

# **ULTRA-LOW SULFUR DIESEL UPDATE & FUTURE LIGHT DUTY DIESEL**

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## **2006 DEER CONFERENCE**

August 23, 2006

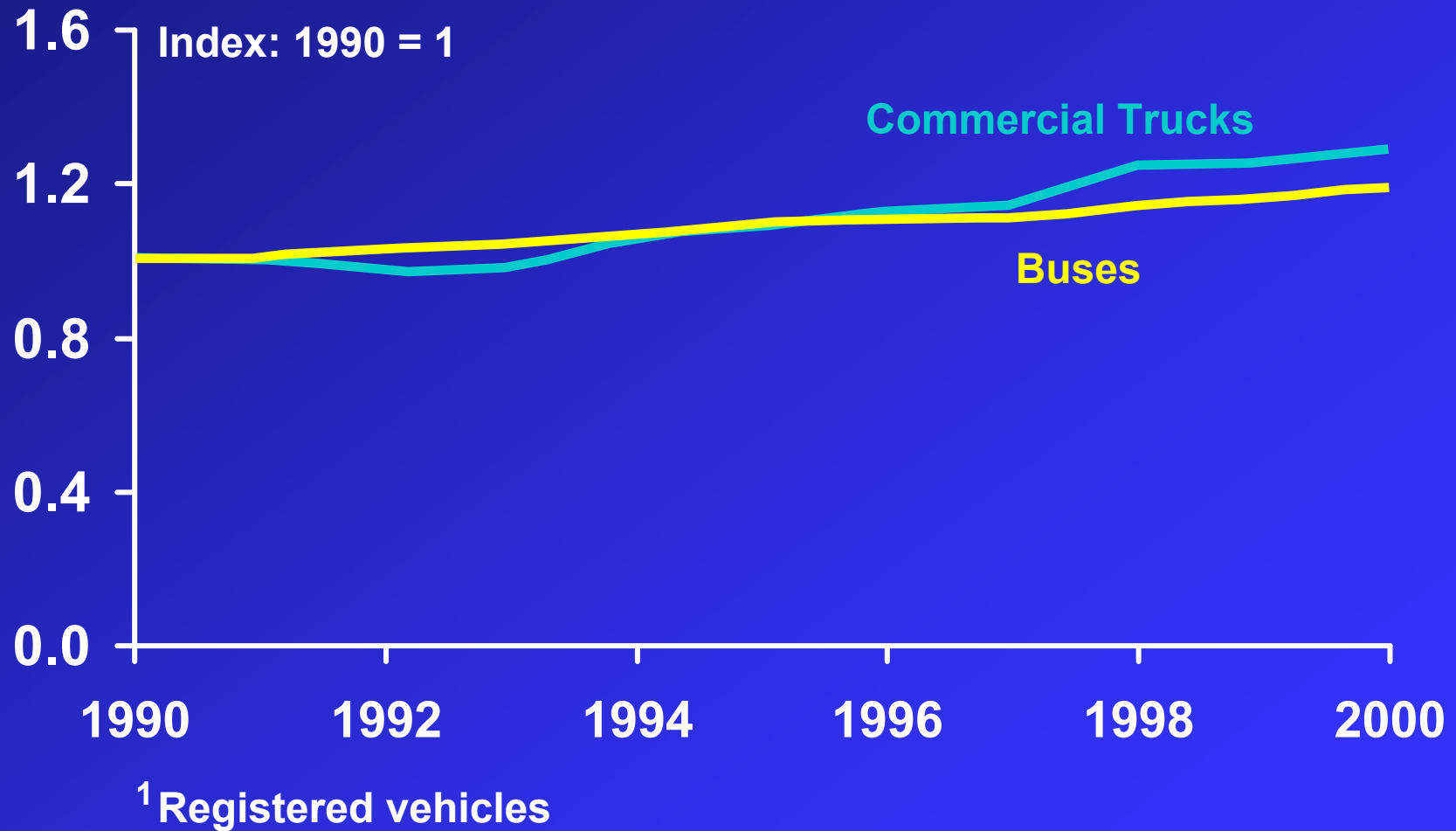


# DIESEL DRIVES AMERICA





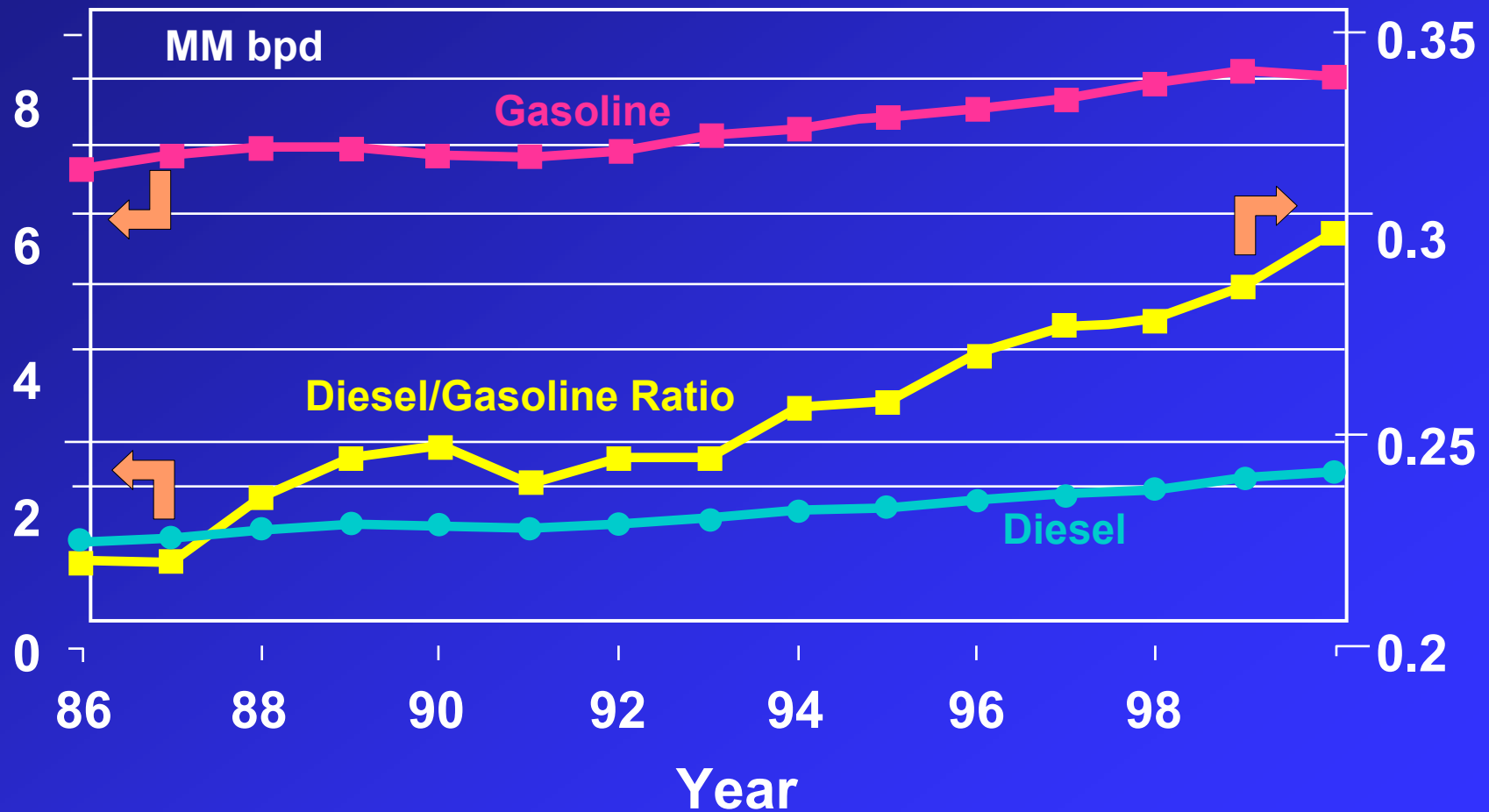
# U.S. GROWTH IN TRUCK AND BUS FLEETS



Source: U.S. Department of Transportation



# U.S. ON-ROAD GASOLINE AND DIESEL DEMAND



Source: Axens



# **DIESELS- PUBLIC PERCEPTION PROBLEMS**

- **OLDER TECHNOLOGY**
- **BLACK CLOUDS OF EXHAUST PARTICULATES**
- **SMELLY**
- **NOISY**
- **CAN BE EASILY REPLACED BY CLEANER FUELS**



# NEW DIESEL FUEL REGULATIONS

- WILL RESULT IN A NEW CLEANER DIESEL FUEL
- WILL ENABLE NEW CLEANER DIESEL ENGINES
- CAN CHANGE DIESEL'S IMAGE IN THE U.S.
- MAY ALLOW CLEAN DIESEL LIGHT DUTY VEHICLES TO BECOME A SIGNIFICANT PART OF THE U.S. FLEET



# MARATHON PETROLEUM COMPANY LLC

- PARENT-MARATHON OIL COMPANY
- FIFTH LARGEST US REFINERY (OVER 1 MILLION BBLs OF CRUDE CAPACITY)
- MAJOR MARKETS IN MIDWEST AND SOUTHEAST
- LARGE FUEL WHOLESALER
- 50% OWNER OF PILOT TRAVEL CENTERS



# HIGHWAY DIESEL FUEL REQUIREMENTS

- **EPA HAS FINALIZED 2007 HIGHWAY DIESEL VEHICLE AND FUEL STANDARDS**
  - **15 PPM SULFUR CAP-JUNE 1, 2006 (AT REFINERIES)**
  - **TEMPORARY COMPLIANCE OPTION (PHASE-IN)**
    - 80% 15 PPM CAP/20% 500 PPM CAP BY 6/1/06
    - 100% 15 PPM CAP BY 6/1/10
  - **SMALL REFINERY AND GEOGRAPHIC PROTECTED AREA (ROCKY MTN STATES) EXEMPTIONS**
- **SEPT 1, 2006 PIPELINES, TERMINALS MUST CONVERT**
- **OCT 15, 2006 RETAIL LOCATIONS MUST CONVERT**



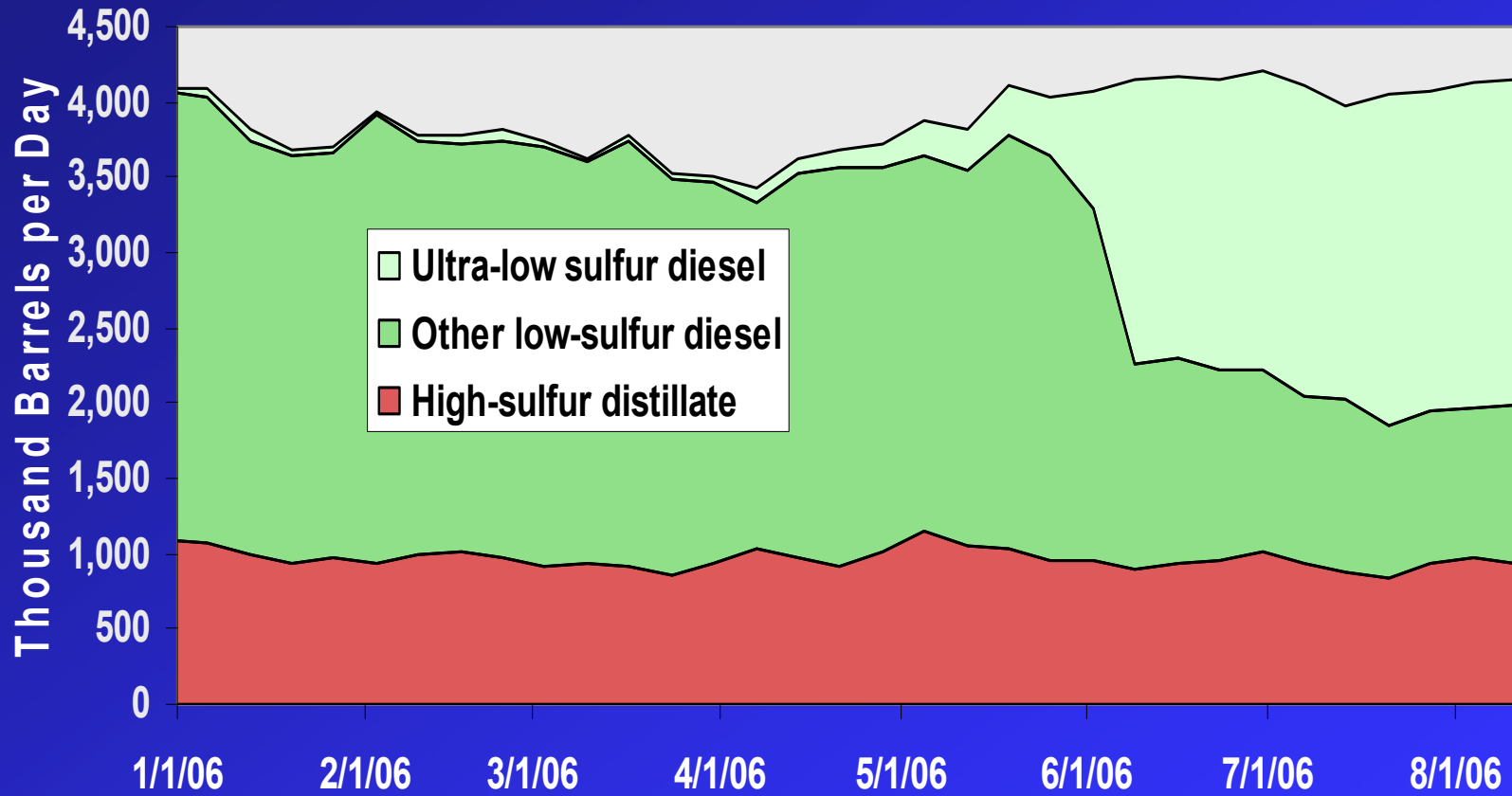


# CURRENT STATUS OF HIGHWAY ULSD

- **REFINERIES – PRODUCING 2.16 MILLION BBL PER DAY ULSD**
- **DISTRIBUTION SYSTEM INVENTORY**
  - 50% CONVERTED TO ULSD
  - CONVERSIONS PROCEEDING ON SCHEDULE
- **RETAIL INVENTORY**
  - IS BEING CONVERTED BY DISTRIBUTION SYSTEM
  - SOME UNCERTAINTY ON PRODUCT AVAILABILITY/PRICE
  - STILL TOO EARLY TO PROJECT



# Total U.S. Distillate Production



Source: API Weekly Statistical Bulletin



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# NON-ROAD DIESEL FUEL REQUIREMENTS

- **RULE WILL COVER PART 89  
(AGRICULTURE AND CONSTRUCTION)  
ENGINES**
- **2 STEP APPROACH REQUIRES**
  - **<500 PPM SULFUR FOR PART 89,  
LOCOMOTIVE, AND MARINE BY 6/1/2007**
  - **15 PPM SULFUR FOR PART 89 BY 6/1/2010**
- **15 PPM SULFUR FOR RAILROAD AND  
MARINE DIESEL IN 6/1/2012**



# WHAT DOES CURRENT DIESEL FUEL LOOK LIKE?

## 2002 National Average Diesel Properties

( 2002 Diesel Fuels Survey, includes California)

API Gravity	34.4
Sulfur, ppm	340
Flash Point, F	159
Viscosity, cs 40 C	2.73
Particulate Matter, mg/l Max.	15
Cetane Index	45.8
Cetane Number	46.4
IBP, F	367
T10, F	424
T50, F	511
T90, F	605
EP, F	655
Aromatics, vol%	27.7



# WHAT WILL NEW CLEAN DIESEL LOOK LIKE?

- **MANY DIFFERENT TECHNOLOGIES WILL BE USED**
- **VERY SIMILAR TO CURRENT DIESEL WITH MUCH LOWER SULFUR LEVELS**
- **SULFUR CONTENT**
  - **MANUFACTURED – 5-8 PPM SULFUR**
  - **DELIVERED – 15 PPM SULFUR**
- **CETANE NUMBER – 1-2 NUMBER IMPROVEMENT**
- **AROMATIC CONTENT – SLIGHTLY LOWER**
- **ENERGY CONTENT – SLIGHTLY LOWER**
- **LUBRICITY – WILL MEET ASTM STANDARDS**
- **COLOR – CLEAR, MAY HAVE GREEN TINT**



# WHAT NEW CLEANER DIESEL WILL NOT LOOK LIKE IN THE U.S.

## Worldwide Fuel Charter Category 4 Diesel

Specific Gravity, 60/60	0.82-0.84
Sulfur,ppm	5 -10
Flash Point, F	122 Min.
Viscosity, cs 40 C	2.0-4.0
Particulate Matter, mg/l	24 Max.
Cetane Index	52.0 Min.
Cetane Number	55.0 Min.
T90, F	608 Max.
T95, F	644 Max.
EP, F	662 Max.
Aromatics, wt%	15 Max.
Lubricity, HFRR scar <u>dia.@60</u> C, micron	400 Max.



# WILL LIGHT DUTY DIESEL ENGINES REQUIRE A DIFFERENT DIESEL FUEL?

- POSSIBLY
- RESEARCH NEEDED INTO THE EFFECTS OF FUEL PARAMETERS ON TIER 2 COMPLIANT DIESEL ENGINES
- ENHANCED PERFORMANCE DIESEL FUEL WILL
  - HAVE TO BE KEPT SEGREGATED FROM HIGHWAY DIESEL FUEL
  - WILL HAVE A HIGHER PRODUCTION COST AND SHOULD CARRY A HIGHER PRICE AT RETAIL LOCATIONS
  - CAN ONLY BE DEVELOPED THROUGH COOPERATION BETWEEN ENGINE/VEHICLE MANUFACTURERS AND FUEL REFINERS





# FUTURE DIESEL FUELS & ENGINES

- WILL BE CLEAN BURNING
- WILL HAVE VERY LOW EMISSIONS
- WILL HAVE A NEW AND IMPROVED IMAGE
- WILL CONTINUE TO PROVIDE THE POWER NEEDED BY THE U.S. ECONOMY