

# Motor Vehicle Standards and Regulations Around The World

Hong Kong Symposium  
"Better Air Quality"  
September 2000

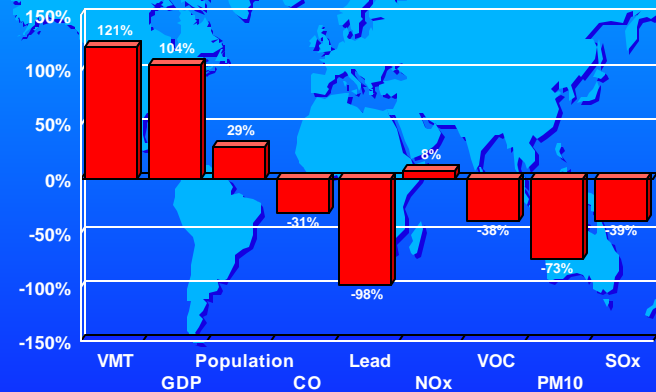
## Outline

- Progress Is Occurring Worldwide
- Serious Air Pollution Problems Remain
- Vehicle Remain Major Pollution Source
- Significant Challenges Remain
  - Toxics (especially Diesel PM)
  - In Use Emissions Performance
- Tighter Controls Are Being Phased In
- Conclusions

## Motor Vehicle Emissions Contribute to Serious Air Quality Problems

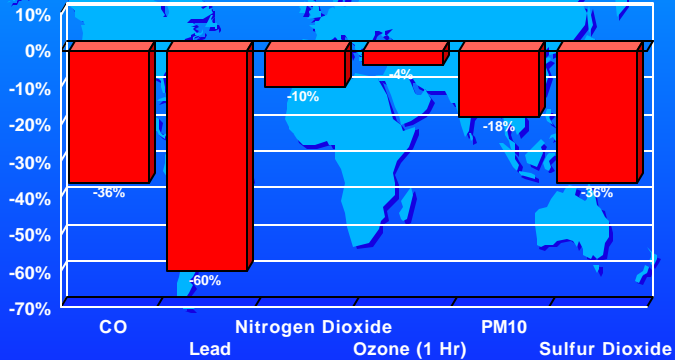
- Pollutants That Cause Ground Level Ozone (NO<sub>x</sub> & NMHC)
- Carbon Monoxide
- Particulates
- Toxic Air Contaminants
- Greenhouse Gas Emissions

## Emissions Reductions in the United States Since 1970 Clean Air Act

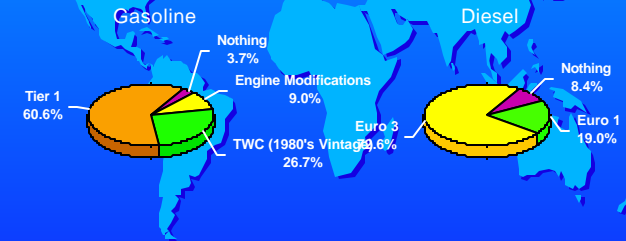


### US National Air Quality Improvements in Past Decade

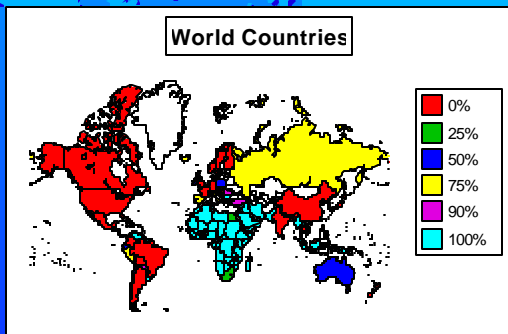
Percent Change in Air Quality Concentrations



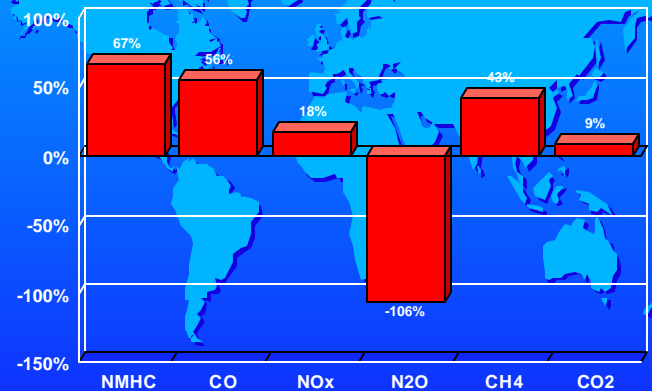
### Pollution Controls On Light Duty Vehicles Globally - 2000



### Leaded Gasoline Sales in 2000



### Global Motor Vehicle Emissions Reduction Compared To No Control





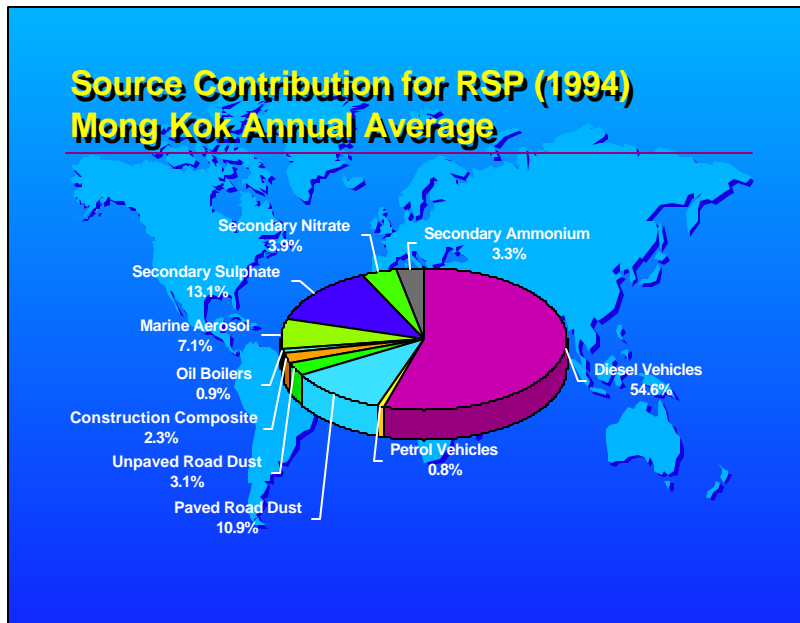
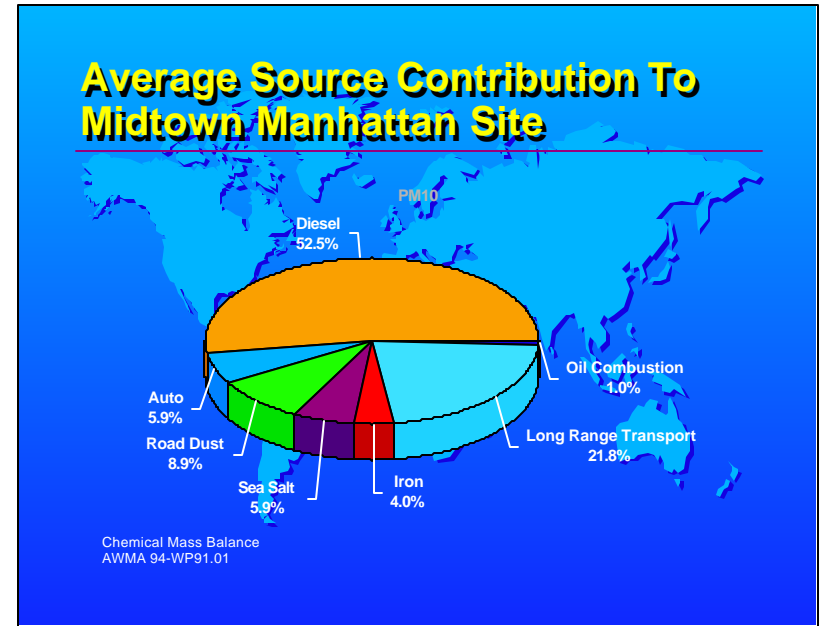
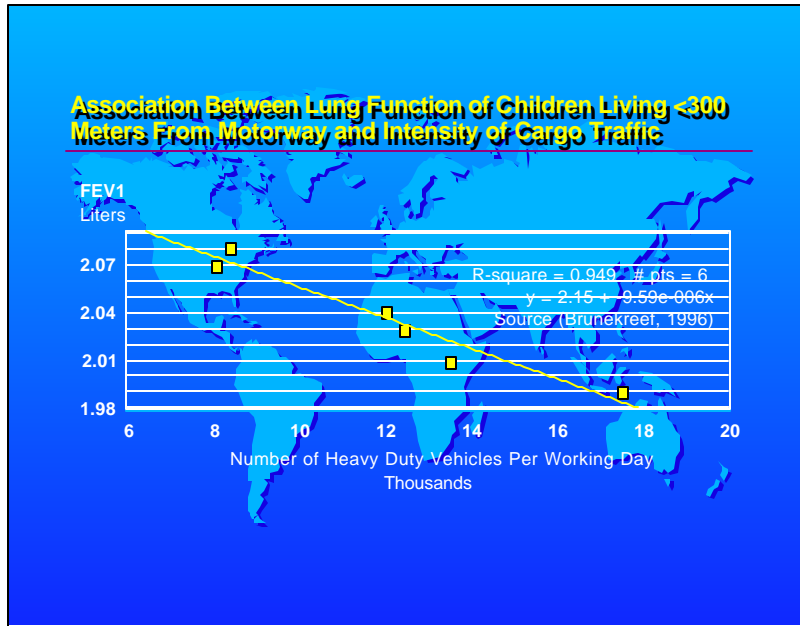
## Serious Air Pollution Problems Remain in the US

- ~110 Million People Lived in Non-Attainment Areas in 1997
- EPA's Forecast For 2007
  - 28 Ozone Non-Attainment Areas
  - 80 Marginal Areas
  - 129 Million People Living in These Areas
- Other Serious Problems
  - Crop Losses
  - Impaired Visibility
  - Eutrophication

## PM10 Study in Europe

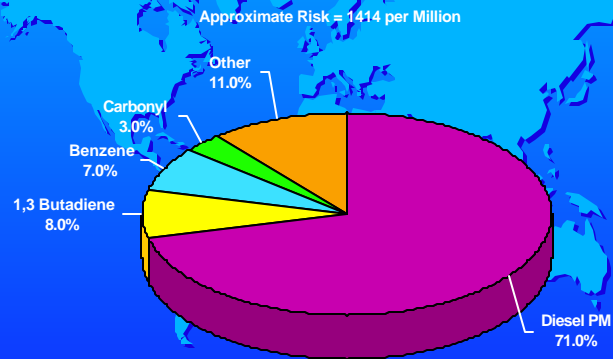
(Lancet Medical Journal - September 2, 2000)

- ~6% of all deaths from PM10
- ~40,000 deaths per year in Austria, France, Switzerland; 2 times traffic fatalities
- Motor Vehicles responsible for ~50%
- People in Cities die about 18 months earlier than they would otherwise
- over 300,000 cases of chronic bronchitis; 500,000 asthma attacks; 16 million lost person days of activity
- Health costs from pollution from traffic ~1.7% of total GDP



- ### CARB Assessment of Diesel PM Toxicity
- High Concentrations Cause Cancer in Rats
  - 30 Human Epidemiological Studies Found Link Between Diesel PM & Lung Cancer
  - Building On Other Evaluations
    - WHO/IARC
    - US EPA
    - German MAK Commission

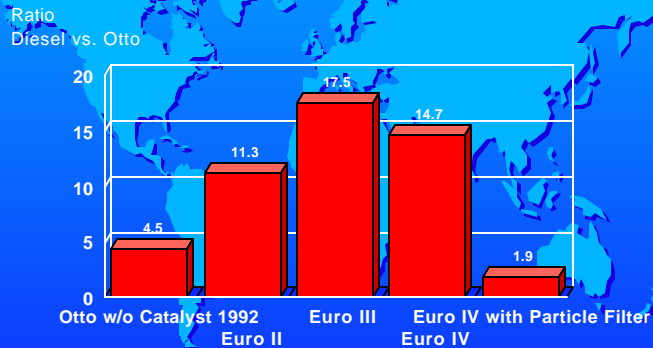
## Average Los Angeles Basin Cancer Risk Apportionment



## EPA Diesel Health Assessment Document - August 2000

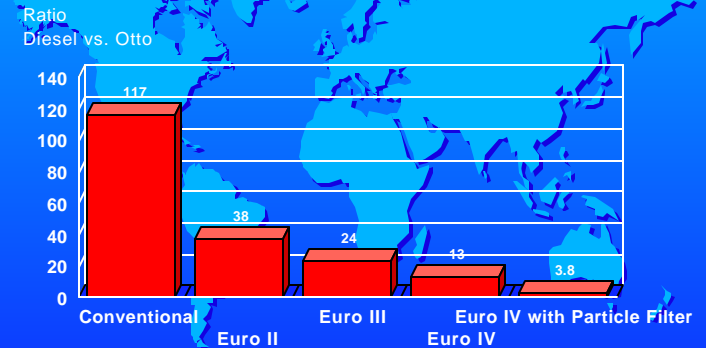
- Highly respirable with large surface area
- Excellent carrier for organic and inorganic compounds
- Toxicologically relevant organic compounds include PAHs, nitro PAHs and oxidized PAH derivatives
- Chemical composition & size vary with engine type, operating conditions & fuel
- Likely carcinogenic to humans by inhalation at any exposure condition
- CASAC Review October 11-12

## Comparison of Carcinogenic Potential of Diesel Versus Otto - Passenger Car Exhaust

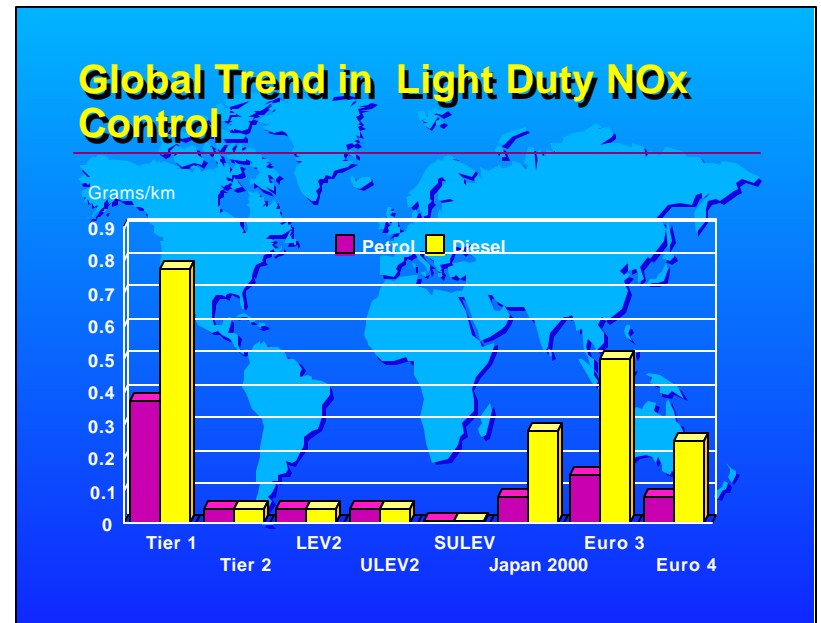
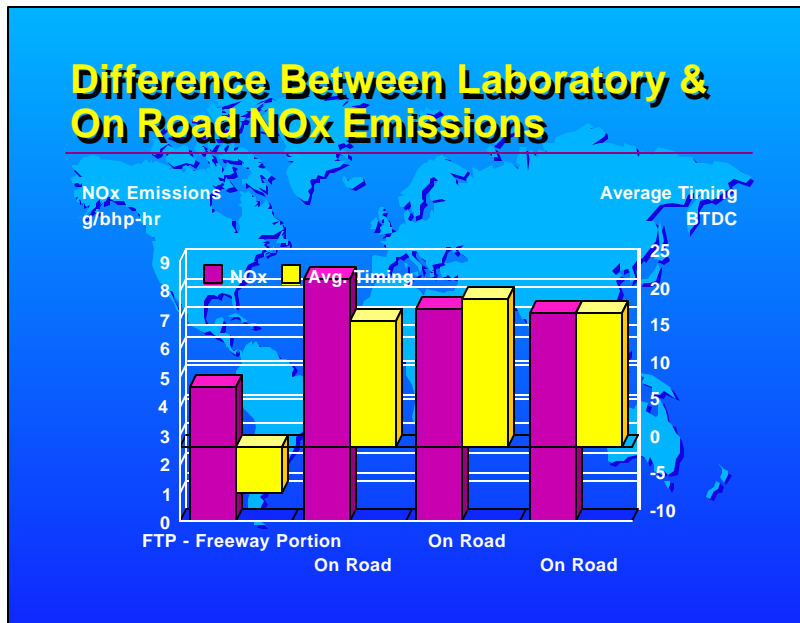
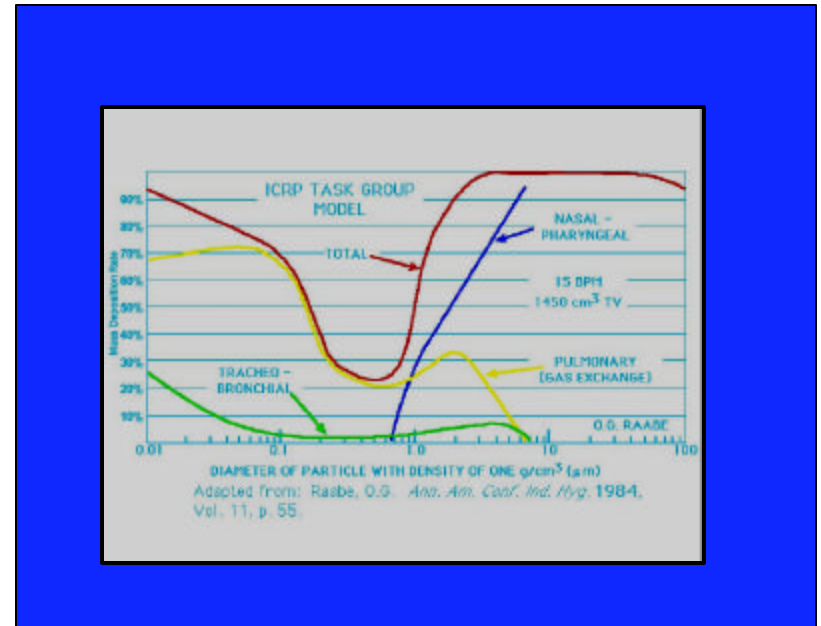
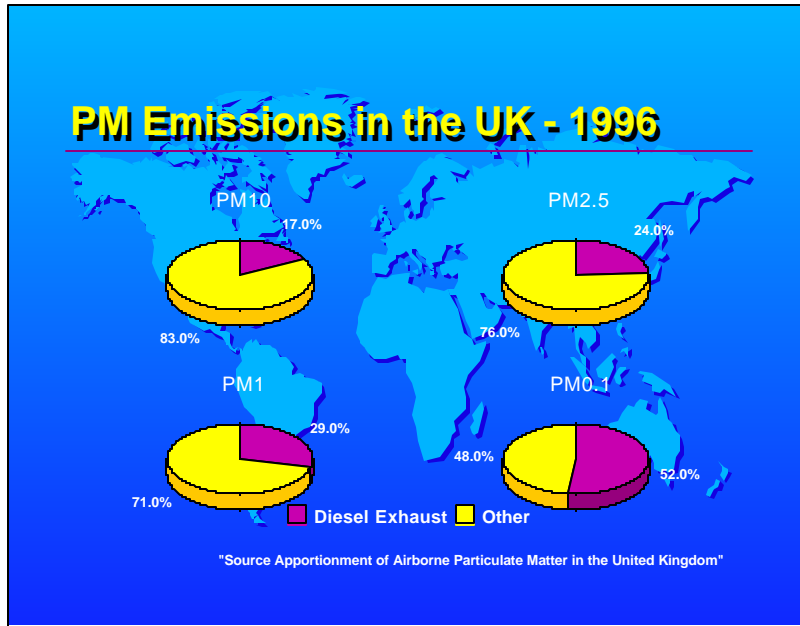


Source: Dr. Axel Friedrich from FhG-ITA, 1998

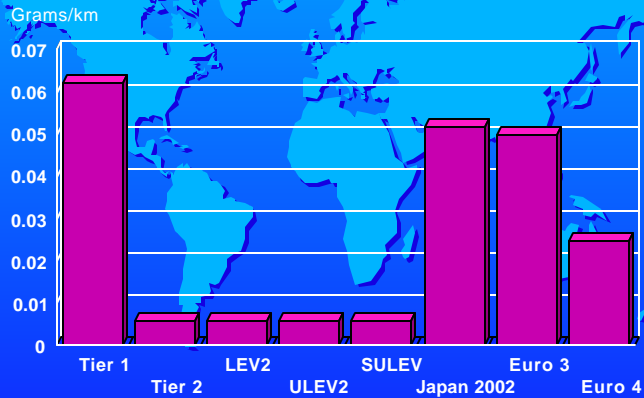
## Comparison of Carcinogenic Potential of Diesel Versus CNG - Bus Engine Exhaust



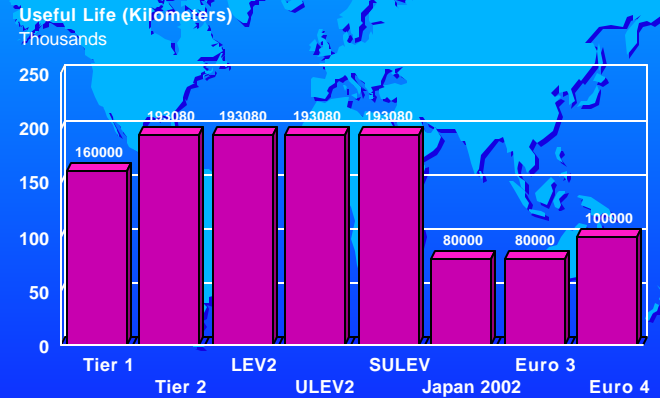
Source: Dr. Axel Friedrich from FhG-ITA, 1998



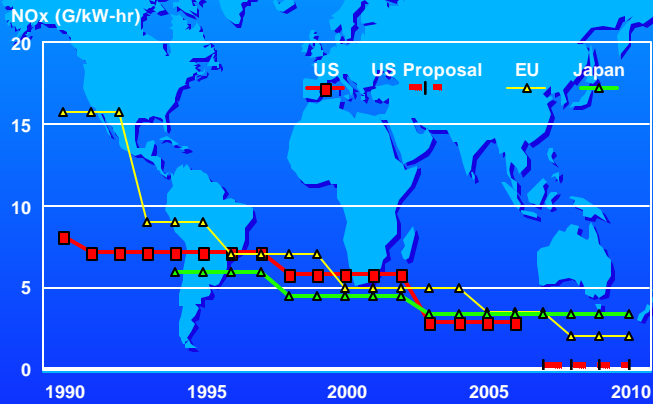
### Global Trend in Light Duty Diesel PM Control



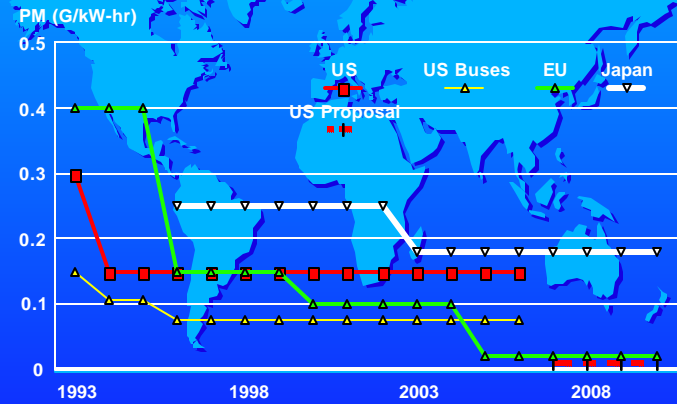
### Global Trends in Car Durability Requirements



### Global Trend in Heavy Duty Vehicle Emissions



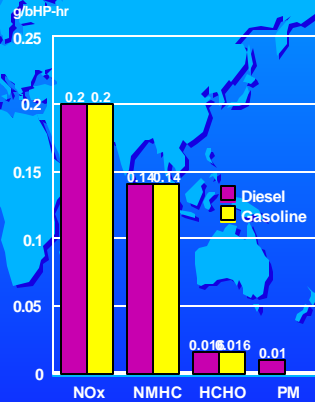
### Global Trend in Heavy Duty Vehicle Emissions



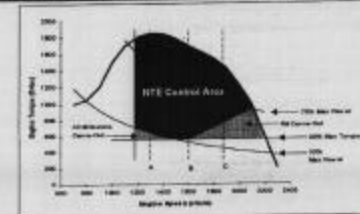


## EPA Proposed 2007 Requirements

- NOx - 4 year Phase-in
- 15 PPM Sulfur - July 2006
- No Crankcase Emissions
- Add Euro Test, OBD, Not To Exceed Provisions

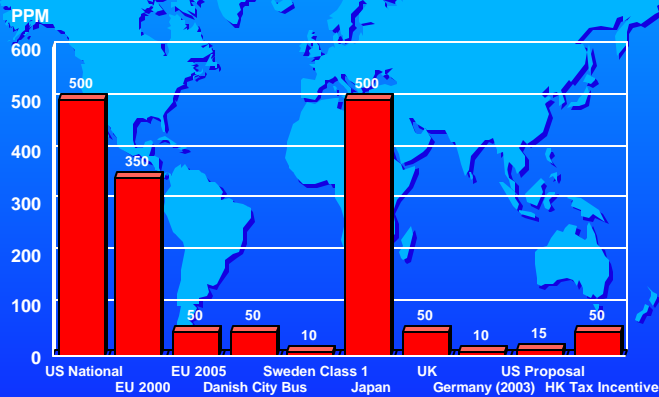


## CYCLE BYPASS PREVENTION ELEMENTS OF THE USA PROCEDURE - NTE CONCEPT



- Definition of a new control area (the "NTE" zone) that is broader than the ESC control area
  - Definition of specific emissions carve-out zones under low load operation
  - Each regulated emission must not exceed 1.25 times the FTP standard within the NTE zone
  - NTE standards apply under any conditions of normal vehicle operation including steady state and transient and expanded ambient conditions
- WVCC EGPE 2002000

## Diesel Fuel Sulfur Specifications



## Major Diesel Retrofit Effort Emerging

- Europe
  - Major Cities in Sweden
  - Germany
  - UK
- US
  - California
  - Northeast States (NESCAUM)
- Japan
  - Tokyo
- Other



## **Conclusions**

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- **Great Progress Has Occurred**
- **High Growth, Poor In Use Performance  
Offsetting Gains**
- **Increasing Concern With Toxic Emissions  
(especially diesel PM)**
- **In Use Performance Increasing Focus**
- **Tighter Controls on Vehicles & Fuels  
Being Phased In**
- **Retrofits Gaining Attention**