Geneva – November 15, 2007
UN ECE WP29 – Round Table on Fuel Quality

# The Need for Global Availability of High Quality Fuels

**Presented by:**

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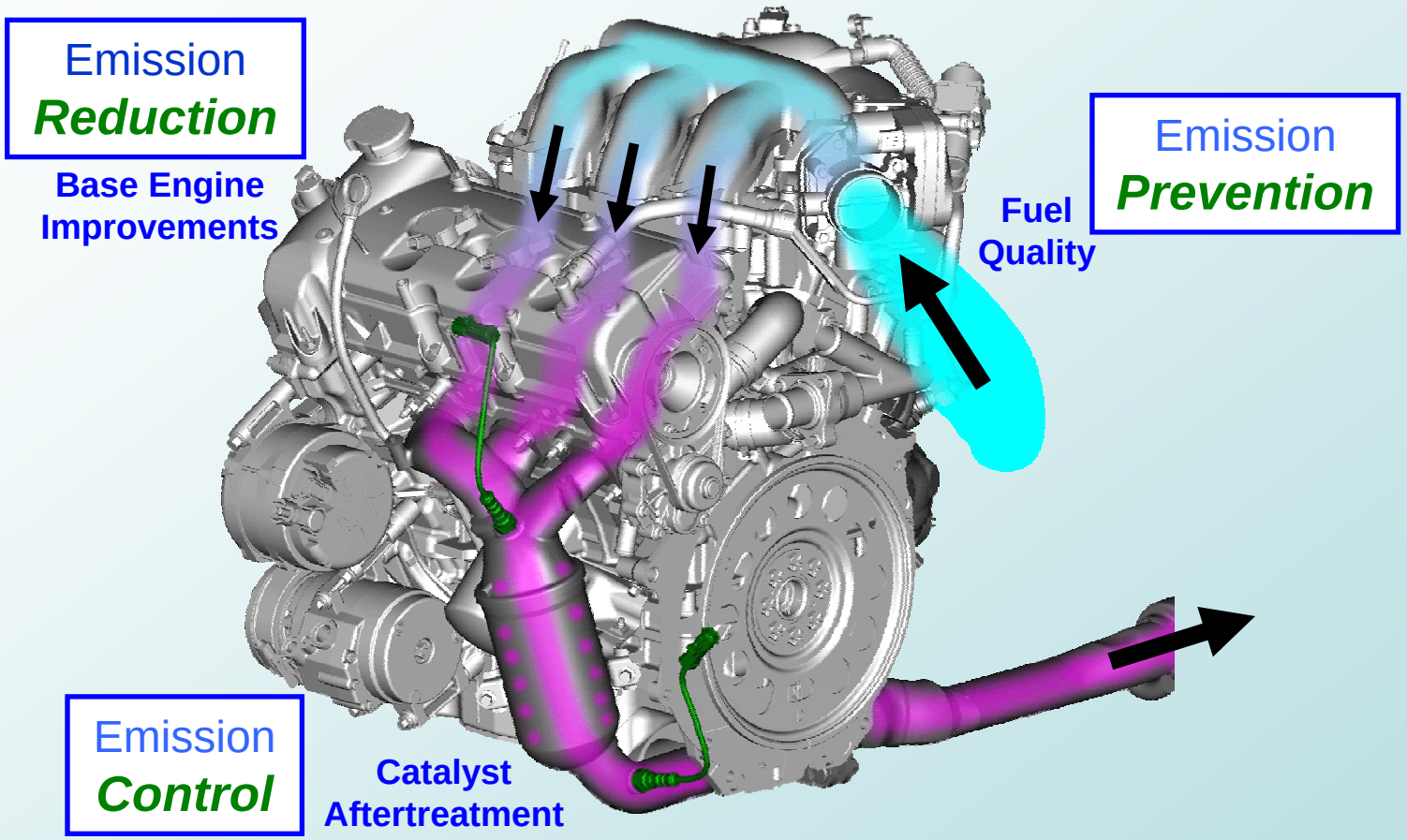
# AGENDA

- Fuel and Vehicle as a System
- Emission Regulatory Challenges
- Fuel Regulatory Needs
- Importance of High Fuel Quality
- Auto Industry Fuel Quality Needs
- OICA Recommendations

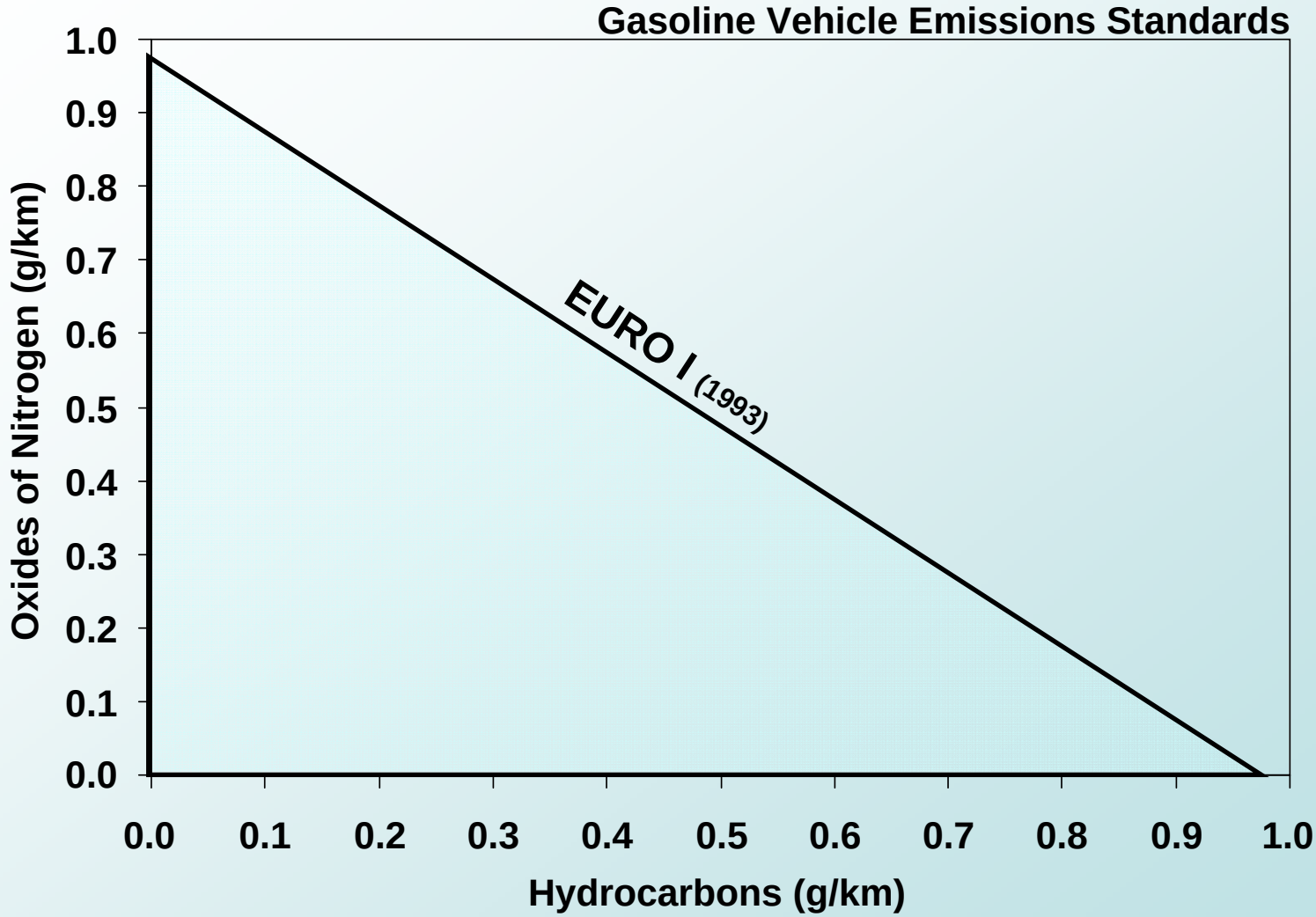
# Fuel and Vehicle are a System

## Emission Management Applied to Fuels and Vehicles




**Fuel Quality and Vehicle Hardware together Determine the Level of Emissions**

# The Path toward Zero Emissions…



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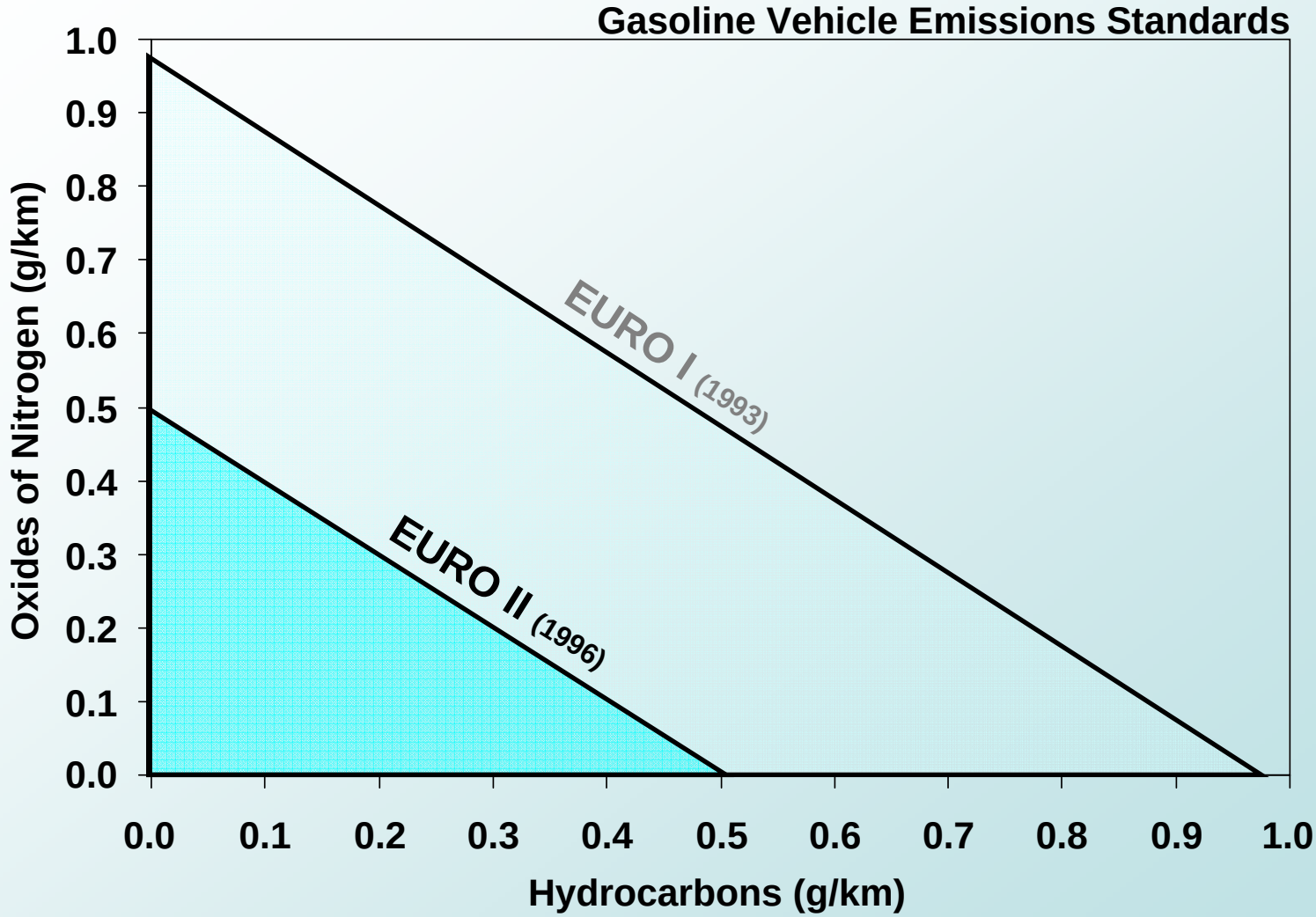

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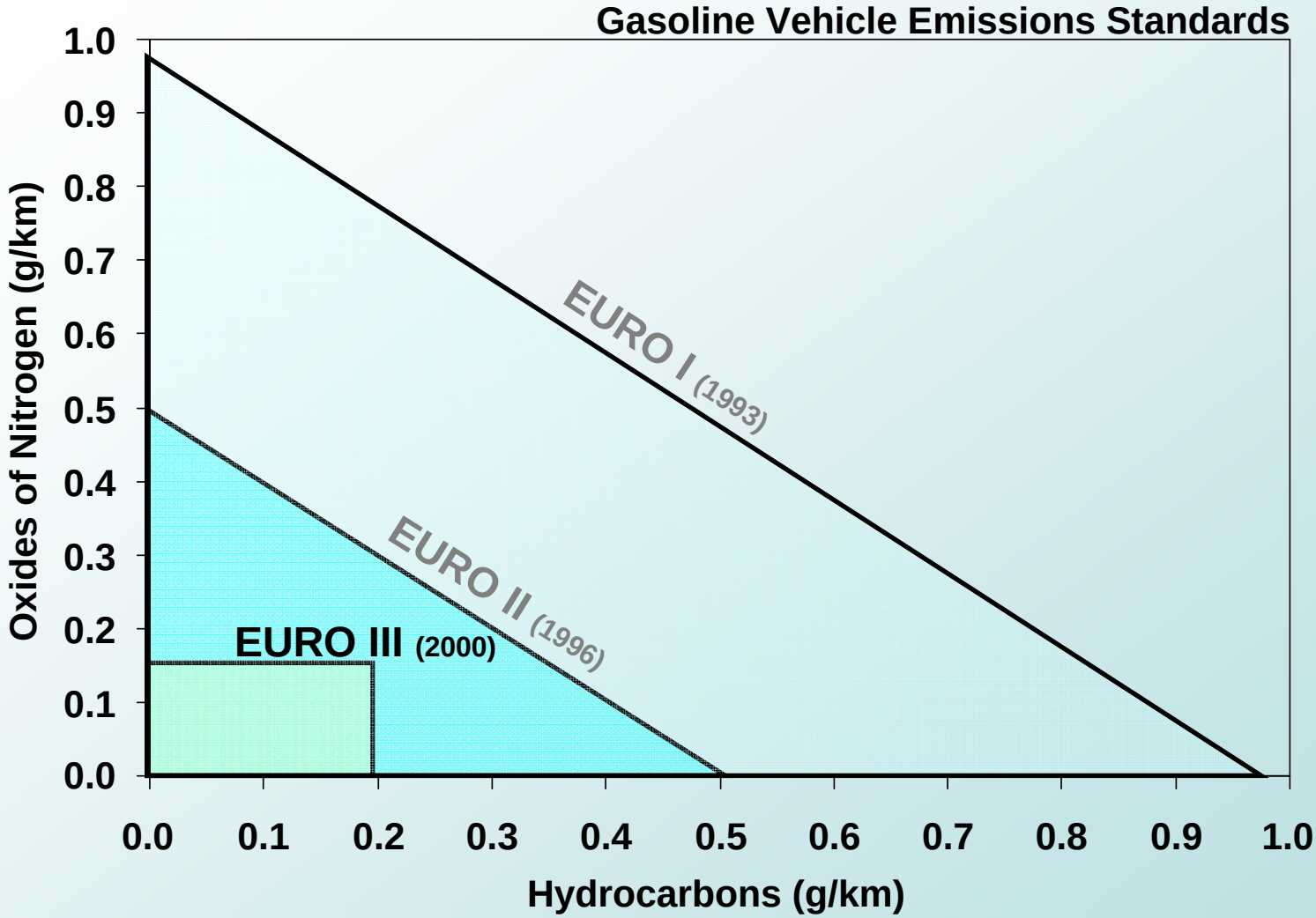

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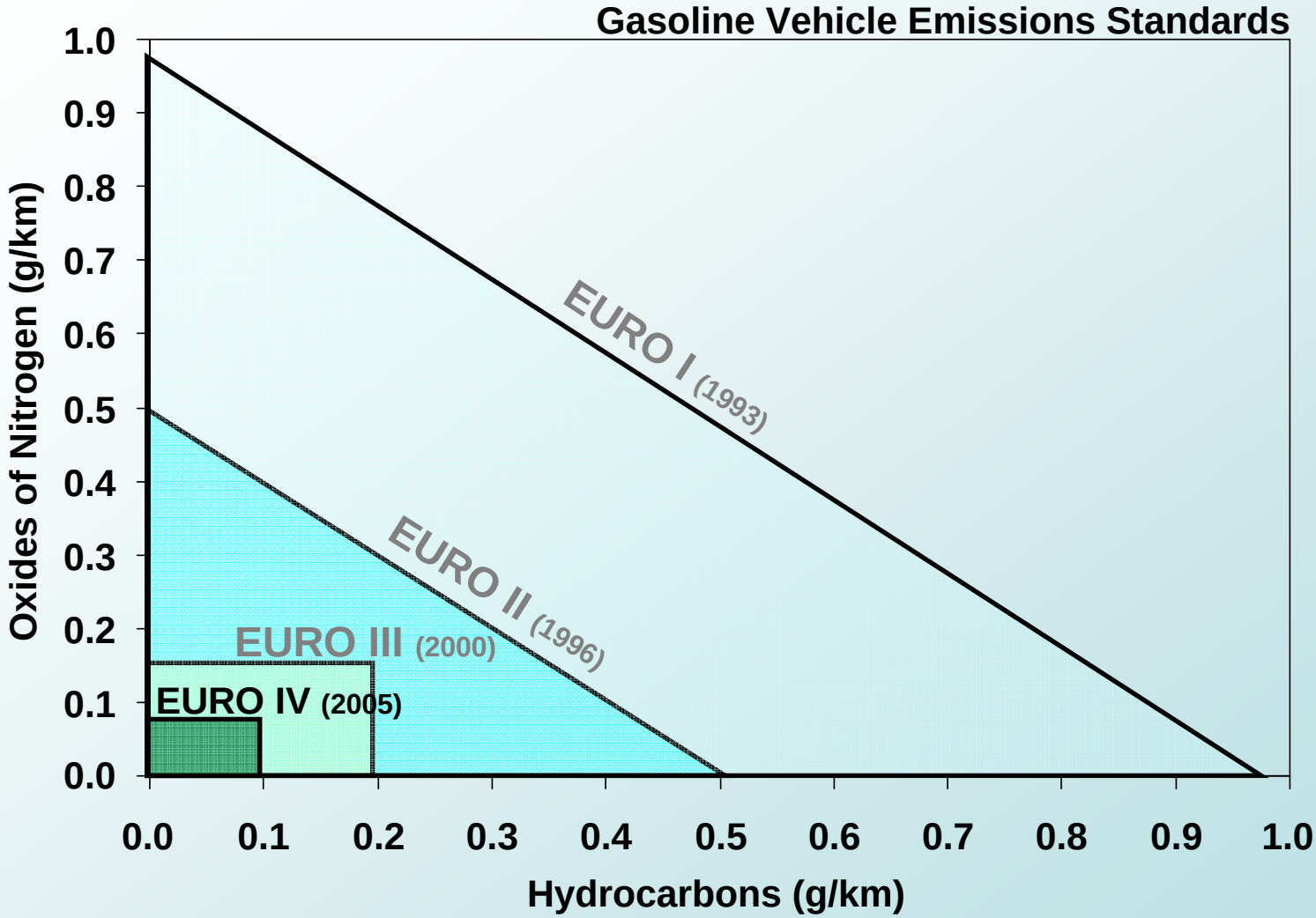

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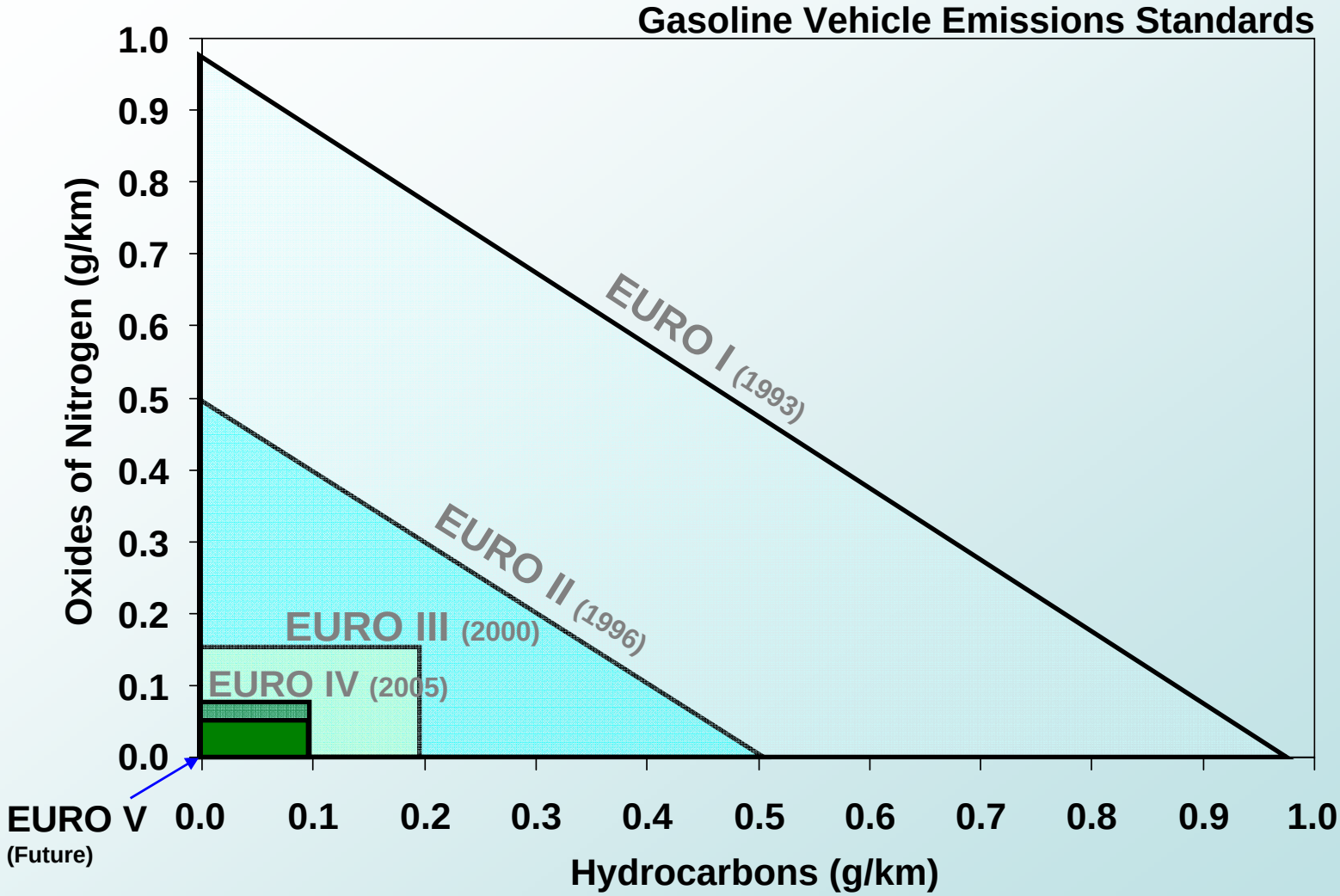
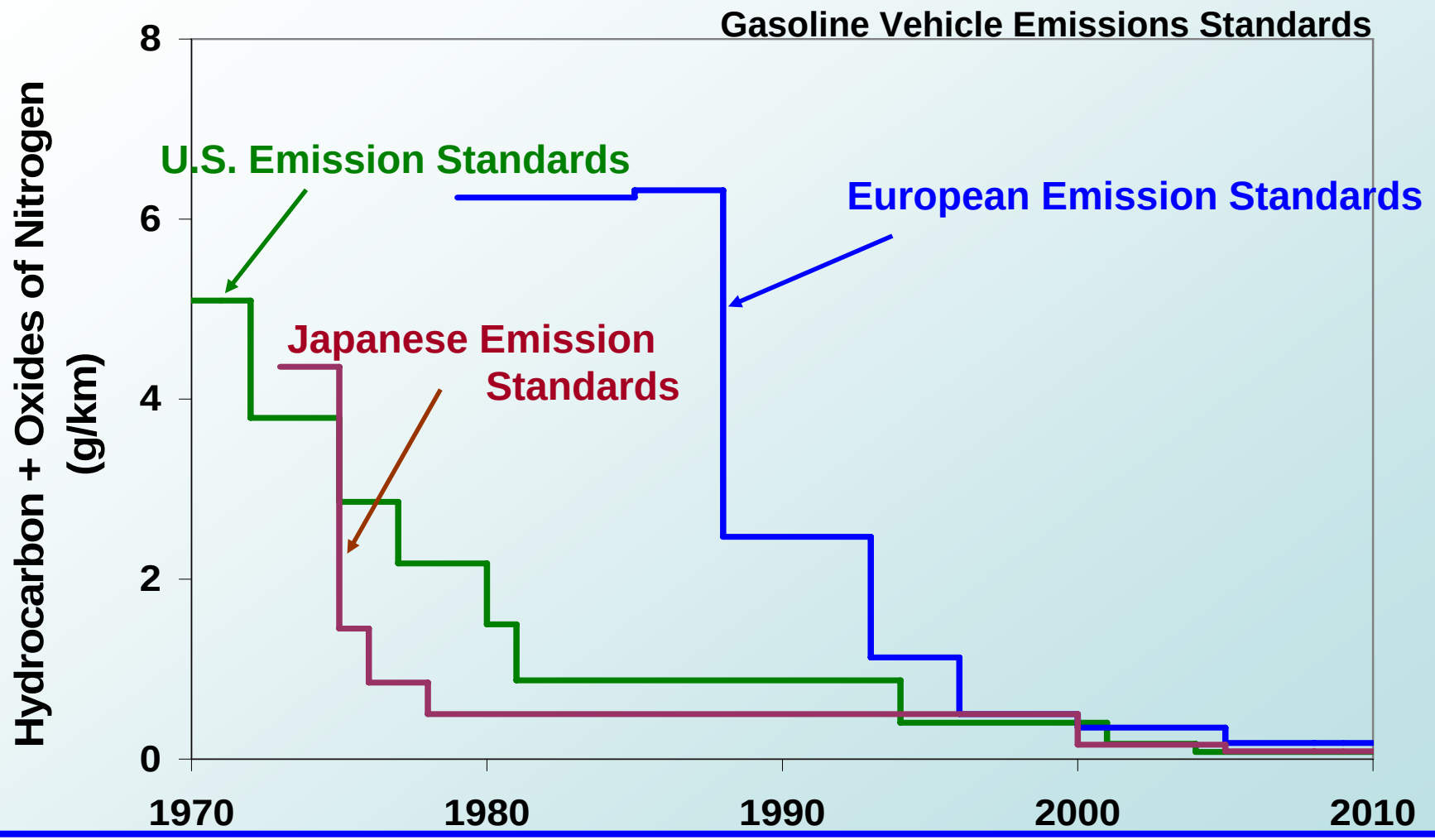


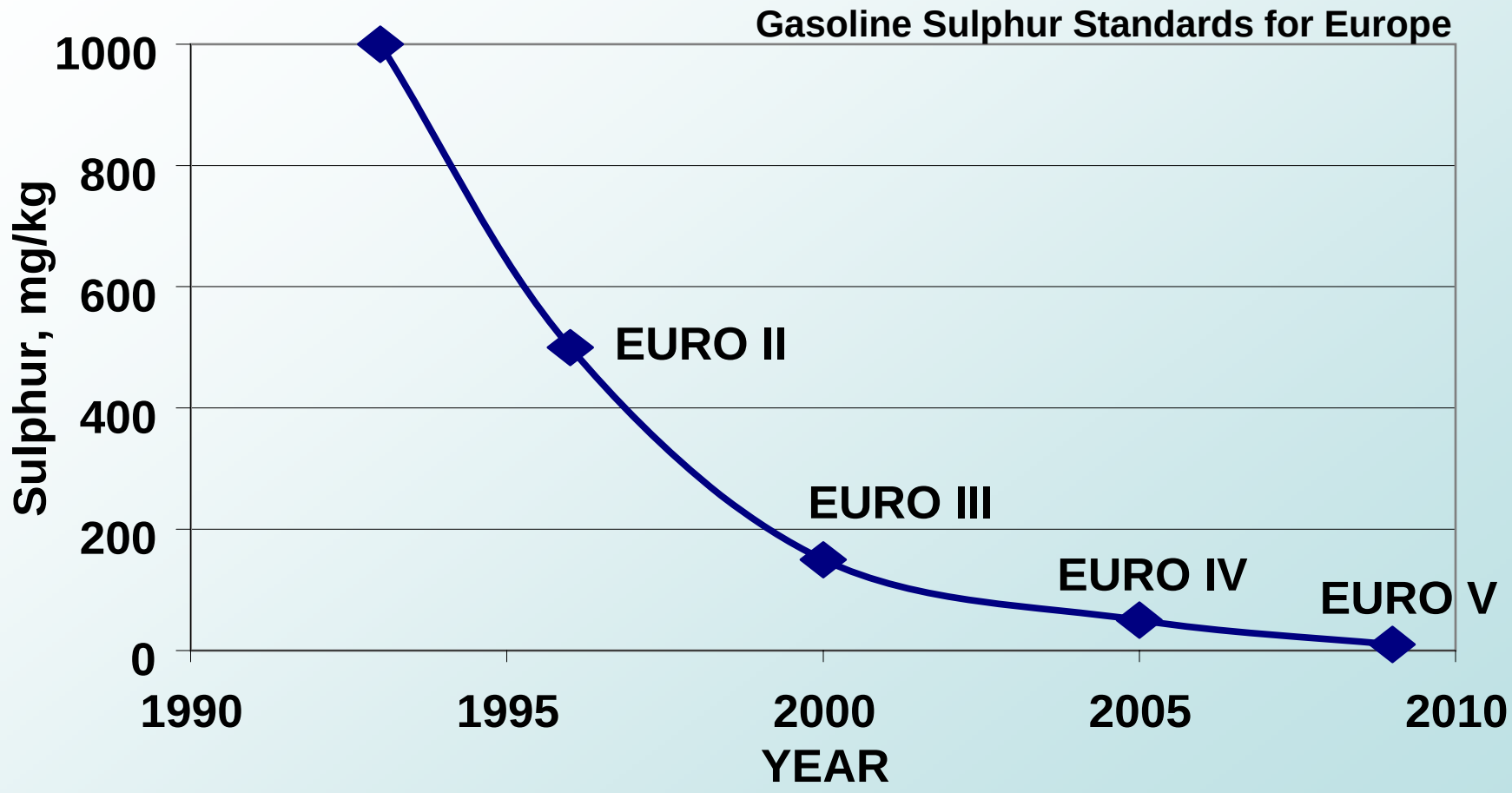

**Vehicle Technology to meet the Emission Standards Requires Comparable Levels of Fuel Quality**

# The Progression toward Zero Emissions…




**Emissions Standards alone do not achieve the benefits of Clean Air Quality – improved Fuels is Key**

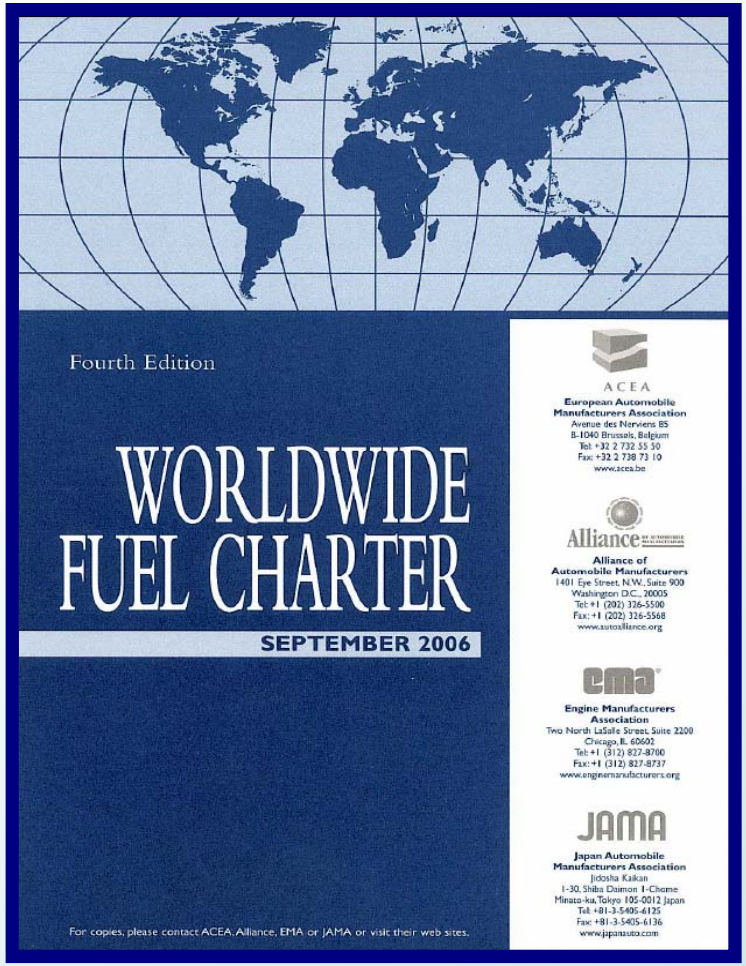
# The Path toward Zero Emissions…




**Sulphur Reductions have followed Legislation, Other Fuel Parameters Also Need Improvement**

# WorldWide Fuel Charter - Fourth Edition 2006

## One approach…



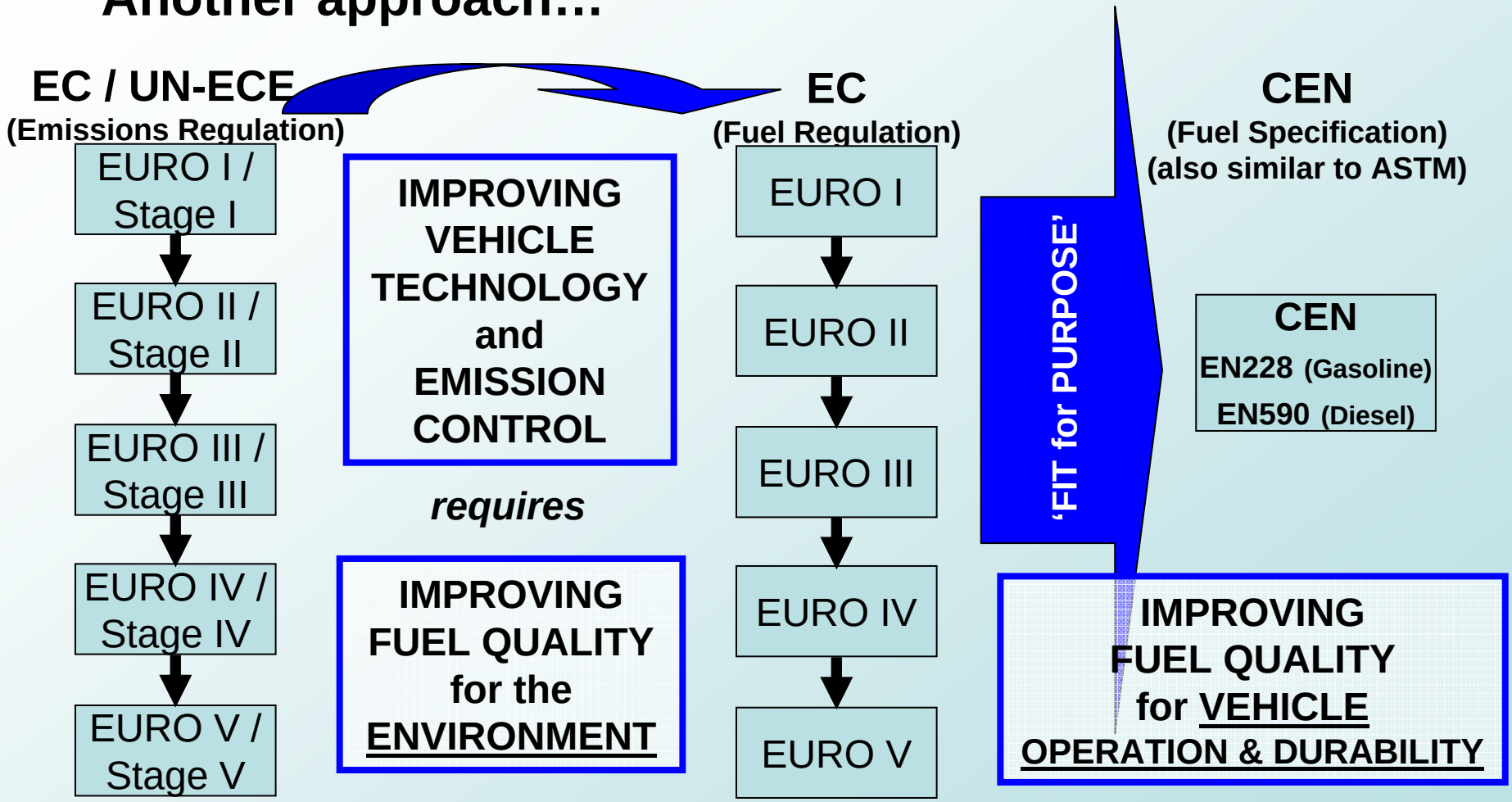

***Available at: http://www.OICA.net***

- **Established in 1998**
  - Updates every two to three years
- **Approved by Auto Manufacturers and Associations worldwide**
  - ACEA/Alliance/EMA/JAMA
  - Brazil, Canada, Philippines, China, Indonesia, Korea, South Africa, Malaysia, Thailand, Vietnam
- **Gasoline and Diesel Fuel Specifications**
  - Four Levels of Fuel Quality with limits connected to emission requirements
- **Fuel effects data support fuel quality needs:**
  - impacts on engine performance
  - emission system functionality
  - component durability

**Fuel quality specification matched to emission level**

# EC Emission Regs and CEN Fuel Specs

## Another approach…




**UN-ECE Emission Requirements have no direct link between Emissions and Fuel Quality**

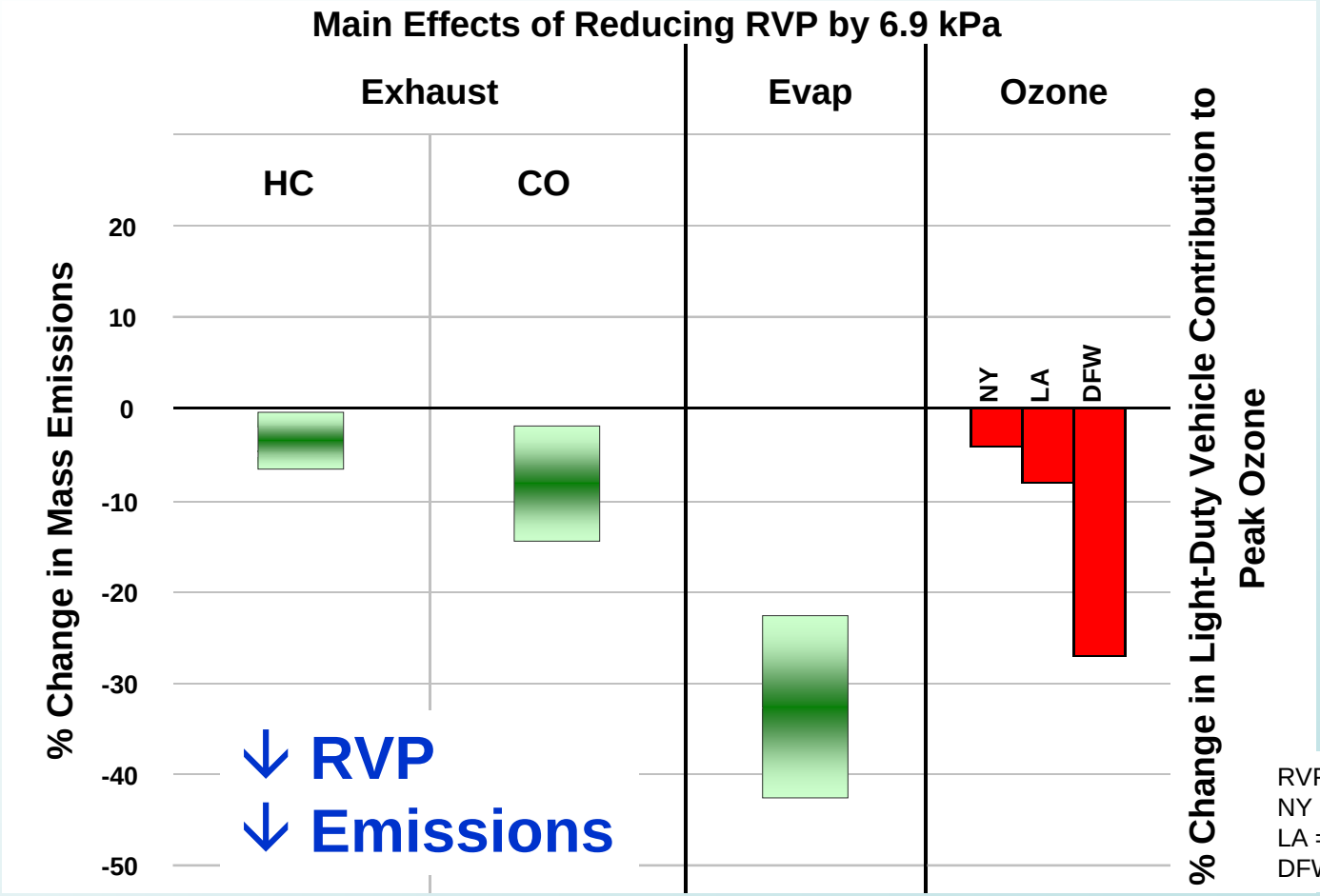
# Importance of High Fuel Quality

## Research and Studies

- **Auto / Oil Programs**
  - EPEFE – European Programme on Emissions, Fuels, and Engine Technologies
  - **AQIRP – US Auto/Oil Air Quality Improvement Research program**
  - JCAP – Japan Clean Air Program

# Importance of High Fuel Quality

## AQIRP - Exhaust and Evaporative Emissions




*Note: Ozone data was modeled for three US cities based on the vehicle technology level and exhaust emission results*

RVP = Reid Vapor Pressure
NY = New York, New York
LA = Los Angeles, California
DFW = Dallas-Fort Worth, Texas

**RVP Control Reduces Exhaust and EVAP Emissions**

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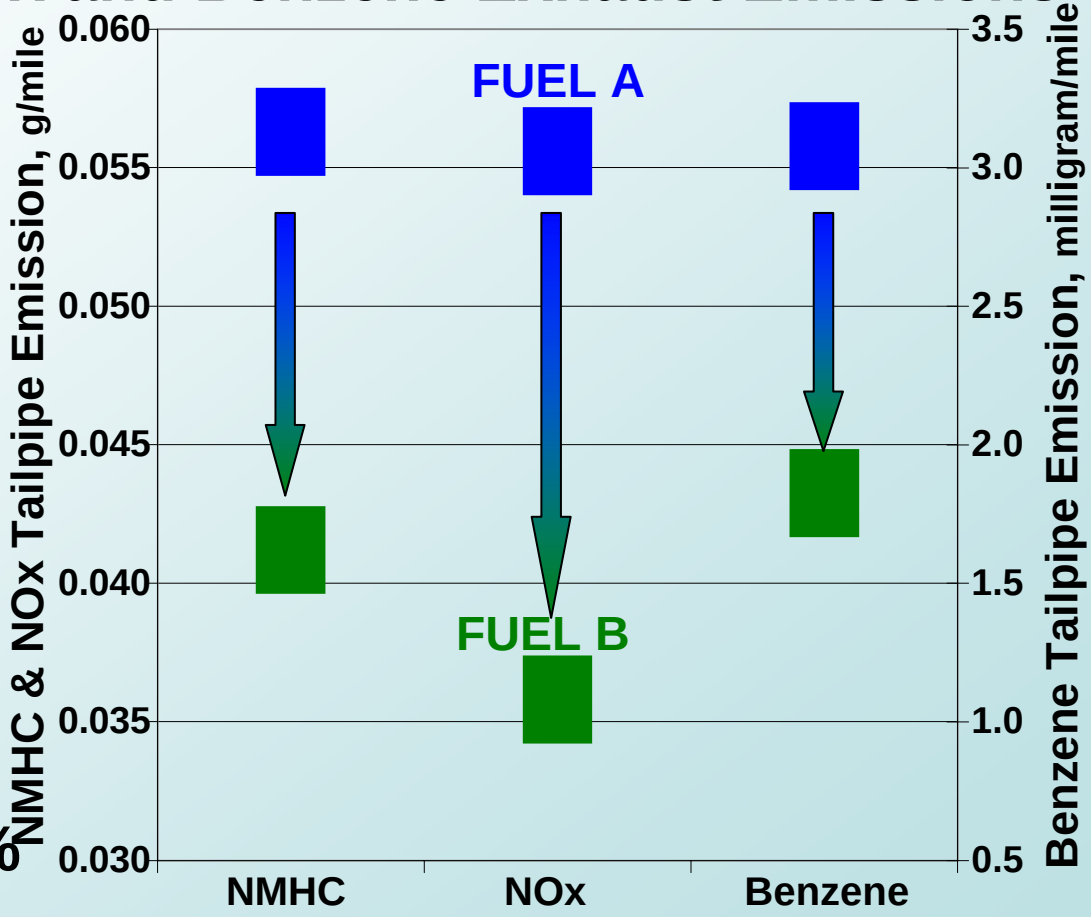
• **Governments** and Trade Associations **conduct studies to evaluate the effect of fuels on emissions**

# Importance of High Fuel Quality

## US-EPA Study : HC, NOx and Benzene Exhaust Emissions

| FUEL | A | B |
|---|---|---|
| RVP, psi | 9.10 | 7.00 |
| T10, °F | 128 | 137 |
| T50, °F | 221 | 210 |
| T90, °F | 324 | 305 |
| Aromatics, volume% | 28.1 | 21.2 |
| Olefins, volume% | 4.0 | 6.7 |
| Benzene, volume% | 1.09 | 0.41 |
| Sulfur, ppm | 32 | 5 |




**Fuel B compared to A**

**NMHC decreased ~26%**

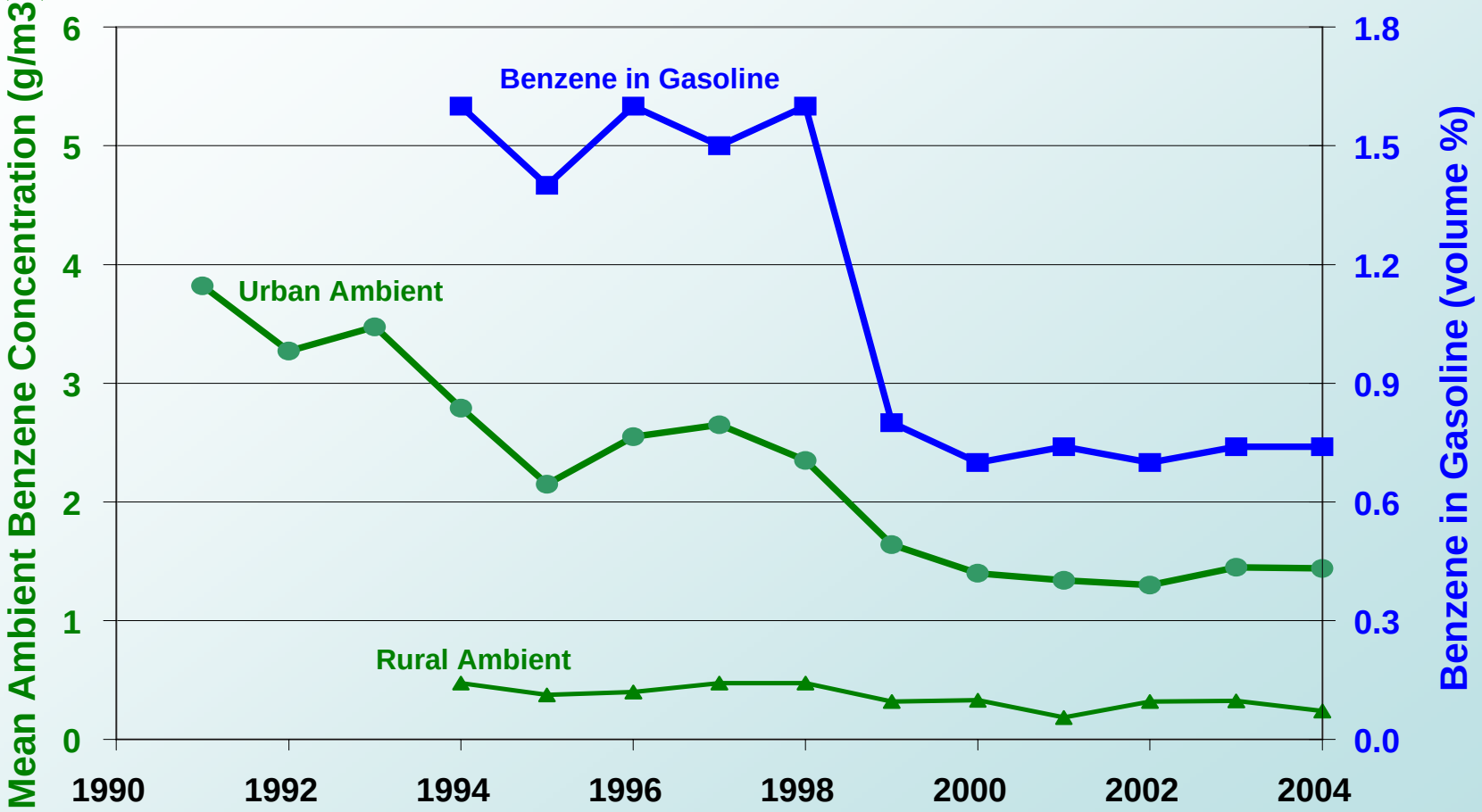
**NOx decreased ~36%**

**Benzene decreased ~43%**

**Changes to specific Fuel Properties results in Reductions in Tailpipe Exhaust Emissions**

# Importance of High Fuel Quality

## Environment Canada - Benzene Measurements




**Less Benzene in Gasoline Resulted in Less Ambient Benzene Levels**

# Importance of High Fuel Quality

## Research and Studies

- Auto Manufacturers and Oil Industry Joint Programs
  - EPEFE – European Programme on Emissions, Fuels, and Engine Technologies
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- Governments and Trade Associations conduct studies to evaluate the effects of fuels on emissions

- **Models for emission inventory estimate the impact of fuel quality improvements on a region's air quality**

**Studies over the past Three Decades directly link Fuel Quality to Emissions**

# Auto Industry Fuel Quality Needs

**Gasoline Fuel Quality Needs:**

- Eliminate Metal Additives (No Pb, Mn, Fe)
- Eliminate Silicon
- Improve Octane
- Reduce Sulphur
- Control Vapour Pressure
- Control Volatility
- Reduce Benzene
- Improve Detergency
- Control Aromatics and Olefins

**Catalyst Mn-deposits**

**Diesel Fuel Quality Needs:**

- Improve Cetane Number and Index
- Control Density, Viscosity, Distillation
- Improve Lubricity
- Reduce Sulphur
- Control Ash
- Improve Cold Flow
- Include Detergency
- Eliminate ethanol in diesel

**Clogged Fuel Filter**

**Bio-based Fuels Market is Growing**

- Evaluate Vehicle Compatibility
- Develop and Adopt Fuel Specifications
  - Use Performance Tests as a Basis
  - Protect Existing Vehicles
  - Support Biofuel Market Growth

**There is a Broad Base of Fuel Quality Needs to Match Emissions Requirements**

# Example Fuel Specification

**Table 1 - Requirements and test methods for premium grade unleaded petrol**
requirements in bold refer to the modified European Directive 98/70/EC [1]

| Property | Units | Limits Min. | Limits Max. | Test Method [a] (See 2. Normative refere |
|---|---|---|---|---|
| **Research octane number, RON** | | **95,0** | -- | EN ISO 5164 [b] |
| **Motor octane number, MON** | | **85,0** | -- | EN ISO 5163 [b] |
| **Lead content** | **mg/l** | -- | **5** | EN 237 |
| Density (at 15 °C) [c] | kg/m$^3$ | 720 | 775 | EN ISO 3675<br>EN ISO 12185 |
| **Sulfur content** [c] | **mg/kg** | -- | **150** (until 31-12-2004)<br>or<br>**50,0** | EN ISO 20846<br>EN ISO 20847<br>EN ISO 20884 |
| | | -- | **10,0** | EN ISO 20846<br>EN ISO 20884 |
| Oxidation stability | minutes | 360 | -- | EN ISO 7536 |
| Existent gum content (solvent washed) | mg/100 ml | -- | 5 | EN ISO 6246 |

**Fuel Specifications Need to be tied to Emissions**

# Avoid Separating Fuels from Emissions

| FUEL QUALITY | + | VEHICLE TECHNOLOGY | = | TAILPIPE EMISSIONS |
|---|---|---|---|---|

**Real-Life Scenario #1**

New Emission Standards Introduced - Low Sulfur Diesel – Decreased Lubricity (worsened) – Fuel System Concerns

Solution: *Use Diesel Lubricity Additives*

**Real-Life Scenario #2**

Tier 2 Emission Standards – Introduced Advanced Emission Control – Manganese in Gasoline – Deposits Plugging Catalysts

Solution: *Provide Manganese-Free Gasoline*

**Real-Life Scenario #3**

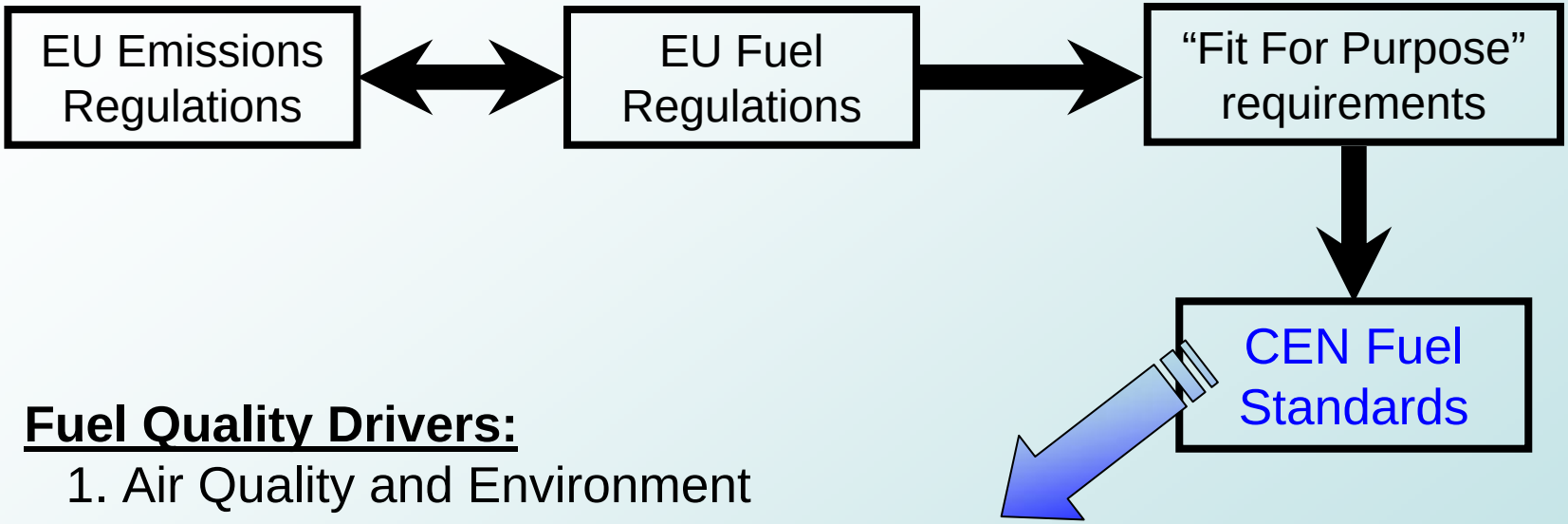
Biofuel – Inadequate Stability – Biofuel Blend Degrades – Performance based Stability Specifications Required

Solution: *Develop Adequate Fuel Specifications*

**Both Heavy Duty and Light Duty Require Fuel Specifications to be tied to Emissions**

# UN-ECE Needs Fuel Regulations

## Current EU Process




**Fuel Quality Drivers:**

1. Air Quality and Environment
2. Operability and Long-term Mechanical Durability

**UN-ECE Fuel Regulations are Needed**

**European Process Recognizes a Vehicle's Need for High Quality Fuel and Provides Operability and Long-Term Mechanical Durability**

# Summary

- More stringent Emission Regulations require the use of more advanced emission control technologies which drives the need for improved fuel quality
- Fuel quality must be compatible with vehicle technology
- Data clearly shows the link between fuel quality and vehicle emissions
- Need exists to treat the fuel and vehicle as a system
- Market Fuel Quality needs to be part of the UN-ECE Regulations

# OICA Recommendations

- **Recognition of the need to link market fuel quality to vehicle emission requirements is critical to the Environment and Auto Industry.**

# OICA Recommendations

- **Recognition of the need to link market fuel quality to vehicle emission requirements is critical to the Environment and Auto Industry.**

- **Action within WP29:**
  - **Determine the Best Process to move forward**
  - **Identify Experts to develop fuel specifications**
  - **Evaluate the most effective mechanism for implementation**
  - **Decide which is most expeditious to implement**
  - **Launch most efficient process for timely implementation**

# We Must All Work Together!

**CLEANER FUELS + CLEANER VEHICLES = CLEANER AIR**

OICA