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# Decarbonization Through Biofuel Use & Production

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REG RENEWABLE ENERGY GROUP

# Agenda

- Who We Are
- Our Products & Processes
- Environmental Impact
- Questions

# Who We Are

# Leading the Industry

- Renewable Energy Group (REG) is an international producer of cleaner fuels and North America's largest producer of biodiesel.

# Production And Distribution


**45+** TERMINALS

**12** BIOREFINERIES

**DELIVERED PRODUCT TO:**

**45** STATES

**6** CANADIAN PROVINCES

**10** COUNTRIES

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# Our Products & Processes

# What Is Biodiesel?

- A renewable fuel made from biological fats and oils, such as used cooking oil, distillers corn oil, etc.

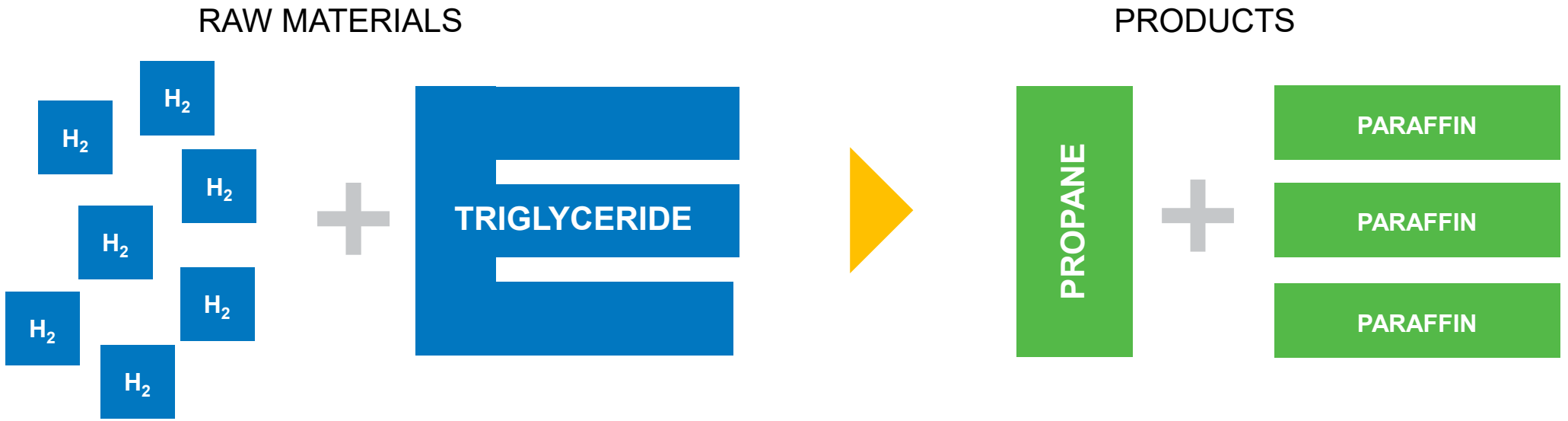

TRANSESTERIFICATION REACTION

# Benefits of Biodiesel

- Oxygenated fuel, which means:
  - Reduced tailpipe emissions
    - Sulfur, carbon monoxide, hydrocarbons and particulates
    - Burn fuel instead of losing it out the exhaust
  - Enhanced lubricity
    - Excellent for ULSD and Renewable Diesel
    - No lubricity additives needed with B2 or higher blends
- Comparable to vegetable oil for transport & handling requirements
- Can be blended at any level with diesel and Renewable Diesel
  - 20% is a common maximum for general purpose use
  - Higher quality biodiesel performs better with Renewable Diesel (CSFBT test)
  - BD/RD blends can have lower Freezing Points than straight RD

# What Is Renewable Diesel

- A renewable fuel composed of **hydrocarbons** that is made from biological oils and fats (**triglycerides**) by **hydrotreating**




HYDROTREATING REACTION

REG

# Benefits of Renewable Diesel

- Paraffinic fuel, which means:
  - Exceptional Cetane number
    - Cetane number is an indicator of combustion quality
    - Greater than 65 (Federal diesel specification limit is 40)
  - Reduced tailpipe emissions
    - In particular, NOx and carbon monoxide
    - Also particulate matter and total hydrocarbons
    - Virtually no sulfur
- Desirable Cloud Point
  - Cloud Point ranges from -10 °C to -15 °C
  - Winter pipeline specs for diesel are around -10 °C
- Can be blended at any level with diesel and biodiesel
  - Worth noting that straight RD is not the same as petro diesel, in spite of marketing claims that it is
    - Key aspects are very different
    - Examples: additive effectiveness, elastomer compatibility, density, and Freezing Point
  - Some users consider a 50% maximum

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# Environmental Impact

# Sustainability

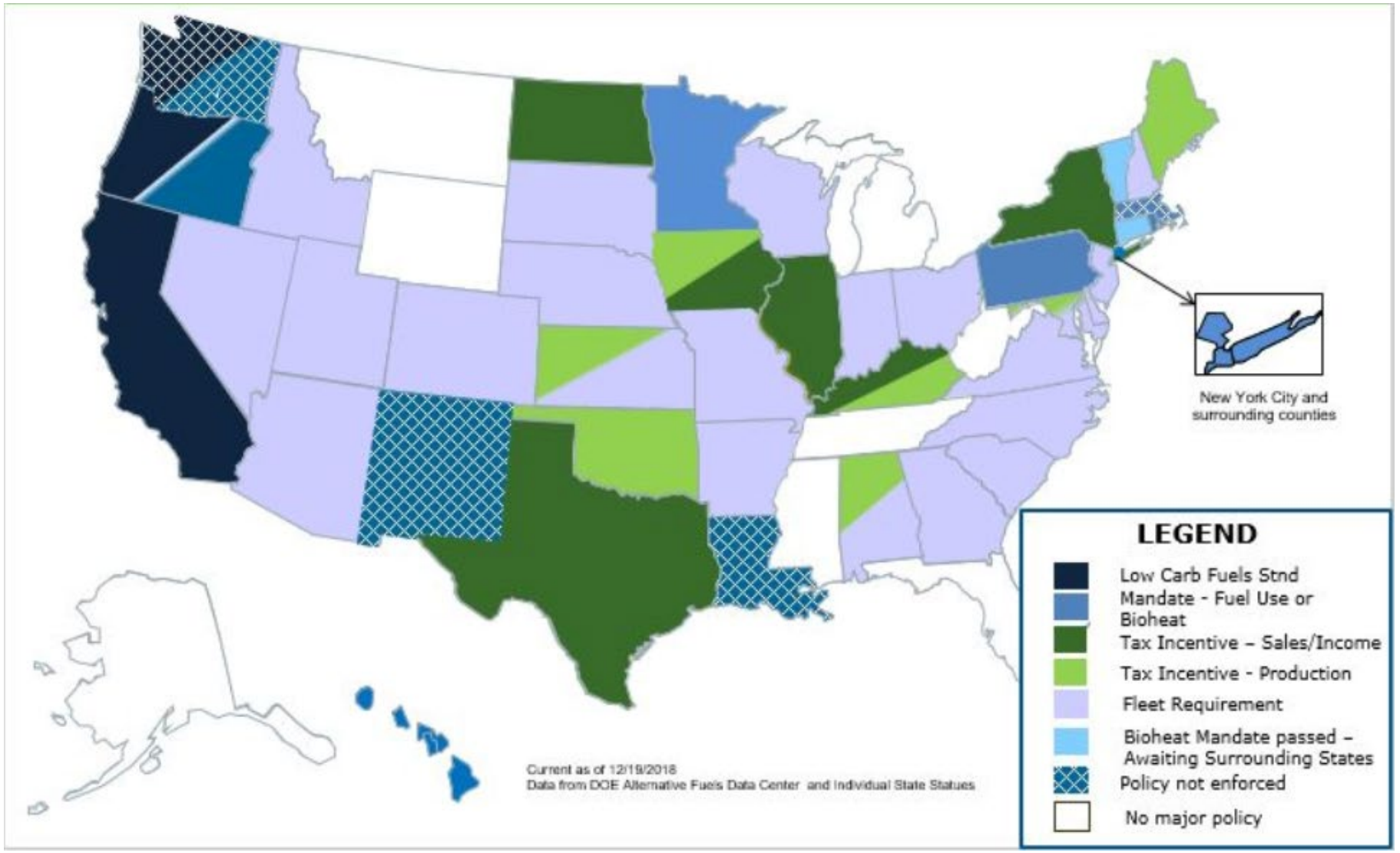
Transportation industry is largest source of emissions in U.S.[1]

Customers demanding sustainability

Regulatory push

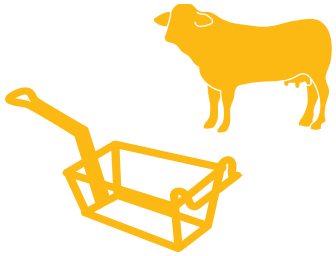
[1] https://rhg.com/research/preliminary-us-emissions-estimates-for-2018/

# States with Notable Low Carbon Policies



# Low Carbon Solution Available Now

## Providing Cleaner Fuel Solutions for Over Two Decades



**WASTE AND BYPRODUCT FATS AND OILS**
*Renewable Low Carbon Feedstock*

**5.5X ENERGY RETURN RATIO[1]**
*Proprietary Refining Technology*

**50 - 90% LOWER CARBON EMISSIONS[2]**
*Biodiesel (BD) & Renewable Diesel (RD)*


**DOWNSTREAM DISTRIBUTION**

*Growing Distribution Network*

Source:
1. NBB; Defined as units of energy returned per unit of fossil used for production
2. EPA Lifecycle Greenhouse Gas Emissions for Select Pathways

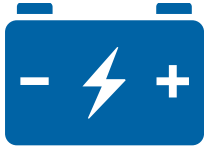
# Superior Carbon Reduction

REG Best-in-Class Biodiesel[1,2]

**PROVIDES CO2 REDUCTION OF**

88%
v. ULSD[2]

85%
v. CNG[2]



65%
v. EV and U.S. grid average electricity[2]

42%
v. EV and CA grid average electricity[2]

Note:
1: REG best-in-class biodiesel is UCO biodiesel from Albert Lea biorefinery
2: Carbon reduction based on life cycle analysis based on CA-GREET 3.0; utilized EV EER of 5.0 for heavy duty vehicles

# Reducing Carbon at Scale

**4.2 MILLION METRIC TONS**
**OF CARBON REDUCTION[1]**

**FROM 495 MILLION GALLONS OF BIOFUELS PRODUCED IN 2019**

## EQUIVALENT TO

GHG EMISSIONS FROM
**10.4 BILLION MILES**
DRIVEN BY AN AVERAGE PASSENGER VEHICLE[2]

$CO_2$ EMISSIONS FROM
**4.6 BILLION POUNDS**
OF COAL BURNED[2]

$CO_2$ SEQUESTERED BY
**5.5 MILLION ACRES**
OF U.S. FORESTS IN ONE YEAR[2]

$CO_2$ EMISSION REDUCTION FROM
**1.7 MILLION**
PASSENGER ELECTRIC VEHICLES ON THE ROAD IN ONE YEAR[3]

Notes:
1. Carbon reduction based on life cycle analysis of REG-produced fuels versus petroleum diesel.
2. epa.gov/energy/greenhouse-gas-equivalencies-calculator.
3. Assuming annual travel of 11,484 miles/year and national grid average electricity versus gasoline using CA-GREET 3.0.

# Carbon Reduction at REG

- Installation of automatic light switches
- Recycling efforts
- Using washable cups instead of disposable
- Wind Turbine for alternate power generation at Albert Lea
- Each plant within the REG network works on continuous improvement ideas to promote conscientious use of our resources

# What can you do?

- Run biodiesel in diesel engines
- Encourage local elected officials and municipalities to consider lower carbon biodiesel/RD alternatives
- Promote education/understanding of renewable fuels
- Limit power use at home
- Recycle/Reuse where possible

# Questions?

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