

# The Success of Diesel Retrofits: A Fuel Supplier Perspective

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*Reducing Emissions from Existing  
Diesel Trucks and Buses*



# Presentation Outline

- BP Retrofit Activities
- CDPF Emissions Benefits
- Durability & Reliability
- Retrofit Deployment Impacts
- BP's ULSD Capabilities



# Who is BP?

## A Global Company

- 110,000 employees in over 100 countries
- The largest oil and natural gas producer in the U.S. and U.K.
- One of the nation's leading producers and consumers of solar power
- Provider of cleaner low-sulfur gasoline to over 40 U.S. cities
- Leader in the development and commercialization of Ultra Low Sulfur Diesel



# BP a Leader in ULSD Development

1999 launched large scale demonstration project

- ⌘ US DOE, NREL, CARB and SCAQMD partners in program and funded emissions work
- ⌘ Industry Program Member
  - Engelhard & Johnson Matthey (PM filter suppliers)
  - Cummins, International, Detroit Diesel and Ford
- ⌘ Over 150 vehicles evaluated over a year
- ⌘ Widely accepted data

First to market in California (2000)

- ⌘ Started commercial sales early 2000
- ⌘ Selling through three channels of trade
  - direct, distributors, retail stations & card locks

First to market in Midwest

- ⌘ 2002 – Cleveland transit, Ann Arbor transit
- ⌘ 2003 – Chicago Transit Authority

# Catalyzed DPF Emissions

Ultra low sulfur diesel with a catalyzed diesel particulate filter offers the following benefits:

- ≡ >90 - 98% PM reduction
- ≡ >70 - 90% CO reduction
- ≡ > 90% HC reduction
- ≡ >90% air toxics & ozone precursor reduction
- ≡ 0 – 5% NO<sub>x</sub> reduction



# Durability & Reliability

## ARCO Fuel Delivery Fleet

- ⌘ Johnson Matthey CRT: 10 Units well over 400,000 miles per unit

## San Diego School Bus Fleet

- ⌘ Engelhard DPX: 10 Units retrofitted in 1999. Still running with no problems. No smell and no smoke.



# Durability & Reliability

## Los Angeles City Refuse Haulers

- ⌘ Johnson Matthey CRT: 3 Units
- ⌘ Engelhard DPX: 7 Units
- ⌘ Over 4 years service with no problems

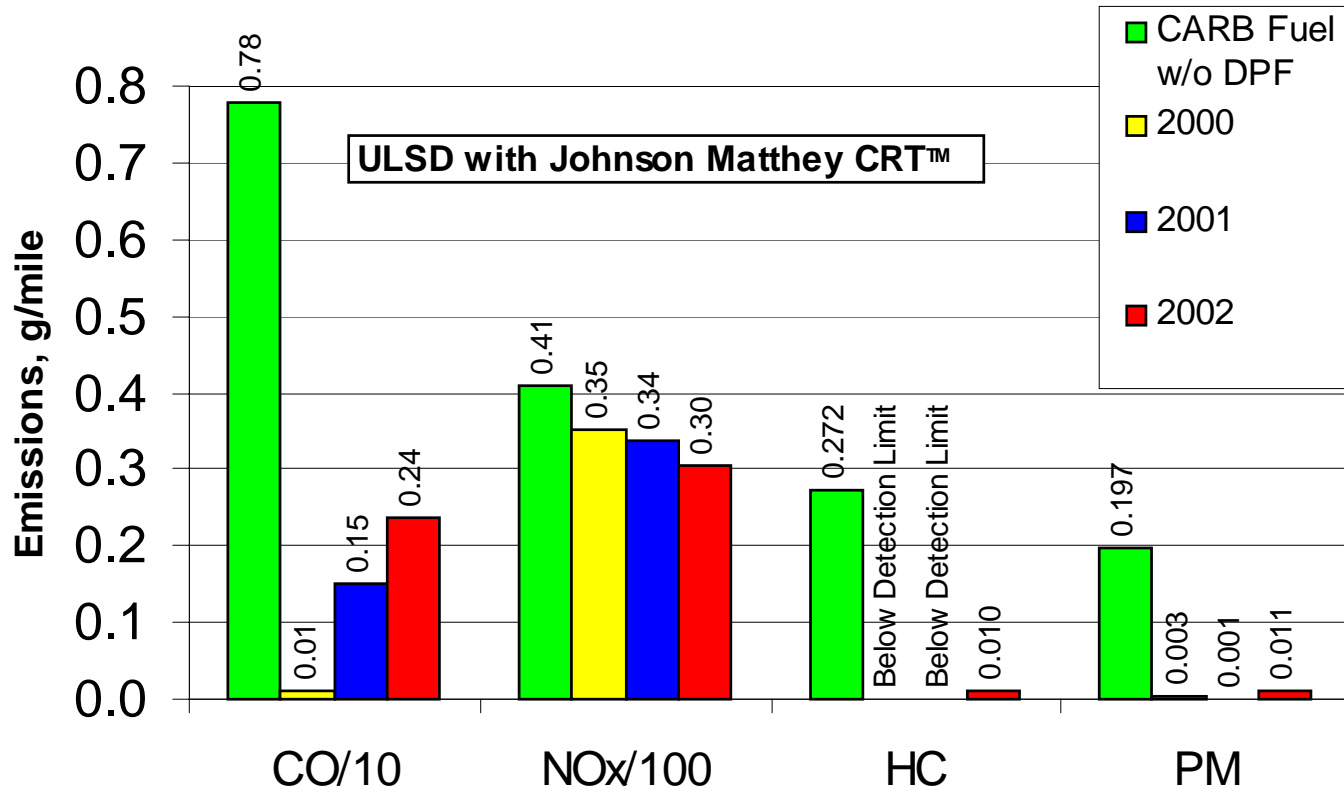
## Ralphs Grocery Trucks

- ⌘ Johnson Matthey CRT: 10 Units
- ⌘ Engelhard DPX: 10 Units
- ⌘ Three rounds of emission testing performed by the National Renewable Energy Laboratory
- ⌘ Well over 300,000 miles of operation on each unit

# Durability & Reliability

## Ralphs Grocery Trucks

Average Grocery Truck Emissions, CSHVR(1&2)

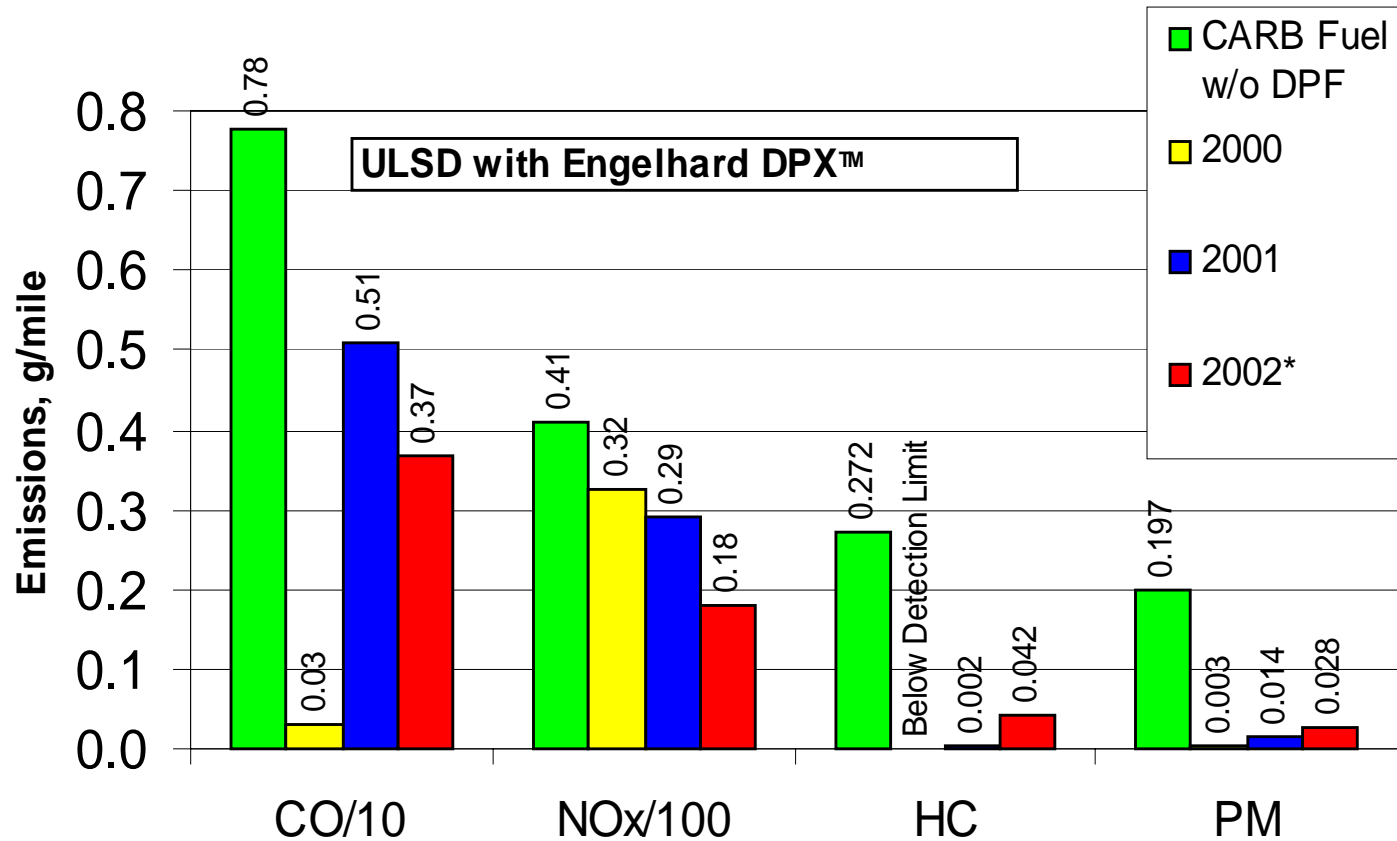




# Durability & Reliability

## Ralphs Grocery Trucks

### Average Grocery Truck Emissions, CSHVR(1&2)





# Durability & Reliability

## Third Round Summary, Ralphs Fleet

- ⌘ CDPF Technology is transparent to the end user
- ⌘ 6 out of the ten filters have not been cleaned as of March 2003 and accumulated over 300,000 miles
- ⌘ Those that were cleaned accumulated over 250,000 miles (2 years of operation)
- ⌘ No fuel penalty observed
- ⌘ Significant Emission reductions have been maintained after 3 years of operation

# Retrofit Deployment Impacts



**Before**



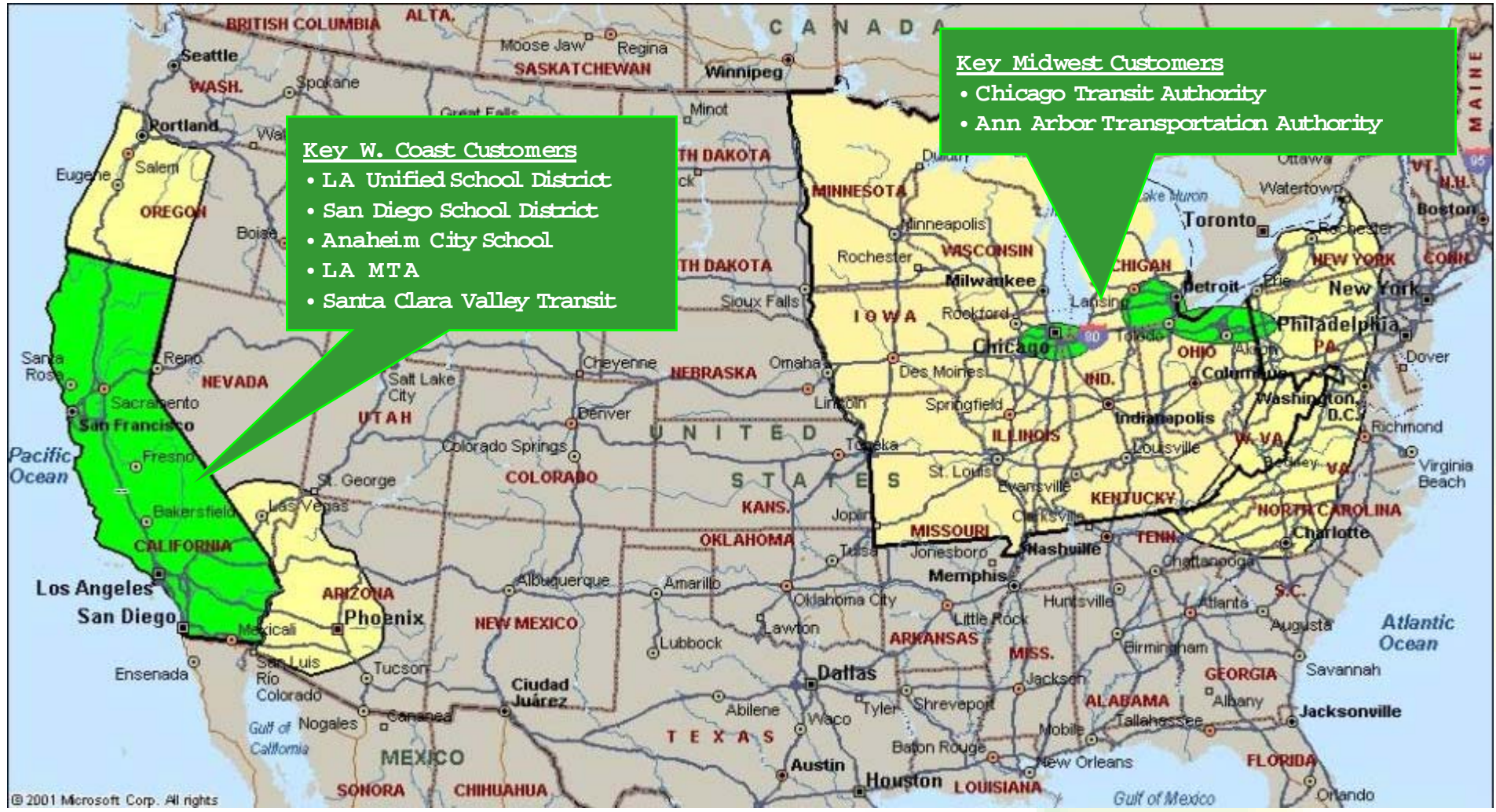
**After**

# BP's Current/Potential ULSD Capabilities



- Key W. Coast Customers
- LA Unified School District
  - San Diego School District
  - Anaheim City School
  - LA MTA
  - Santa Clara Valley Transit

- Key Midwest Customers
- Chicago Transit Authority
  - Ann Arbor Transportation Authority



# Fleet Conversions

- Plan ULSD conversion ahead of retrofitting vehicles
- It is not necessary to pump out existing diesel product. No special tank cleaning is required.
- Plan three tank turns at the site to make the conversion to ultra low sulfur