

# The Growing Role of Biodiesel

## 2004 Clean Cities Update



# **Biodiesel is a simple and effective alternative to Petroleum Diesel**

---

- ✓ **Runs in Diesel Engines**
- ✓ **Satisfies Mandates**
- ✓ **Reduces Emissions**
- ✓ **Reduces Oil Dependence**
- ✓ **Meets 2006 Standards**
- ✓ **Stimulates Our Economy**



# Biodiesel Runs in Any Diesel Engine Without Modification

---

- Specify D6751-02
- Specify cloudpoint
- Use 20% blend, B20
- Does not Void Warranty
- Pay .25-.30 per gallon
- Pour into tank
- Schedule early filter change
- Resume business as usual



Rudolph Diesel

# How does Biodiesel Perform? Better than Petroleum Diesel Fuel

---

- High Cetane- exceeds premium diesel std.
- High lubricity- B1 makes diesel slippery
- Comparable BTU content- power and mpg



# What does World Energy know about biodiesel's current role?

---

- Supplier for most American fleets
- Largest biodiesel capacity in the U.S.
- Strategically allied with Gulf Oil
- Nation-wide local distribution network
- Longest cold-weather experience

# What Is Driving the Switch to Biodiesel?

---



# Opportunity to Reduce Petroleum Dependence

---

- Displace 302 million barrels/yr crude oil by 2016
- Displace 2.9 billion barrels of crude by 2016
- Reduce imports from 70 percent to 65 percent by 2016

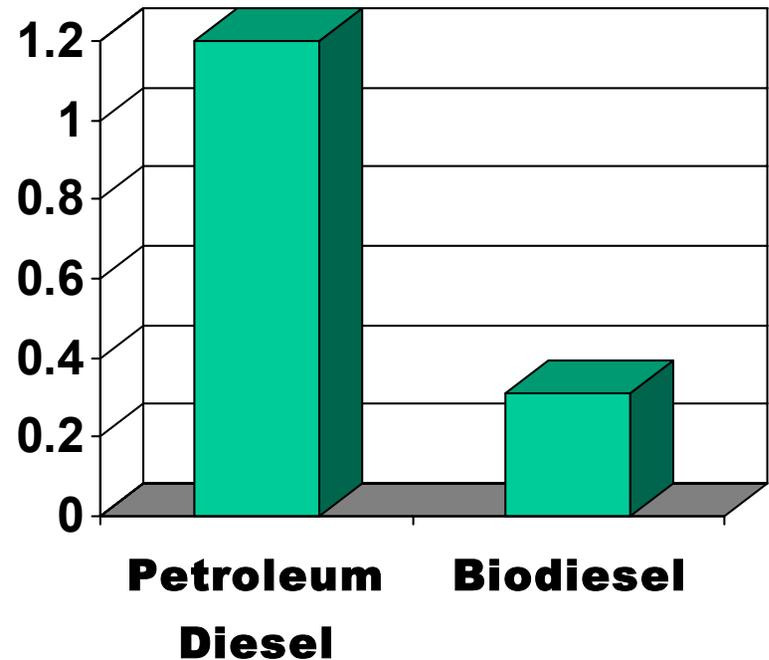


# Truly Renewable Power Source

---

- Biodiesel yields 3.2 units of fuel energy for every unit of fossil fuel consumed in its life cycle.
- Petroleum diesel yields 0.83 units of fuel energy per unit of fossil energy consumed.

**MJ Fossil Used per MJ Fuel**



# Regulatory Compliance

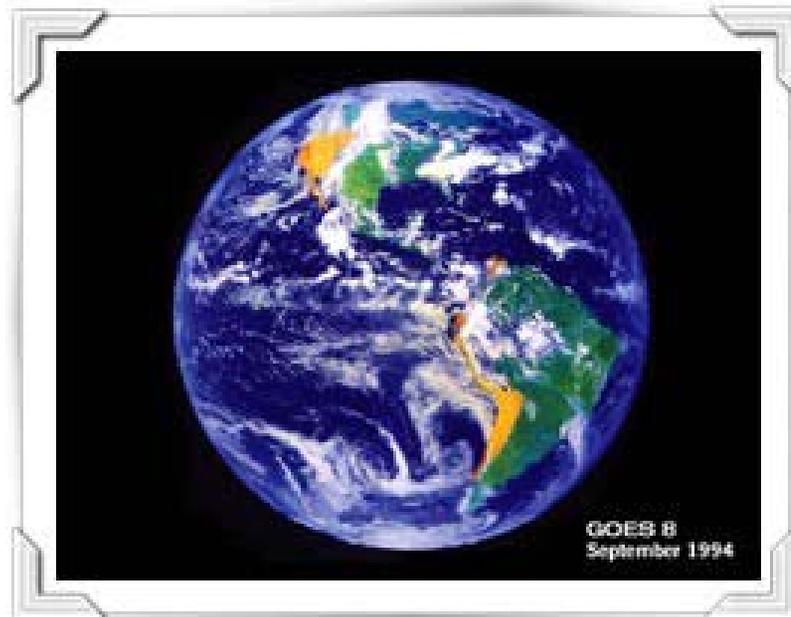
---

- EPA Act:
  - 2250 gallons of B20 = 1 vehicle (\$563 at .25)
- Limited to 50 percent of compliance
- Executive Order 13149
  - 20 percent petroleum reduction

# Slow Down Global Warming

---

- 78 percent reduction per US Department of Energy and US Department of Agriculture
- 15.66% reduction for B20 blends



# Stimulate the US Farm Economy

---

- Soybean oil demand increase from 51 million bushels to 318 million bushel
- \$7.8 billion reduction in direct payments to farmers
- \$63.4 billion improvement in US trade deficit
- \$100 billion increase in net farm income



# Meet EPA 2006 Standards for Clean Diesel...

---

- Soy Biodiesel at 0-1 ppm sulfur.
- Specify 15 ppm standard for blend
- Zero aromatics



## ... With Improved Lubricity

---

Lubricant	<u>HFFR</u> (microns)
None	536
<b>1% Biodiesel</b>	<b>321</b>
Additive 1	338
Additive 2	398
Additive 3	343
Additive 4	348
Additive 5	515



# Emissions Reductions

---

## **B20 emissions reductions compared to petroleum diesel:**

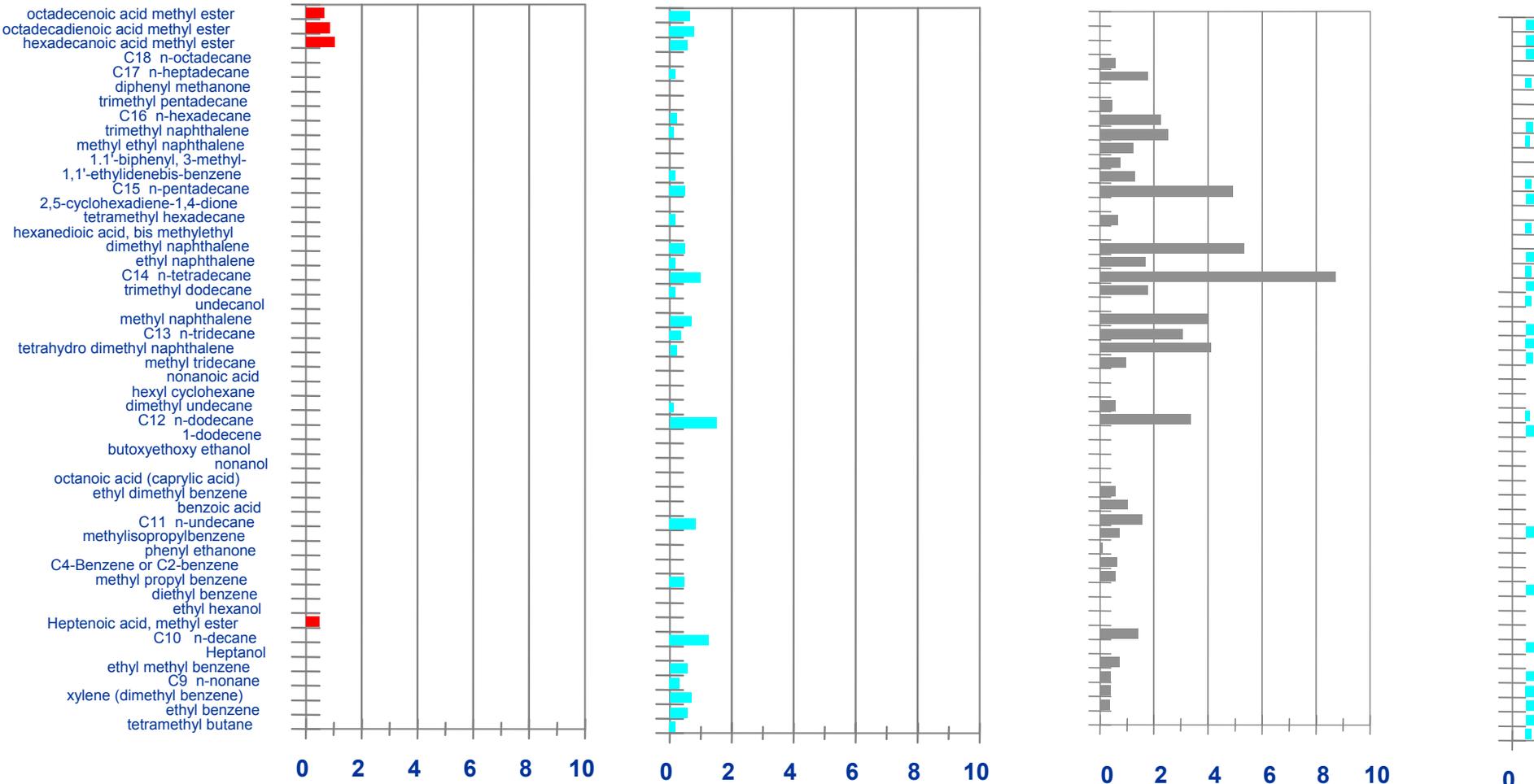
- Carbon monoxide -16%
- Unburned hydrocarbons -21%
- Particulate matter -10%
- Sulfates -20%
- NPAH -50%
- Mutagenicity -20%

# HEAVY HC SPECIATION - CUMMINS N14 ENGINE

B100

B20

2D



Tier I Health Effects Data  
supplied by SWRI, 1997-8

RELATIVE EMISSION RATE (MG/HP-HR)

# NO<sub>x</sub> Reductions

---

- Fuel alone is insufficient
- Compatible with All Clean Diesel Technologies
- Amenable to timing retards, EGR, retrofits
- OEM's now developing fuel sensors

# Public Health Risk Reduction

---

- Lovelace Research Institute 211(b) test results
- **NO** pronounced toxicity at any level (B100)
- **NO** mortality or clinical abnormality
- **NO** neurotoxic or internal pathologic response
- **NO** adverse effect on fertility and reproductive systems
- Corroboration of Tier I findings concerning decreased mutagenicity activity in living organisms

# Pure Biodiesel is Safer to, Burn and Spill

---

- B100 reduces toxicity to marine life by 20x
- Flashpoint over 300 F
- Less Toxic than Table Salt
- B20 biodegrades twice as fast as petroleum diesel



# Who is Already Using Biodiesel?

## Sensitive Locations

---

- Aspen
- Yellowstone NP
- Northstar at Tahoe
- Glacier NP
- Breckenridge
- Channel Islands



# Who is Already Using Biodiesel?

## Utility Fleets

---

- Commonwealth Edison
- San Diego Gas & Electric
- Florida Power & Light
- Madison Gas & Electric
- Alabama Power
- Georgia Power
- Reliant Energy

# Who is Already Using Biodiesel?

## Government Fleets

---

- Transit of Northern Kentucky
- The US Post Office
- US Dept. of Agriculture
- North Carolina, Ohio, Michigan DOT's
- The State of Alabama, Oregon
- Las Vegas fleets- city, school, etc.
- City of Berkeley

# Who is Already Using Biodiesel?

## Military Fleets

---

- Malmstrom AFB
- Peterson Air Force Base
- Camp Pendleton USMC
- The US Navy
- Scott AFB
- Manchester Fuel Depot

# References

---

- National Renewable Energy Laboratory, “Life Cycle Inventory of Biodiesel and Petroleum Diesel for Use in an Urban Bus,” prepared for US Department of Energy’s Office of Fuels Development, May 1998
- John Urbanchuck, “An Economic Analysis of Legislation for a Renewable Fuels Requirement for Highway Motor Fuels,” AUS Consultants, November 2001
- Randall Von Wedel, “Technical Handbook for Marine Biodiesel,” prepared for National Renewable Energy Laboratory, April 1999

# References

---

- Tier 1 Environmental Effects Testing for Biodiesel, conducted by Southwest Research Institute, March 1998
- Tier 2 Testing of Biodiesel Exhaust Emissions, conducted by Lovelace Respiratory Research Institute, May 2000

# World Energy Alternatives, LLC

---

## Corporate Headquarters

90 Everett Avenue

Chelsea, MA 02150

Tel 617.889.7300

[www.worldenergy.net](http://www.worldenergy.net)

## Western U.S.

408 Broad St., #11B

Nevada City, CA 95959

(530)478-9196

## Southern U.S.

410 Pierce St.

Houston, TX 77002

(832)615-7390