

# Clean Diesel Powering the Future

*Remarks to the Northeast Diesel Collaborative  
September 12, 2013*

*Allen Schaeffer  
Executive Director*



# Our Members are the Leaders in Clean Diesel Technology

AGCO  
BP  
BorgWarner  
BOSCH  
Caterpillar Inc.  
Chrysler  
Cummins Inc  
Daimler  
Delphi Diesel Systems  
Deere & Company  
Ford Motor Company  
General Motors  
Honeywell  
Johnson Matthey

Mazda North American  
Operations  
Navistar  
Terra Environmental  
Volvo Group  
Volkswagen of America  
Yanmar

## ***Allied Members***

Association of Diesel  
Specialists  
National Biodiesel Board  
Western States Petroleum  
Association

# The Northeast is Rich in Diesel History

# The Northeast has been a leader in advancing Ideas, Policies, Research, Testing on Diesel

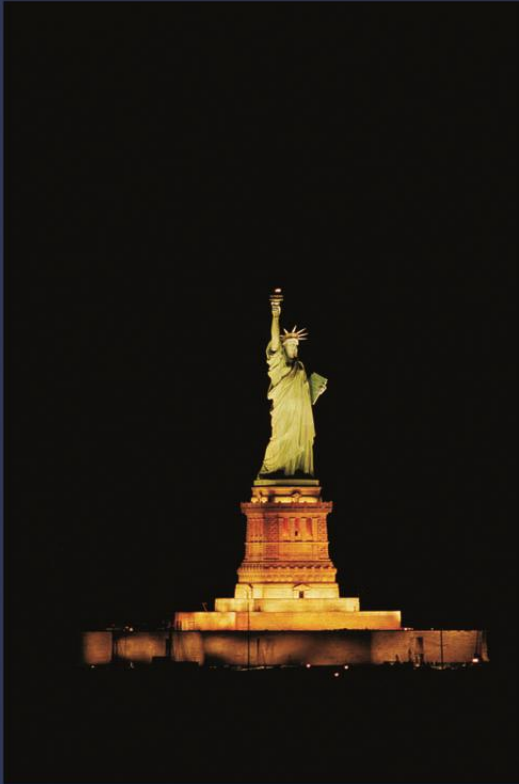
- Diesel Opacity Testing -- I/M programs
- Boston “Big Dig”
- NYC WTC Ground Zero Recovery and Rebuilding
- NYC-MTA buses



# Northeastern States have relied on diesel power during unique times



## 10 Seconds



When grid power went off - diesel power came on.

Within 10 seconds, diesel back-up generators kept hospitals running, 911 emergency call centers operating, local phone networks functioning, news operations broadcasting and planes landing safely. From Main Street to Wall Street, diesel generators meant "open for business."

America depends on efficient, reliable power from diesel engines. On land or water, diesel powers the nation's vital industries - farming, construction and the movement of goods and people.

Diesel even kept the lights shining brightly at the Statue of Liberty.

[www.dieselforum.org](http://www.dieselforum.org)

## August 2003: When Grid Power Went off...Diesel Power came on



ISAT GeoStar 45  
23:15 EST 14 Aug. 2003

# Diesel Power for Grand Central Station

- Governor Andrew M. Cuomo today announced the completion of a project to install two new emergency diesel generators at New York City's Grand Central Terminal to help power emergency safety systems in the event of a blackout.
- ...is part of a series of measures authorized by Governor Cuomo to bolster the state's critical infrastructure against future extreme weather events like Superstorm Sandy and other potential threats to public safety.
- **“Anyone who has ever experienced a power failure will recognize the invaluable service these emergency diesel generators would provide Grand Central commuters during a blackout,” said Governor Cuomo.** “Emergency preparedness has been a top focus of my administration for protecting New Yorkers in case of extreme events, including those impacting the power grid. The backup generators will provide an additional element of safety and security for this iconic transportation hub—one of the busiest train stations in the country.”



# CLEAN DIESEL

The Technology

The Journey

The Future

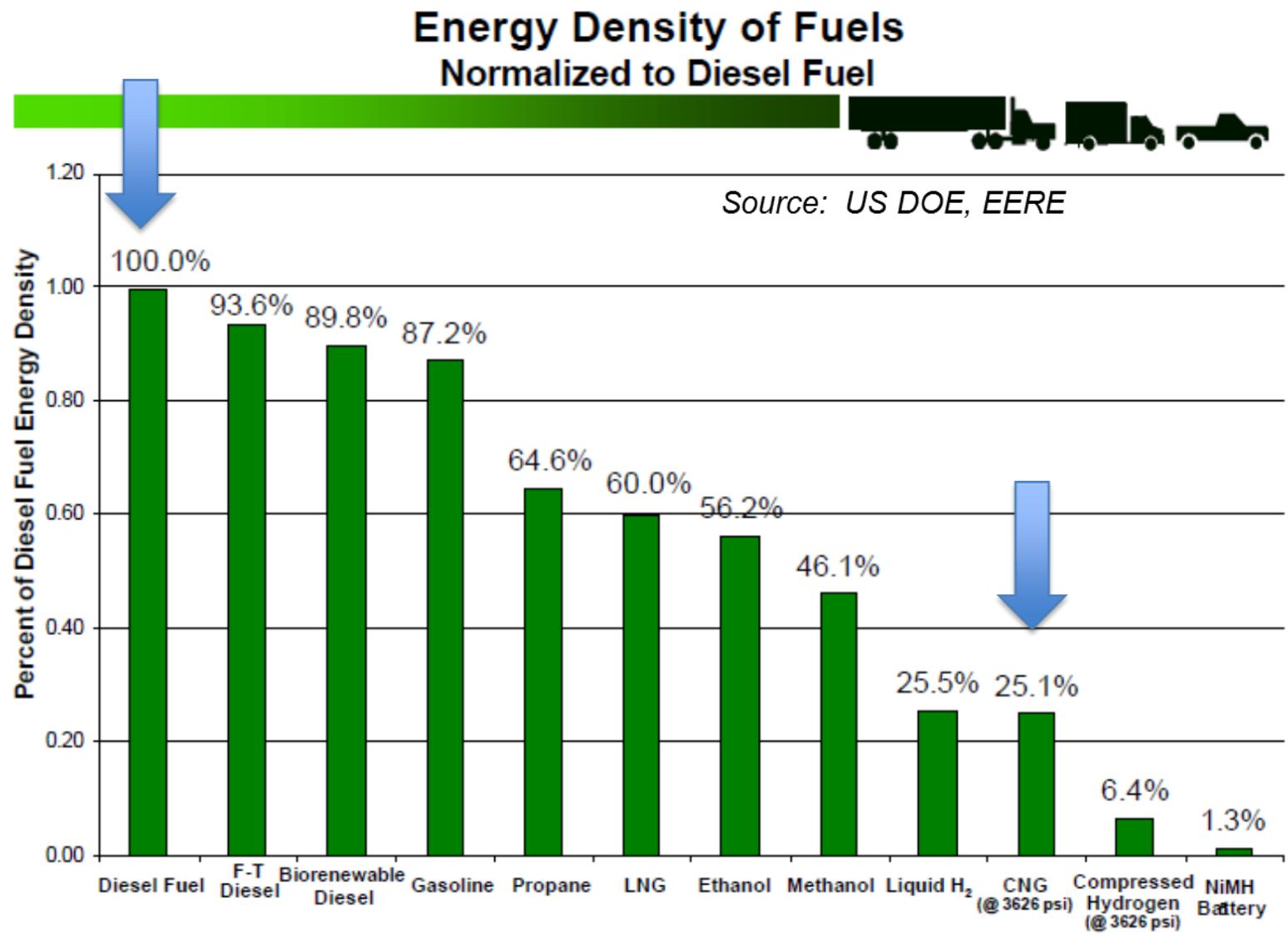


# Why we're still talking about DIESEL today...

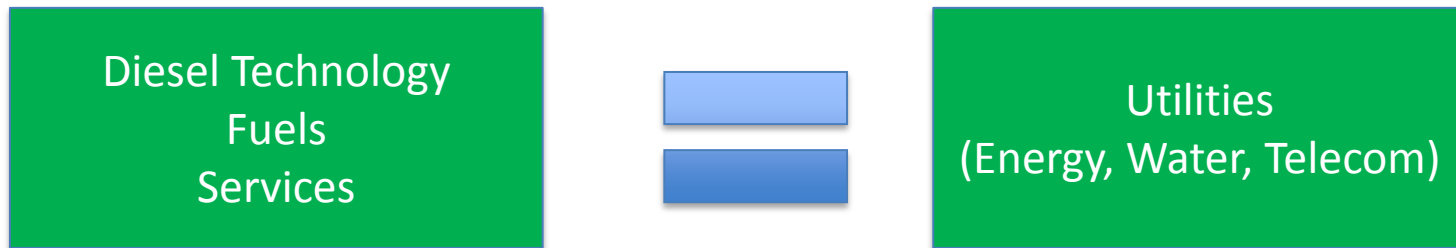
- The most energy efficient internal combustion engine and energy-dense liquid fuel
- Proven performance, reliability, durability, availability is **why diesel plays predominant role in 16 key sectors of the economy**
- Transformation to low-emissions, its renewable fuel and hybrid capabilities position **diesel technology as a sustainable energy strategy for the future**



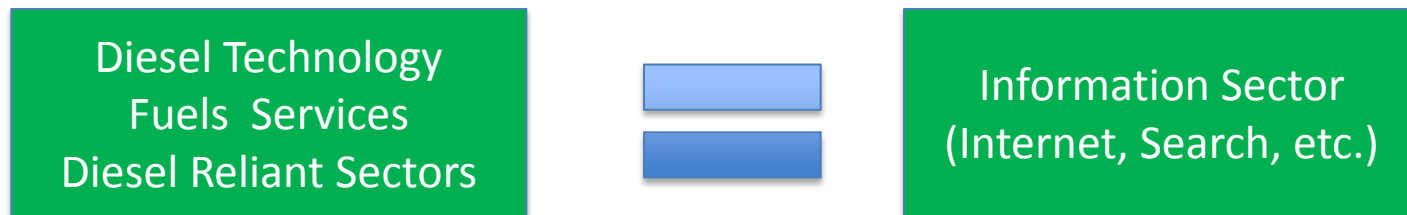
# DIESEL'S ENERGY DENSITY STANDS OUT



# Economic Powerhouse: Diesel Power Facilitates Large Share Of U.S. GDP 4.5 %



- *Diesel technology, fuels and services produced about the same as the **Utilities** (energy, water, telecommunications) GDP share*



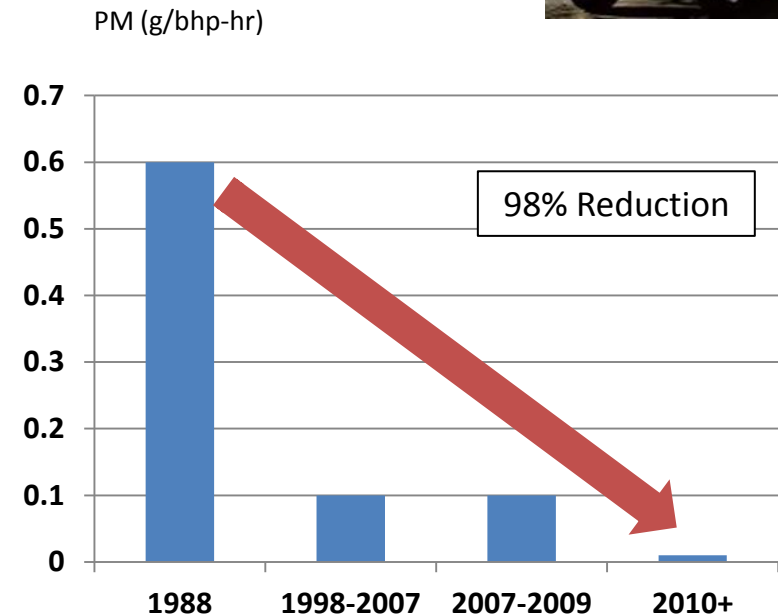
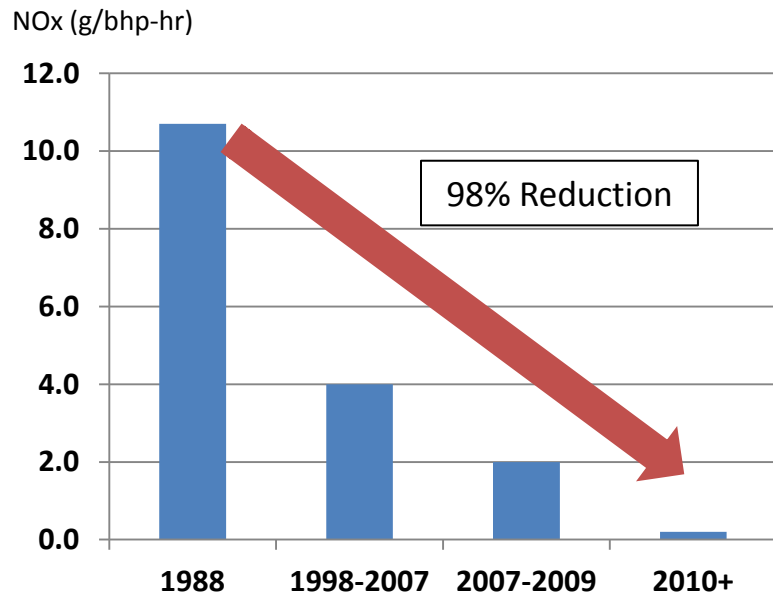
- *The total of technology, fuels, services and diesel-reliant sectors is about the same as the **Information sector**—about 4.5% of US GDP*



# THE JOURNEY *HEAVY DUTY VEHICLES*

# Clean Diesel Trucks Support Emission Reduction and Energy Independence

New clean diesel engines have reduced NOx and PM emissions by more than 95% over the last 25 years.



\*Actual standard is NMHC\*NOx with a 0.5g/bhp\*hr maximum on NMHC

National  
Average

29%

#1 State:  
Indiana

44%

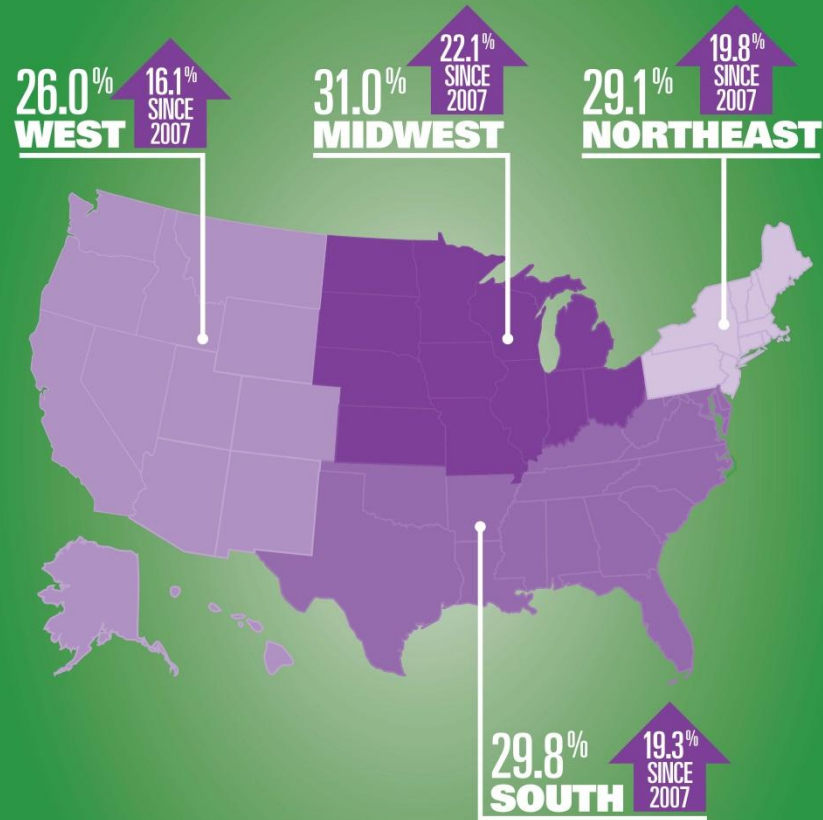


**11 percent** of all commercial trucks on the road today are **2010 model or newer**



## Share of Clean Diesel Trucks on the Road Today

Percentage of Class 3-8 vehicles that met or exceeded 2007 U.S. EPA Emission Standards in 2012



Weight Class 3-8 Vehicles





**GREAT TASTE!**



**FEWER EMISSIONS!**

“We estimate that the hamburger’s contribution of particulate matter to ambient atmosphere is **twice that of all the on-road diesel vehicles**. You’d have to drive a diesel truck **143 miles** to generate the same amount of particles as cooking a **single 1/3 lb. burger**.”

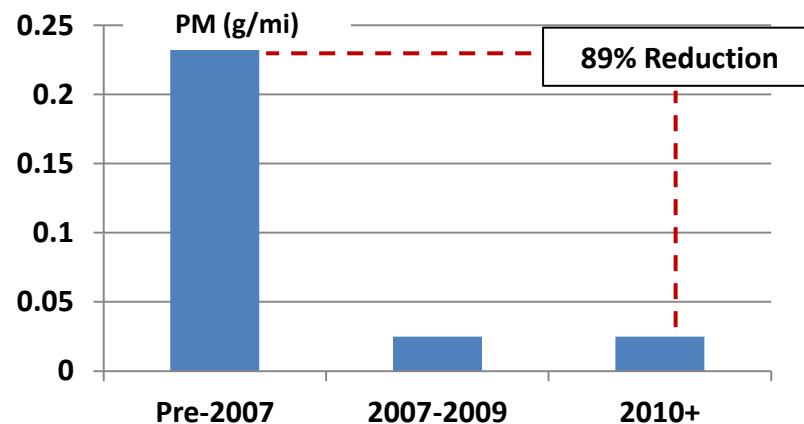
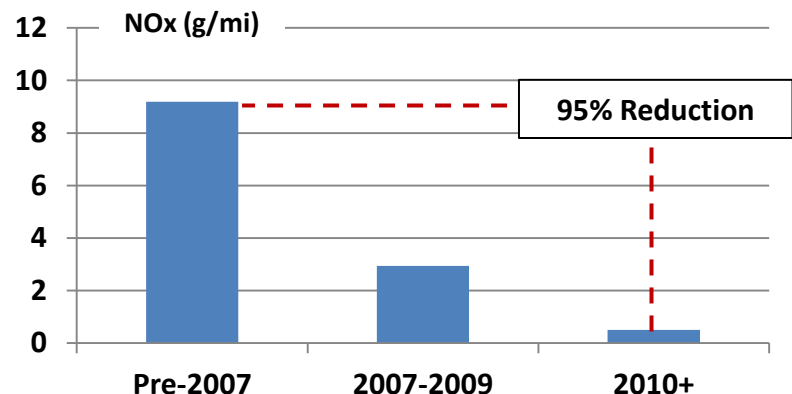
“It’s really a testament to the advances in technology in diesel engines,” said Bill Welch, the school’s principal investigator.

- New York Times, September 25, 2012

# New clean diesel engines in class 8 trucks save ~\$3,500/year in fuel costs.

## Class 8 Line Haul Savings from clean diesel

Savings to the new clean diesel buyer	Per Year
Average vehicle miles traveled	125,000
Fuel savings - gallons	875
Fuel savings - bbl	21
Fuel cost savings @ \$4.00/gal	\$3,500
CO <sub>2</sub> savings – metric tonnes	8.9
NO <sub>x</sub> savings – metric tonnes	1.1
Particulate matter savings – kg	26



EPA estimates for in-use distance based output. Phase-in for 2004 and 2007 rulemaking is averaged across 2007-2009 and 2010 and beyond respectively. Pre-2007 estimates are based on an estimate of all vehicles in operation before 2007.



# The Benefits of the new generation Clean Diesel Heavy Duty Trucks are ... striking

**The 1.9M heavy-duty diesels introduced from 2007 through 2012 have saved the American consumer:**

5.7M tonnes of CO <sub>2</sub>	560M gallons of diesel	13.3M barrels of
crude oil	1M tonnes of NOx	27,000 tonnes of PM

**These reductions are equivalent to:**

- **NOx emissions from 105 coal power plants**
- Removing the CO<sub>2</sub> emissions from 1.2M light-duty vehicles from the road for one year
- Removing NOx emissions from 87M and PM from 225M light-duty vehicles for one year
- Carbon sequestration from 4.6M acres of forests or a forest half the size of Maryland
- Removing the annual CO<sub>2</sub> of 24,000 railcars of coal stretching continuously from New York City to Washington, DC
- Roughly 5% of the Strategic Petroleum Reserve for sweet crude.

# Future Heavy-Duty Trucks: Balancing New Fuel Efficiency Standards & Near Zero Emissions

## **New commercial diesel trucks (2014-2018) will be getting even more fuel efficient**

- \* EPA/NHTSA GHG rules for HD trucks require anywhere from 6 % to 23 % reductions in fuel consumption by 2018 (3 classes of vehicles, - pickup trucks/vans, vocational and tractors)
- \* Combinations of engine and vehicle technologies deployed phase 1

## **Phase 2 – 2014-2018 Significant challenges to achieve future fuel economy gains**

- \* Meeting near-zero emissions of NOx with lower CO2 Reductions gets harder– future standards
- \* Further changes in NOx emissions challenge ability to meet future fuel economy requirements.



# THE JOURNEY

## *LIGHT DUTY DIESEL CARS AND TRUCKS*

***“The only thing wrong with the compression-ignition engine is it was invented in 1893. If it had been developed by Elon Musk last year, Congress would be drafting legislation requiring every auto maker to offer diesel engines.”***



*Drew Winter, Editor-in-Chief for Wards Auto,*

# Light Duty Diesel is Taking Off



**Chevy Cruze 46 mpg highway;** highest fuel economy of any non-hybrid vehicle in US

- Sales up 41.8% compared to Aug. 2012
- Market Share under 3 %; Forecast: 10% of the market, or roughly 1 million vehicles by 2018 or 2020
- Clean diesel is a key strategy for meeting 54.5 mpg CAFÉ by 2025.
- Number of choices today (22) to double in 18 months

# Are Northeasterners embracing diesel cars?

## States with Fastest growing diesel car sales 2010-2012

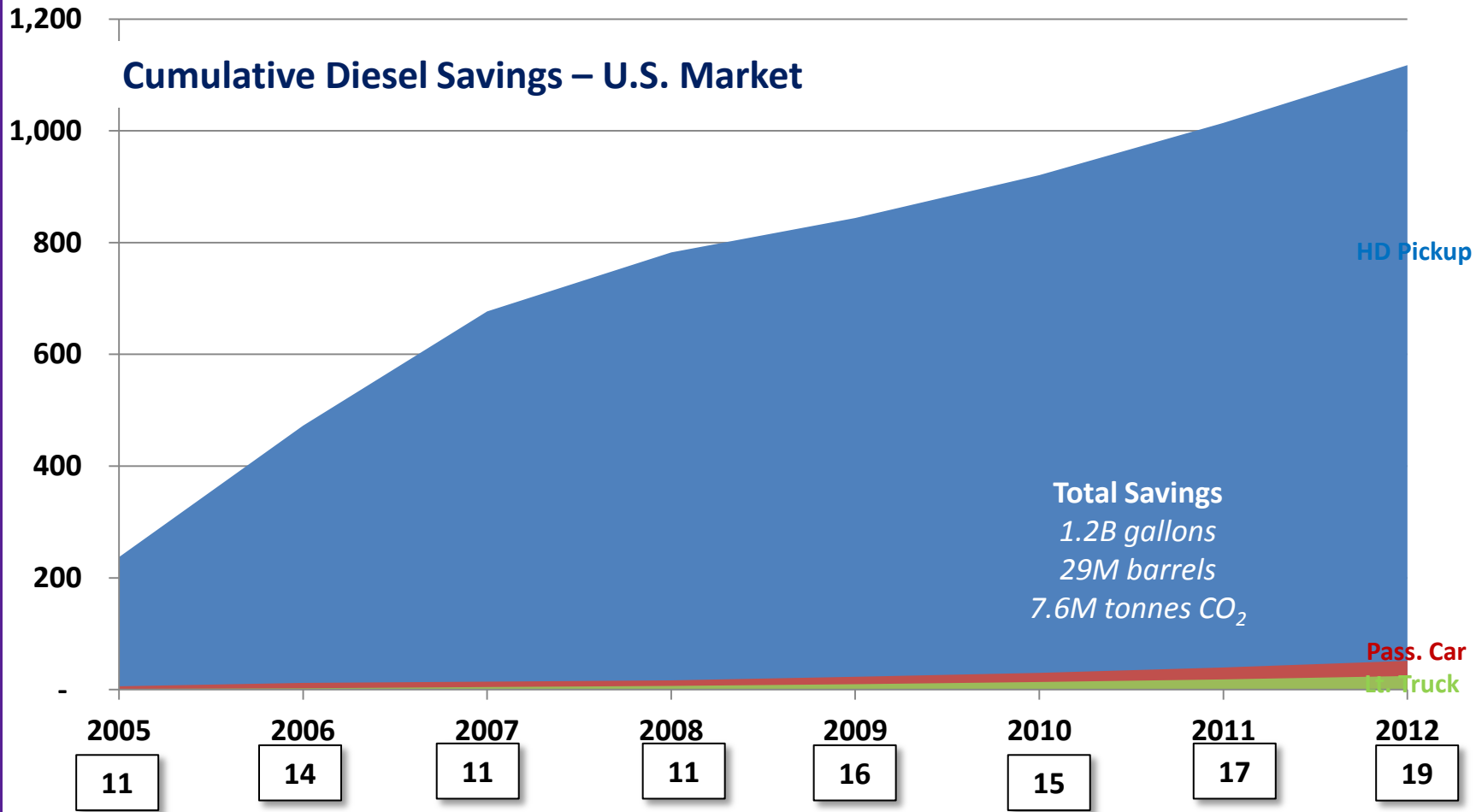
1. California
2. New York
3. Massachusetts

## 2012 Top 10 Highest Percentage Diesel Cars and SUVs State Percent

- 1) Alaska
- 2) Washington  
Montana  
**Vermont**
- 3) **New Hampshire**  
Wyoming  
District of Columbia
- 4) Maryland  
Colorado  
**Connecticut**  
Utah  
New Mexico  
Idaho  
**Maine**  
Delaware

# Diesel engines sold between 2005 and 2012 have saved ~1.2B gallons of fuel.

Million Gallons



Number of Models

Total savings for cars, light trucks, and HD pickups  
 Assumes average VMT of 15,000 miles/year

Gasoline = 8,887gCO<sub>2</sub> /gal.  
 Diesel = 10,180gCO<sub>2</sub> /gal.



[www.dieselforum.org](http://www.dieselforum.org)

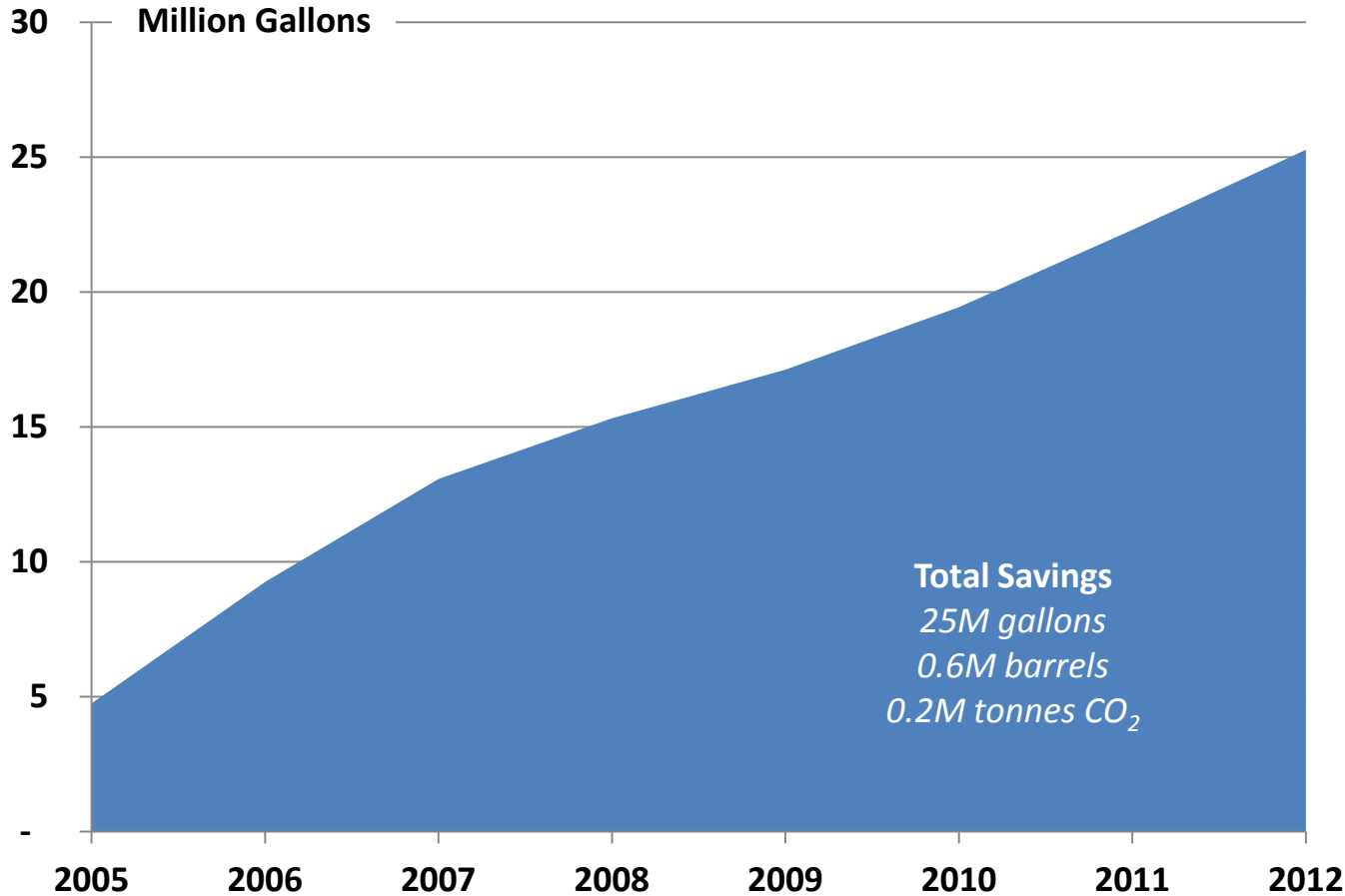
## Putting the numbers into perspective...

- The 2.9M light-duty new technology diesels introduced from 2005 through 2012 have saved the American consumer:
  - 7.6M tonnes of CO<sub>2</sub>
  - 1.2B gallons of gasoline
  - 29M barrels of crude oil
- These reductions are equivalent to:
  - Removing 1.6M vehicles from the road for a year
  - Carbon sequestration from 6.2M acres of forests
    - This is an equivalent forest the size of Vermont
  - Removing the annual emissions from 2.2 coal fired power plants
    - 32,000 railcars of coal stretching continuously from Boston to Philadelphia
  - Societal savings of \$250M based on U.S. government value of CO<sub>2</sub> (\$33/ton)
  - Roughly 11% of the Strategic Petroleum Reserve for sweet crude.

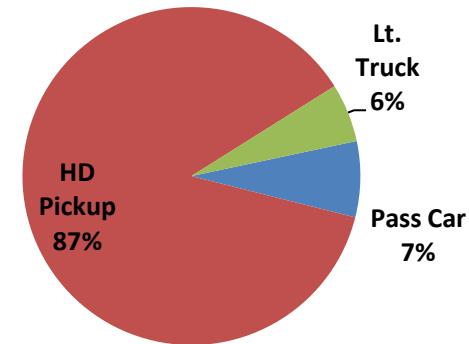


# New diesel vehicles have saved the state of New York consumers 25 million gallons of gasoline since 2005.

## Cumulative Diesel Savings – New York



### Benefits by Vehicle Type



Total savings for cars, light trucks, and HD pickups  
 Assumes average VMT of 15,000 miles/year

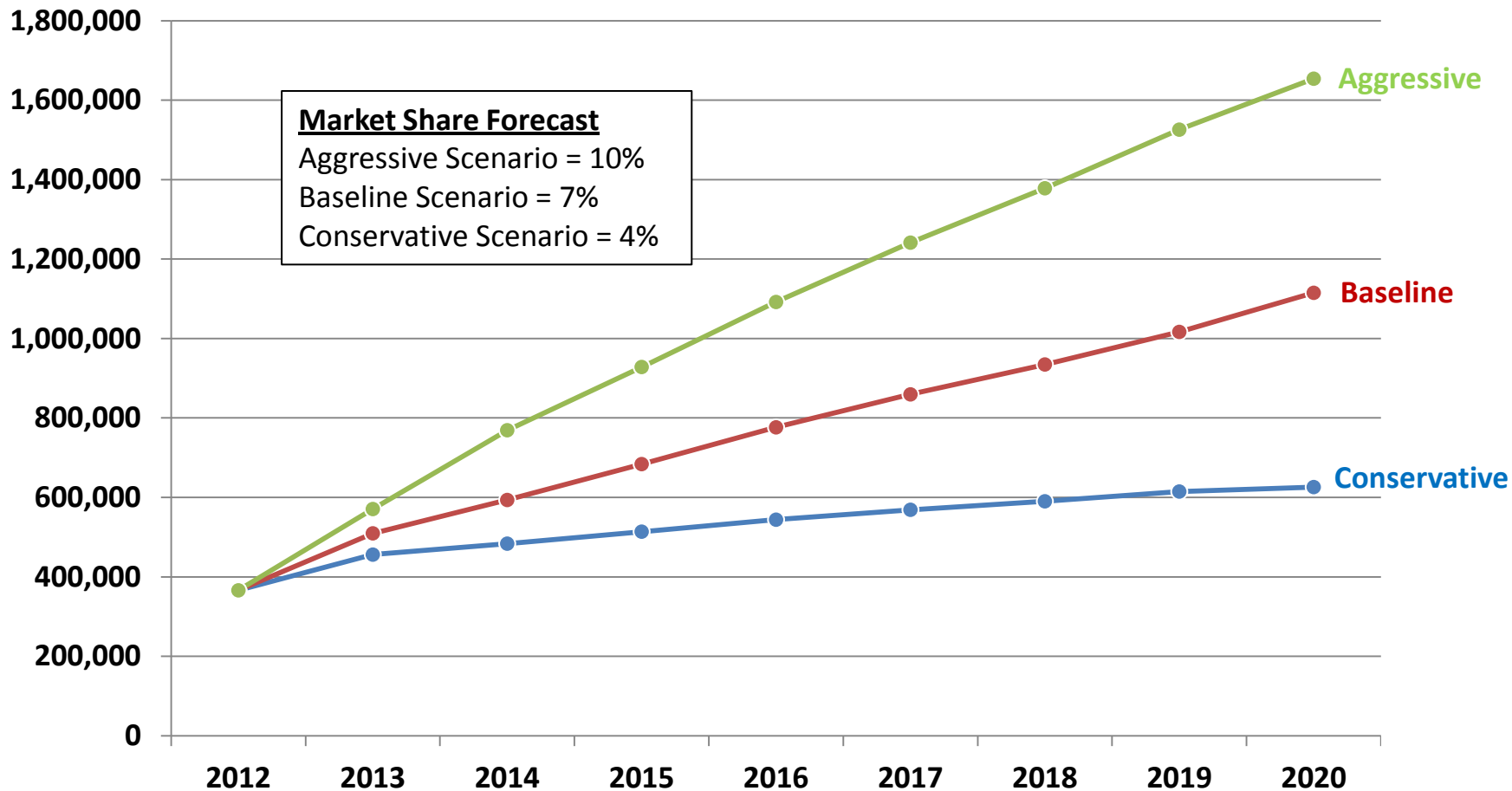
Gasoline = 8,887gCO<sub>2</sub> /gal.  
 Diesel = 10,180gCO<sub>2</sub> /gal.



Baseline assumptions for diesel engine growth yield a 7% market share and over 1M new diesel sales per year by 2020.

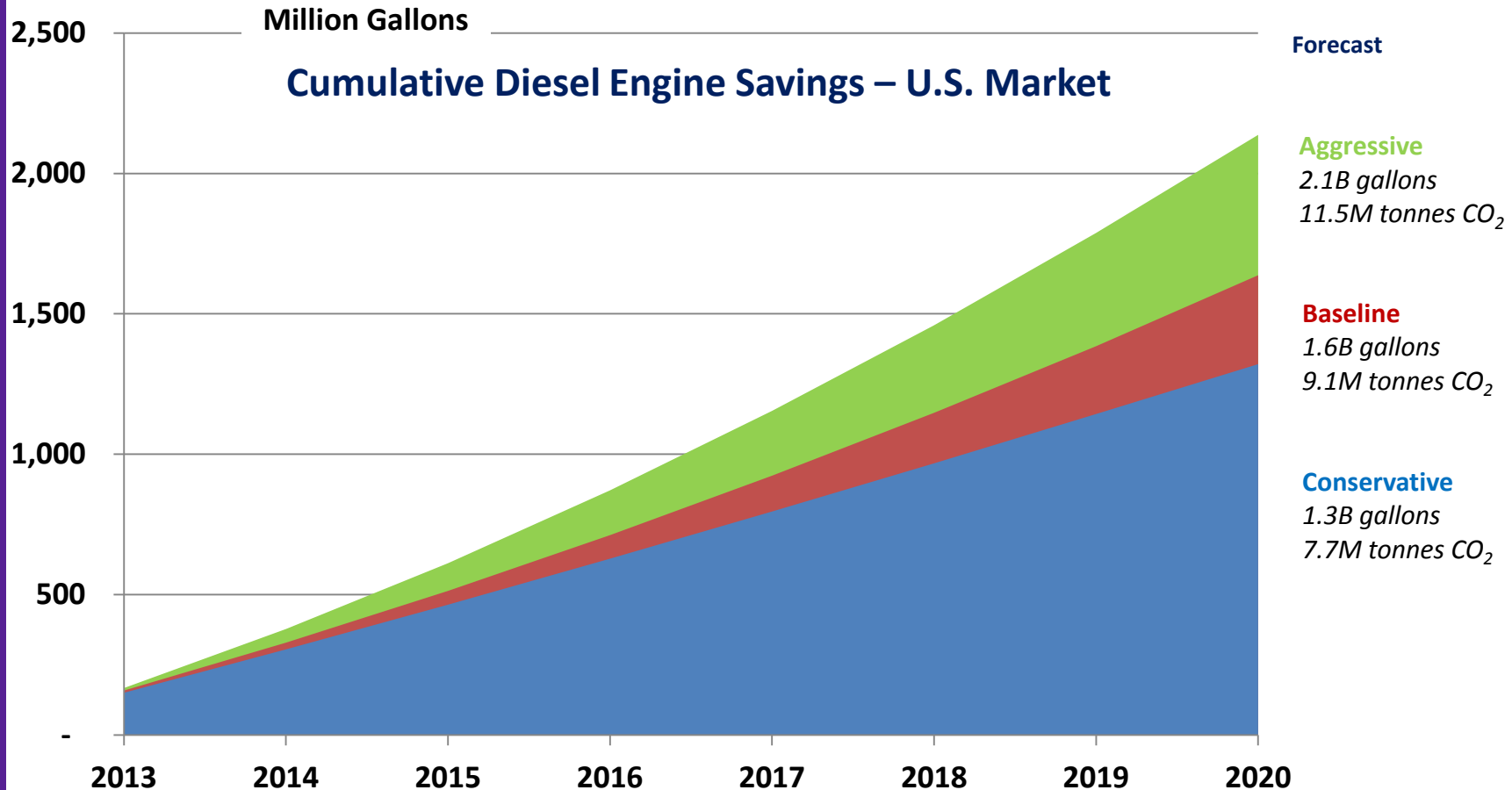
Forecast ■

## New Clean Diesel Engine Sales Forecast – U.S. Market



Total sales for cars, light trucks, and HD pickups based on future EPA compliance paths, fuel requirement changes under RFS2 and ARB LCFS and announced OEM diesel vehicle introductions.

# Forecasted savings for new diesels: 1.3-2.1B gallons of gasoline saved.



Total savings for cars, light trucks, and HD pickups  
Assumes average VMT of 15,000 miles/year

Gasoline = 8,887gCO<sub>2</sub> /gal.  
Diesel = 10,180gCO<sub>2</sub> /gal.



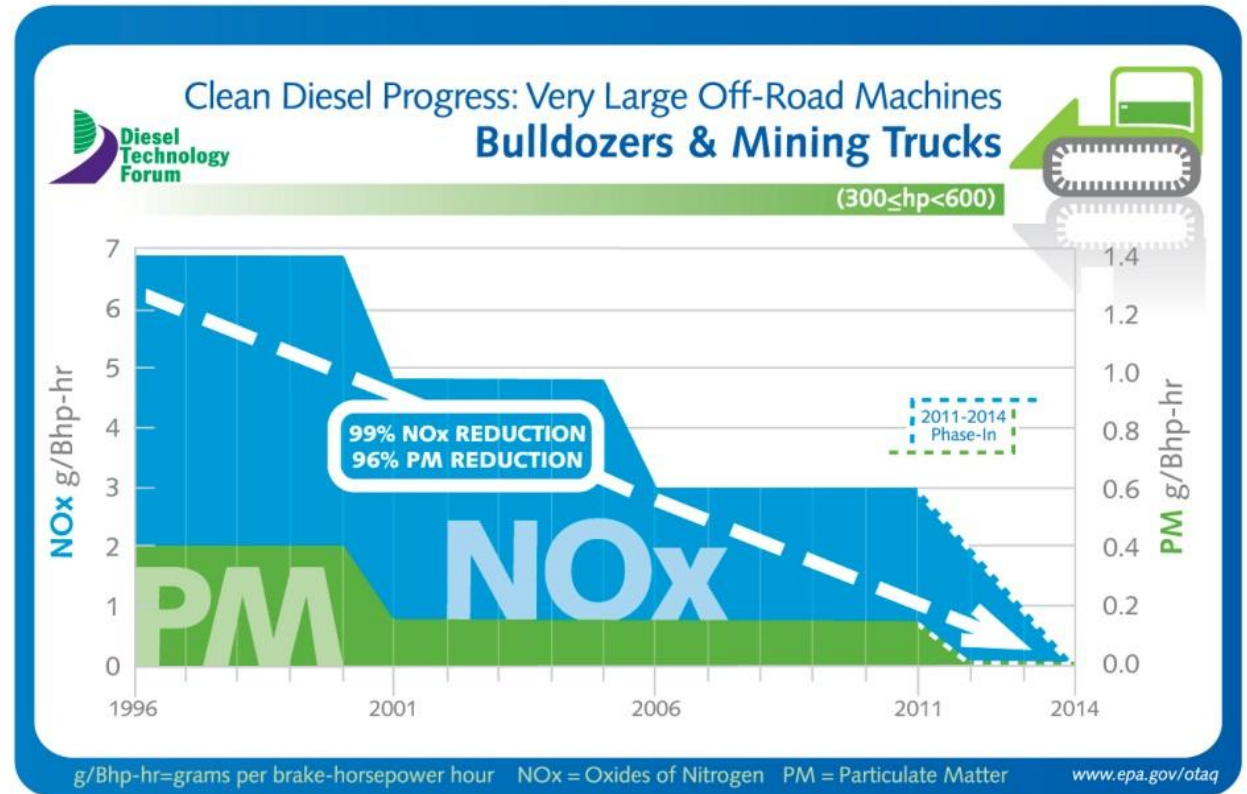
[www.dieselforum.org](http://www.dieselforum.org)



# *THE JOURNEY OFF HIGHWAY ENGINES & EQUIPMENT*

# Tier 4. Final. 2014 milestone for large diesel engines in Off-road and Marine applications

Marine and large engines for construction equipment



# The Tier 4 Final

## A harder journey over shorter time.



- Meeting the same near-zero standards as on-highway, but in about 1/3 less time
- While HD Class 8 Trucks all use SCR-based emissions controls, off road engines and equipment types use a variety of emissions technologies
  - Some Tier4 engines do not have exhaust after-treatment; some have catalysts, some use SCR
  - Training for operators required with some systems and filter regeneration



**THE FUTURE**  
***CO2 IS THE NEW NOX AND PM***

# The Journey Continues . . .

## Emissions

Safety  
energy efficiency

More economical  
than Gasoline

The fuel of work

Europeans  
embrace diesel  
cars to reduce CO<sub>2</sub>



## Meet Clean Diesel

Ultra low sulfur  
diesel

Global demand for  
diesel changes  
economics

Resurgence in US  
passenger cars



## Energy Efficiency A key strategy for GHG/CO<sub>2</sub>

**Fuel Diversity**  
Biodiesel  
& Renewable  
Low-carbon fuels

Diesel #1 Global  
Transport Fuel

Diesel cars 10 % all  
vehicles

Hybridization



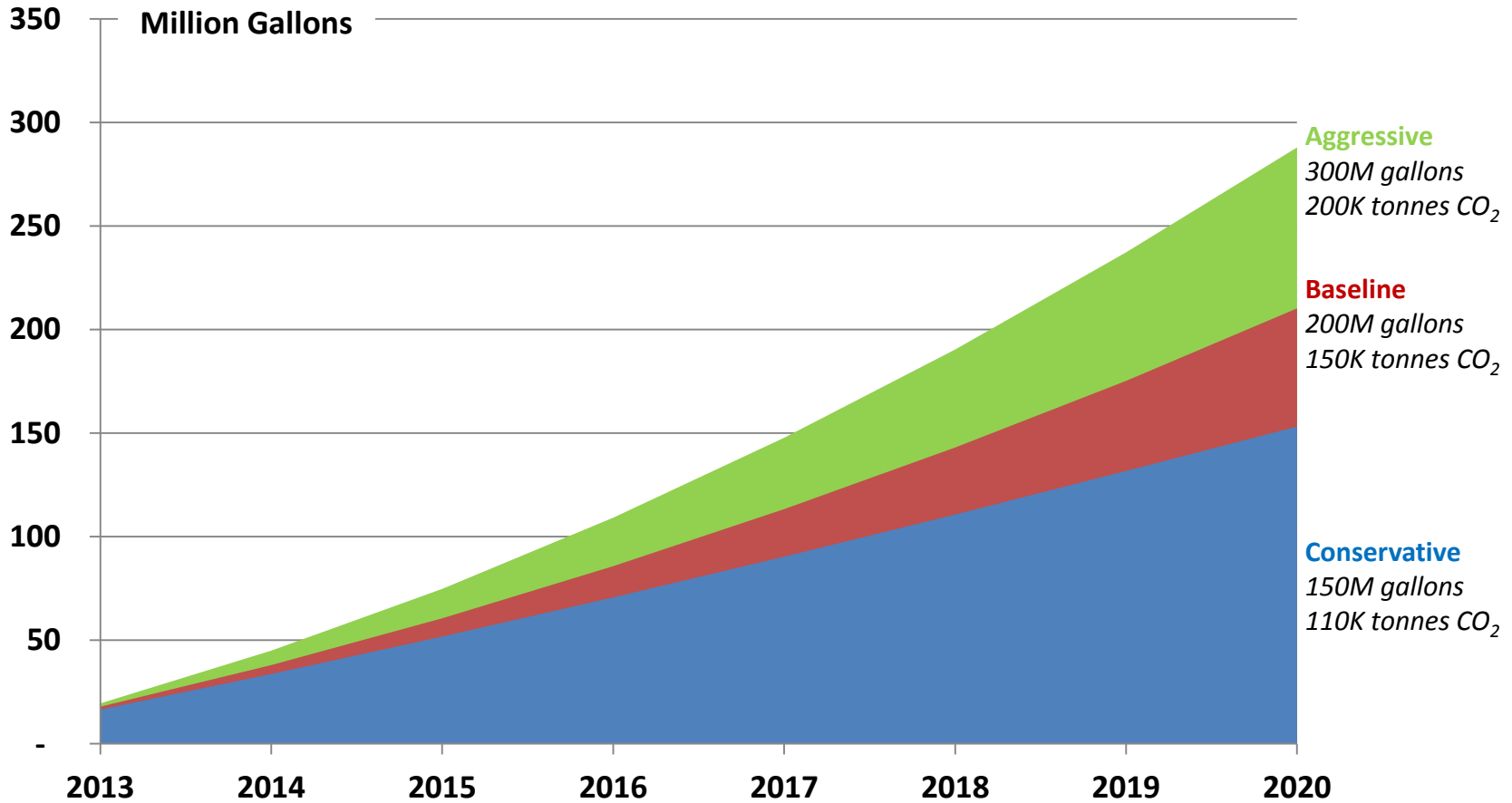
# Enhancing Efficiency and Sustainability of Diesel Power: hybridization and fuel diversity



If all new light-duty diesel vehicles are fueled with B5 biodiesel, the US will save an additional 150-300M gallons as compared to diesel fuel alone.

Biodiesel ■

### Cumulative B5 Biodiesel Fuel Savings – U.S. Market



Total savings for cars, light trucks, and HD pickups  
Assumes average VMT of 15,000 miles/year

Gasoline = 8,887gCO<sub>2</sub> /gal.  
Diesel = 10,180gCO<sub>2</sub> /gal.  
Biodiesel = 9,460gCO<sub>2</sub> /gal.



# What do leading energy authorities say?

## Diesel to be # 1 Transport Fuel by 2020

- **ExxonMobil:** Diesel will surpass gasoline as the number one global transportation fuel by 2020.
- **The World Energy Outlook:** Diesel fuel will remain the dominant growth fuel between now and 2035.
- **The National Petroleum Council:** Diesel engines will remain the powertrain of choice for HD (heavy-duty) vehicles for decades to come because of their power and efficiency.

# THOUGHTS FOR THE FUTURE

- **New technology (trucks, engines, equipment) offers significant improvements in all emissions and fuel savings (CO<sub>2</sub>), reliability, warranty coverage, etc. over existing technology.**
  - *What are the air quality and other considerations of encouraging more rapid adoption of new technologies?*
- **Modernizing/Upgrading past success largely fueled by DERA... but federal funds are diminishing -- \$6-8 million (projected) vs. \$40M past...what does the future hold?**
  - Can states pick up the slack? NJDEP Pilot, CA- Carl Moyer.
  - Will “private” approaches – bid specs, green construction provisions, LEED-type standards be as effective?
  - Wildcard: MAP-21/Transportation Bill; CMAQ provisions

# Summary

- Clean diesel power now poised to continue to play the leading role in key sectors of the economy.
- Emissions control strategies will continue to evolve and be more diverse, but maybe less complex; diesel engines may not be running on diesel fuels.
- Our Journey toward reducing energy consumption, sustaining environmental progress with economic growth must continue.

# Thank you

Contact information

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[www.facebook.com/dieseltechforum](http://www.facebook.com/dieseltechforum)

Twitter: @DieselTechForum

#cleandiesel

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