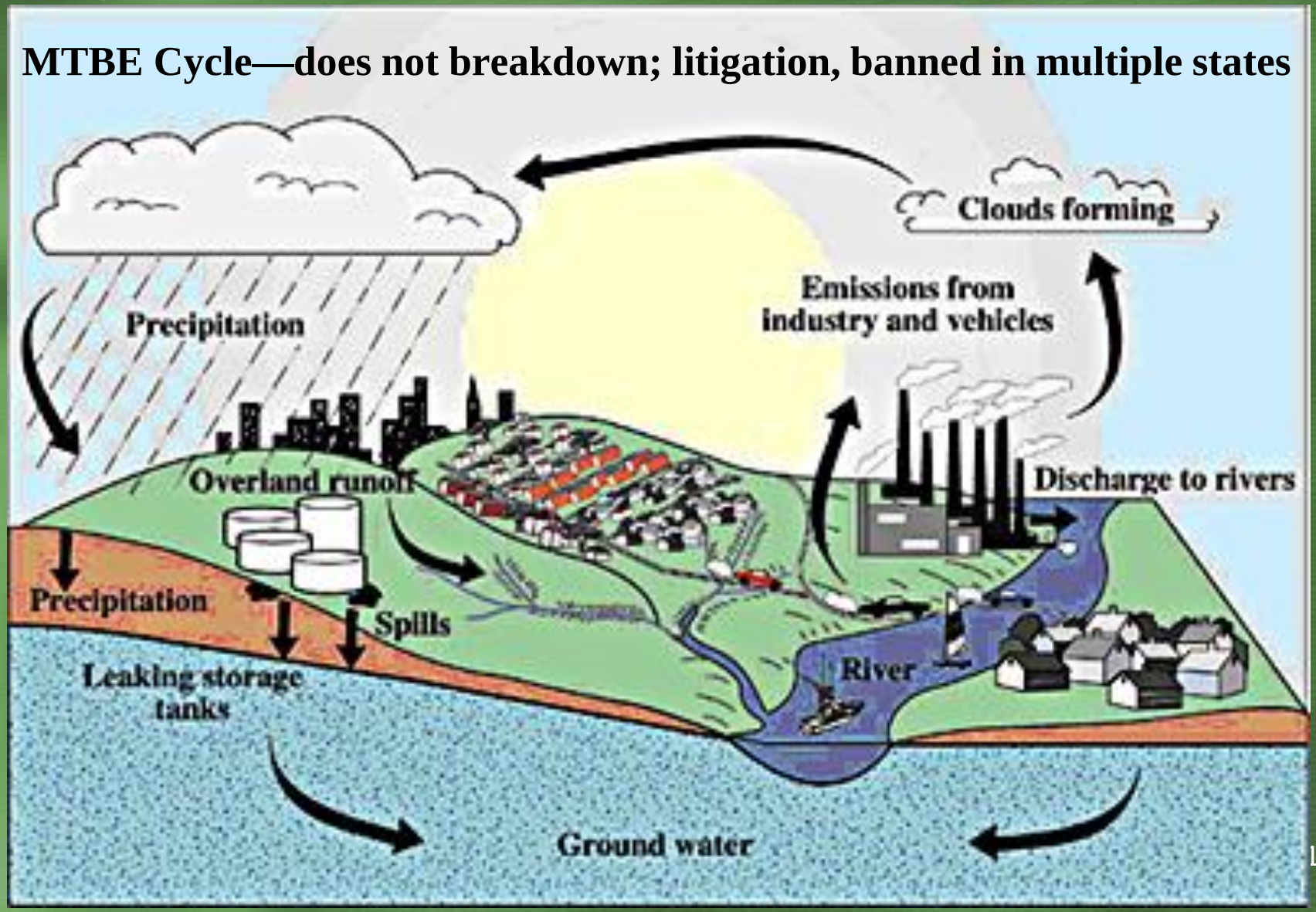
Oil Disruption--Geo-Political --1973 Oil Embargo Spurred Development of Home-Grown Fuel



2006 Ethanol Replaces Carcinogenic MTBE as an oxygenate, serves as a source of octane.



Ethanol

- Substitute for Carcinogenic Aromatics
- Replaces MTBE in Gasoline -- Urban Air Initiative
- Less Expensive, Less Harmful Octane
- Fuel for Fuel Cells

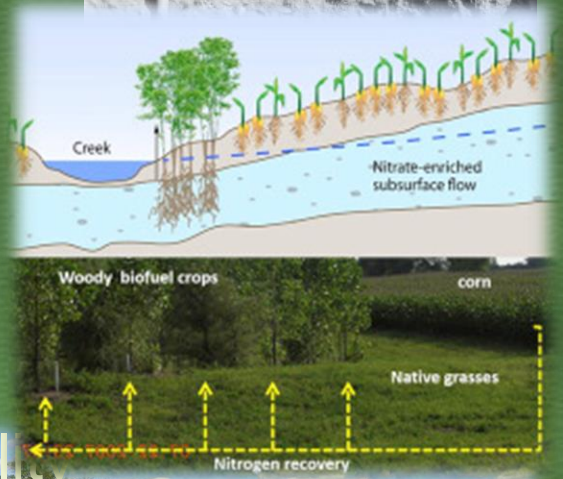
Biodiesel and Renewable Diesel

- Low Sulfur
- Cleaner Burning
- Fewer Particulates
- Less Maintenance

Why Replacing Fossil-Fuel Oil With Advanced Transportation Biofuels is Important—

Solutions to Problems

- Reduce carbon footprints
- Erosion control
- Waste water treatment
- Remediation of contaminated soil
- Nutrient management
- Carbon sequestration
- Alternative to carcinogens / Air Quality
- Overflowing landfill relief/plastic recycling
- Burning agricultural waste in fields
- Grease (fatbergs) in sewers
- Contaminated black market used cooking oil



A Few Types of Jobs Available in Advanced Biofuels from Feedstock Development and Production through Fuel Sales

- Agronomists
- Farmers / Farm workers
- Farm equipment designers
- Biologists
- Chemists/ Chemical engineers
- Mechanical engineers
- Electrical engineers
- Researchers into bioenergy crop development
- Lab Technicians
- Industrial Engineers
- Plant Operations Managers
- Welders/Boilermakers
- Accountants
- Agriculture/horticulture experts
- Freight railroad operators, engineers, loaders, unloaders
- Equipment operators, technicians
- Farm product purchasers/traders
- Agricultural Inspectors
- Computer Software Engineers
- Truck drivers
- Equipment operators
- Lawyers
- Office Personnel
- Investors
- Others?

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Renewable Fuels' Role in GHG Reduction

Shortest Time

- **Fuel for existing planes, trains, automobiles, equipment**

- **Fuel for non-EV vehicles that will continue to be bought, especially by:**
  - **Lower income people**
  - **Rural residents**
  - **Those with long commutes *(responsible for many vehicle miles traveled)***

- **Don't have to wait for electricity to be renewable or batteries "fair trade"**

Renewable Fuels' Role in GHG Reduction

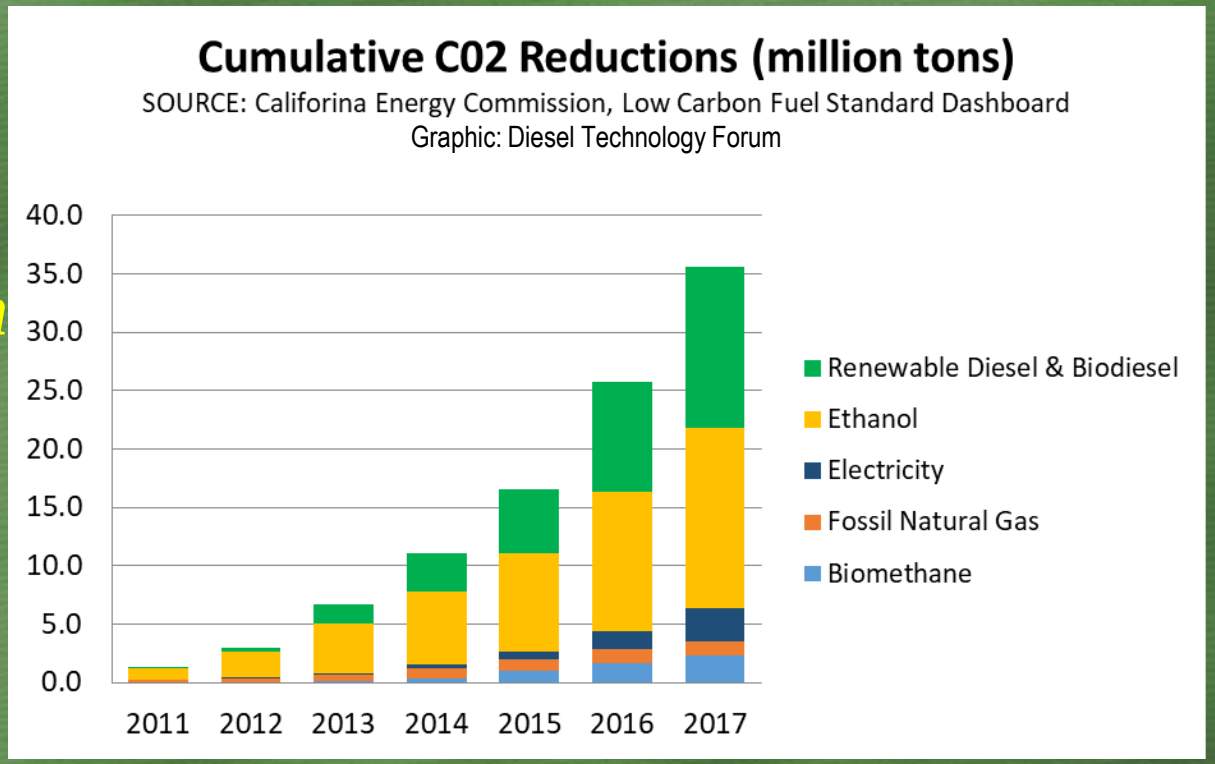
Most Cost Effective

- **People who can't afford EVs can lower carbon footprint of current and future vehicles with less expensive fuel** **(November 1, 2019, in the US. Fossil gasoline with no ethanol was $3.09/gallon; with E15, more than 60 cents less ($2.45) and E85 nearly a dollar less ($2.14)**

- **Infrastructure change to existing fuel stations; can be part of scheduled equipment replacement**

Renewable Fuels' Role in GHG Reduction

Greatest Amount of GHG Reduction



Proposals

- **Include Renewable Fuels in GHG Reduction Plan**
  - **Financing Infrastructure and R&D**
  - **Promote Development and Use**

- **Look at Low Carbon Fuel Standard models to address gaps**
  - **Incorporate into regional Transportation and Climate Initiative (TCI)**

- **Disappearing Carbon User Fee**
  - **Prioritize funding for renewable fuel infrastructure and use for low income and high pollution areas**

Find out more: **www.AdvancedBiofuelsUSA.org**

For a Truly Sustainable, Renewable Future

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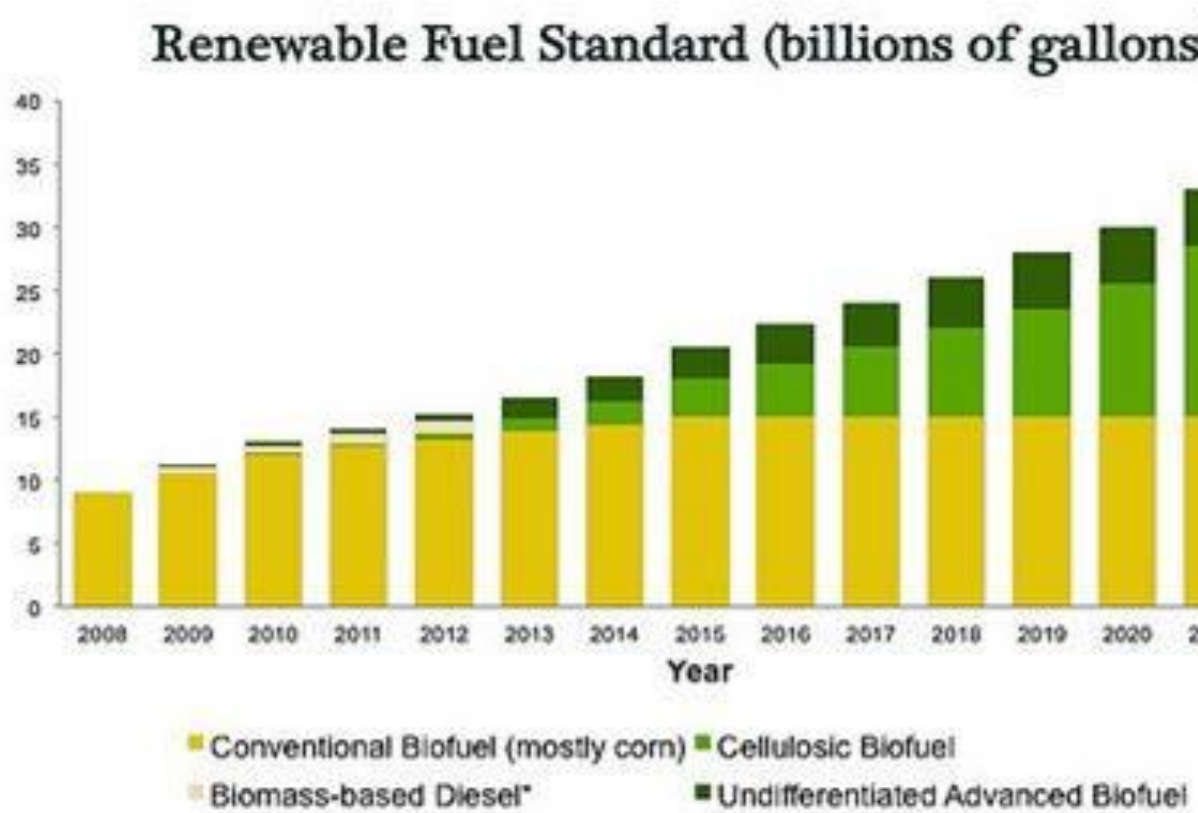
History of Ethanol in US: Federal Policy

2007 Renewable Fuel Standard

Sec. 202 Energy Independence and Security Act of 2007
(Billion Gallons/Year)



After 2022 EPA determines volumes based on six criteria

* After 2012, the volumes of biomass based diesel are determined by a regulatory process.

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