Stakeholder Dialogue on
Improving Environmentally Sustainable Transport in Sri Lanka
Organized by
Ministry of Environment & Renewable Energy
Air Resource Management Center
Clean Air Sri Lanka
Centre for Science and Environment

CLEANER FUELS AND VEHICLES

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Director General, SLSEA

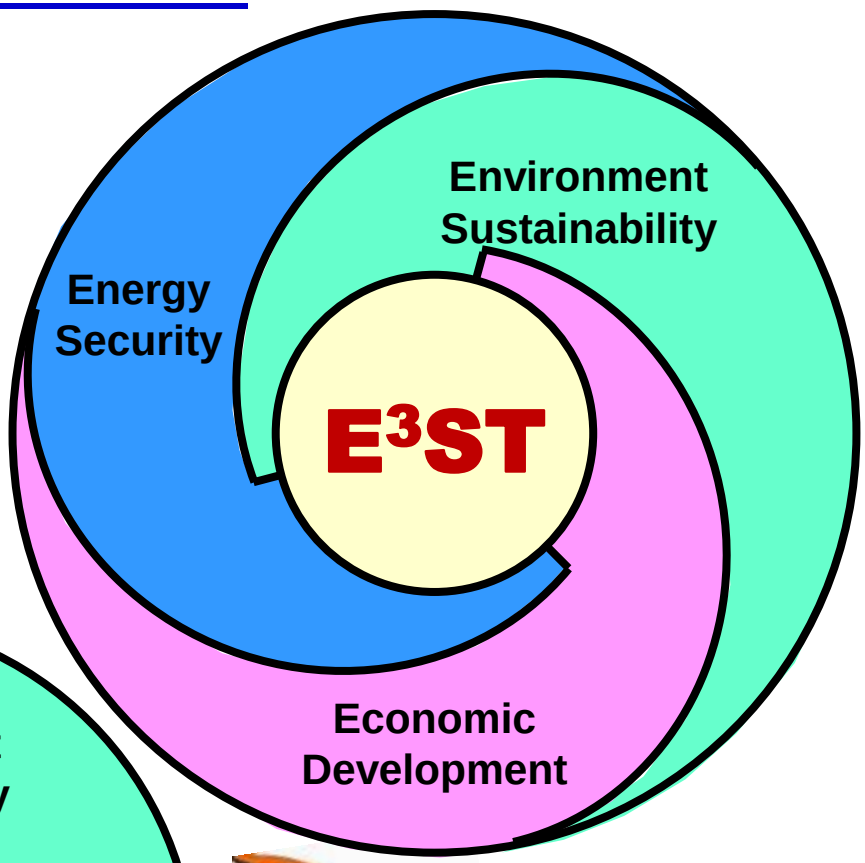
Hotel Taj Samudra, Colombo 03
10th December 2013

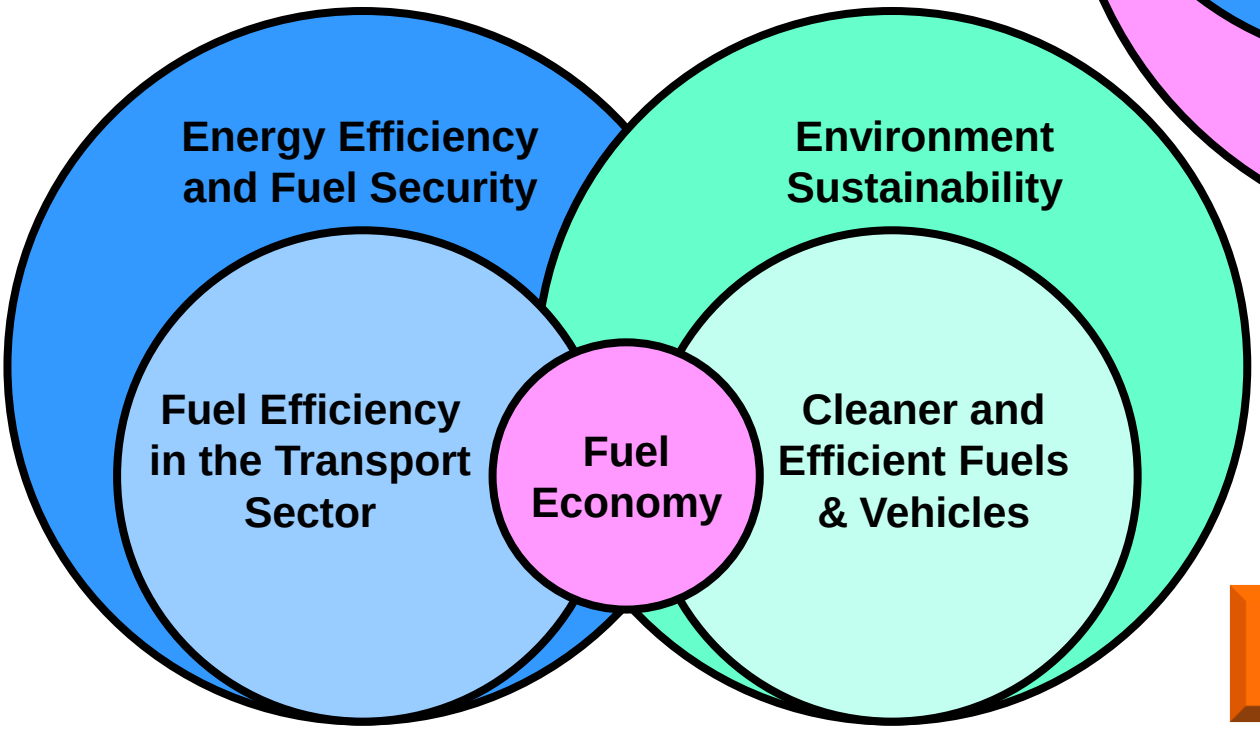
OVERVIEW

- **The Context**
- **Fuel Economy**
- **Cleaner Vehicles**
- **Cleaner Fuels**

THE CONTEXT

- **Growing Concerns**
  - ✓ Energy Security
  - ✓ Environment Sustainability
  - ✓ Economic Development
- **Interventions in Transport**
  - ✓ Energy Efficient & Environmentally Sustainable Transport System (E^3ST)

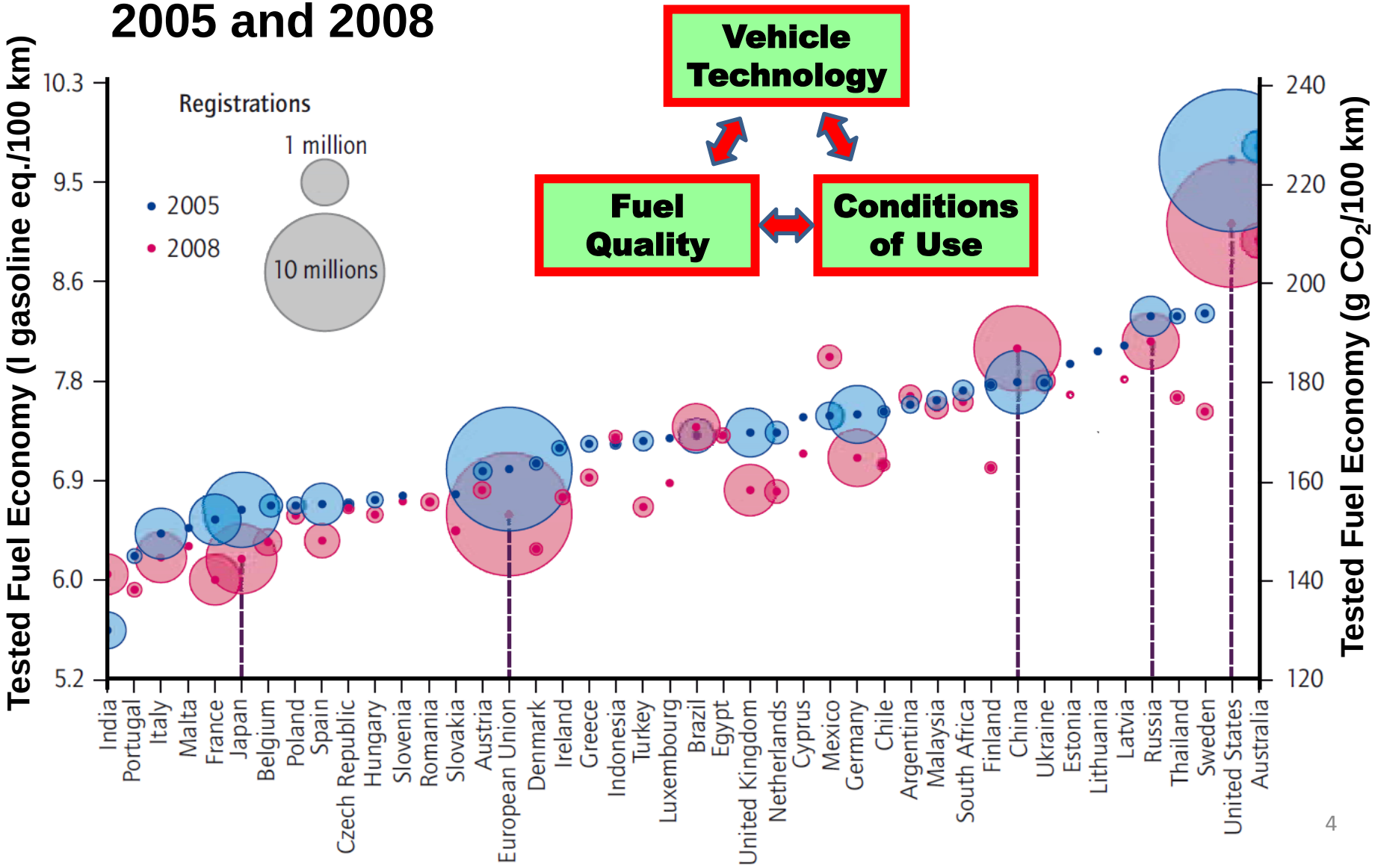




Managing Energy Intensity in the Economy

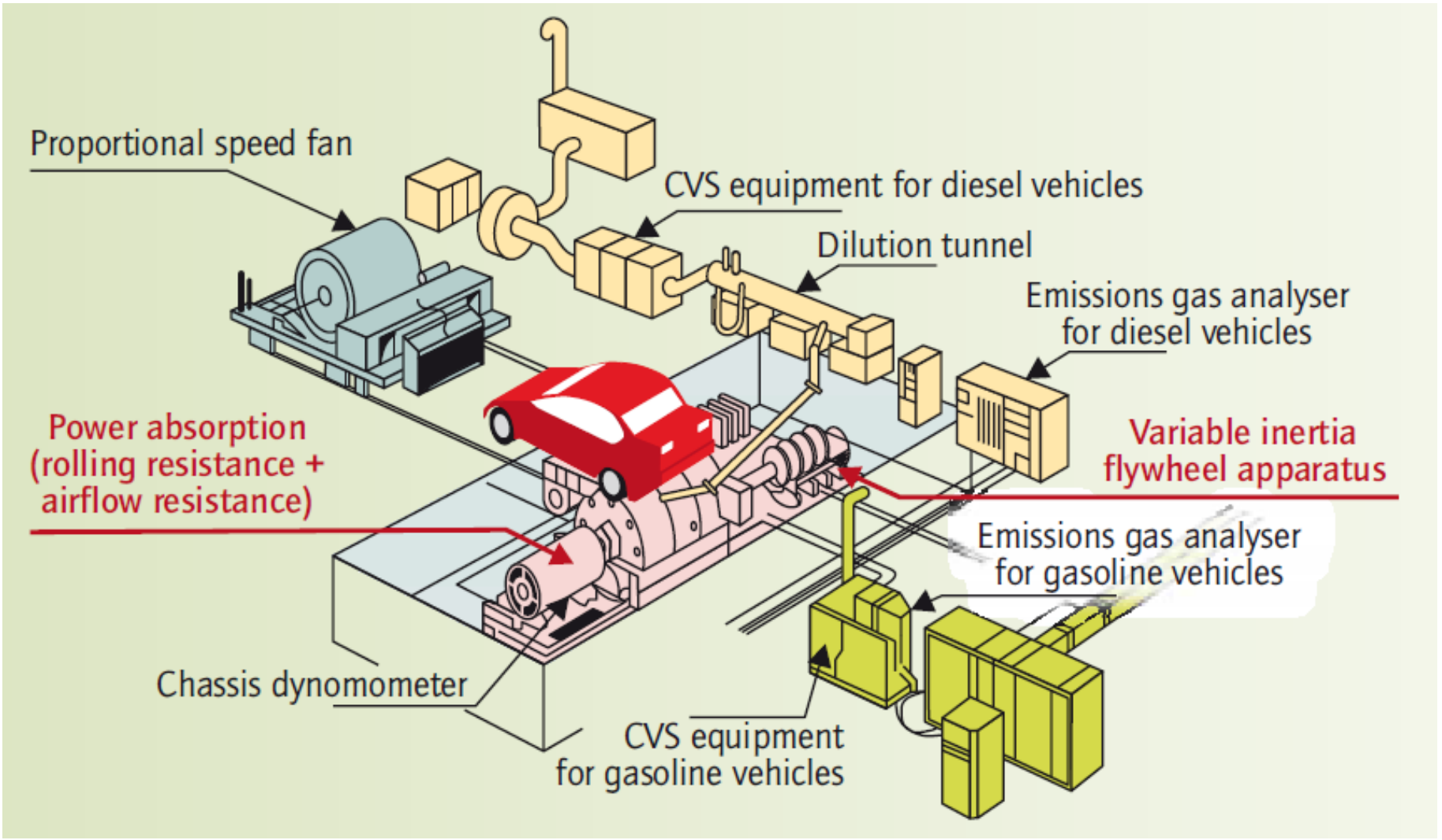
FUEL ECONOMY

- Average fuel economy and new vehicles registrations, 2005 and 2008



FUEL ECONOMY

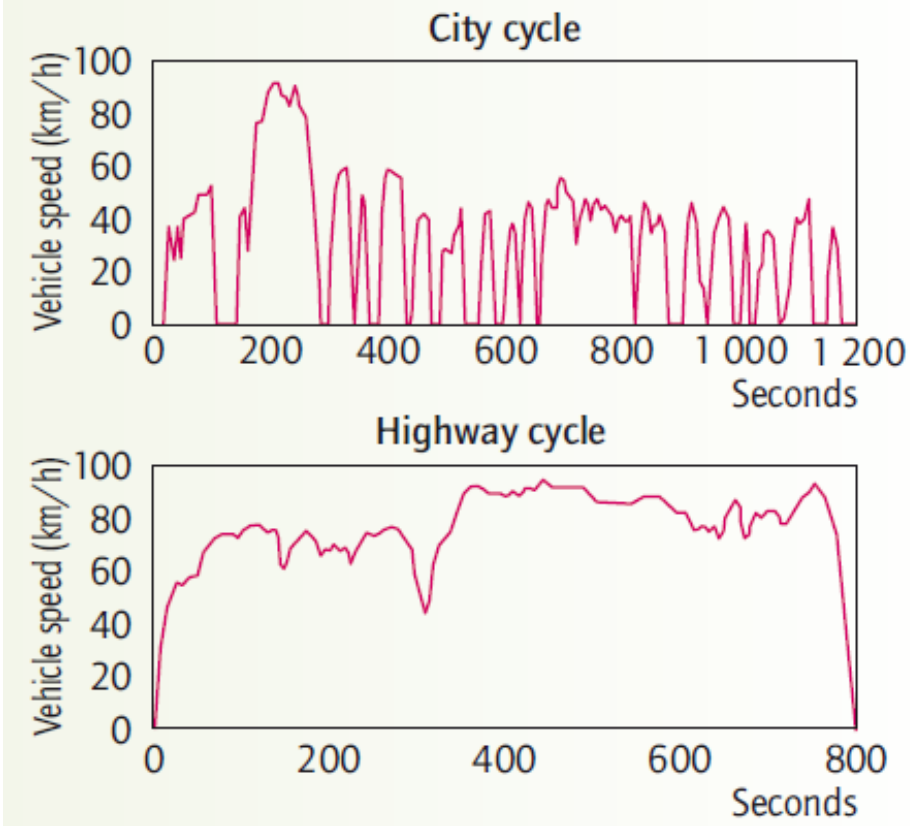
- **Fuel Economy Testing in a Chassis Dynamometer**



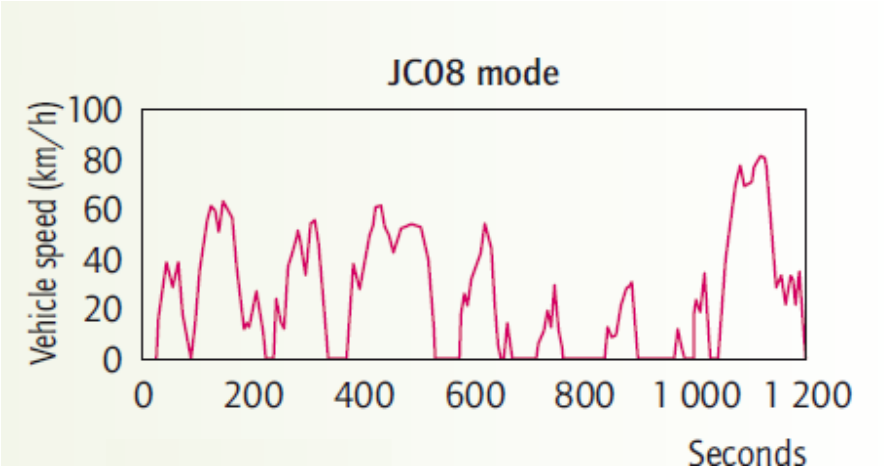
FUEL ECONOMY

- **Fuel Economy Testing in a Chassis Dynamometer**

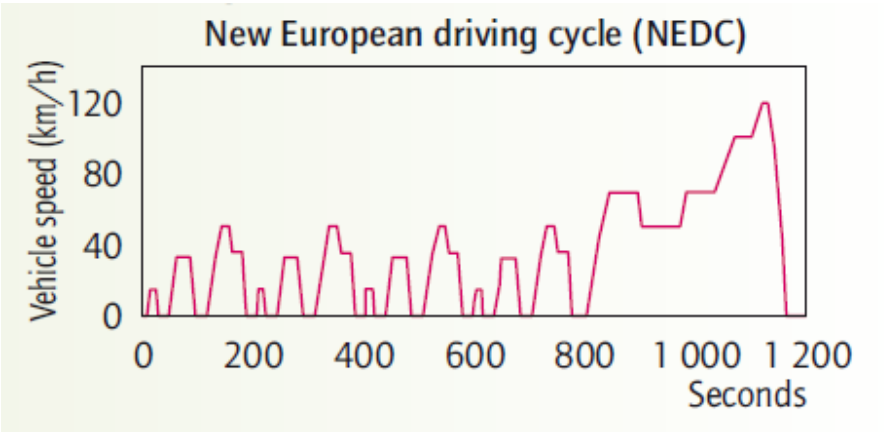
United States



Japan

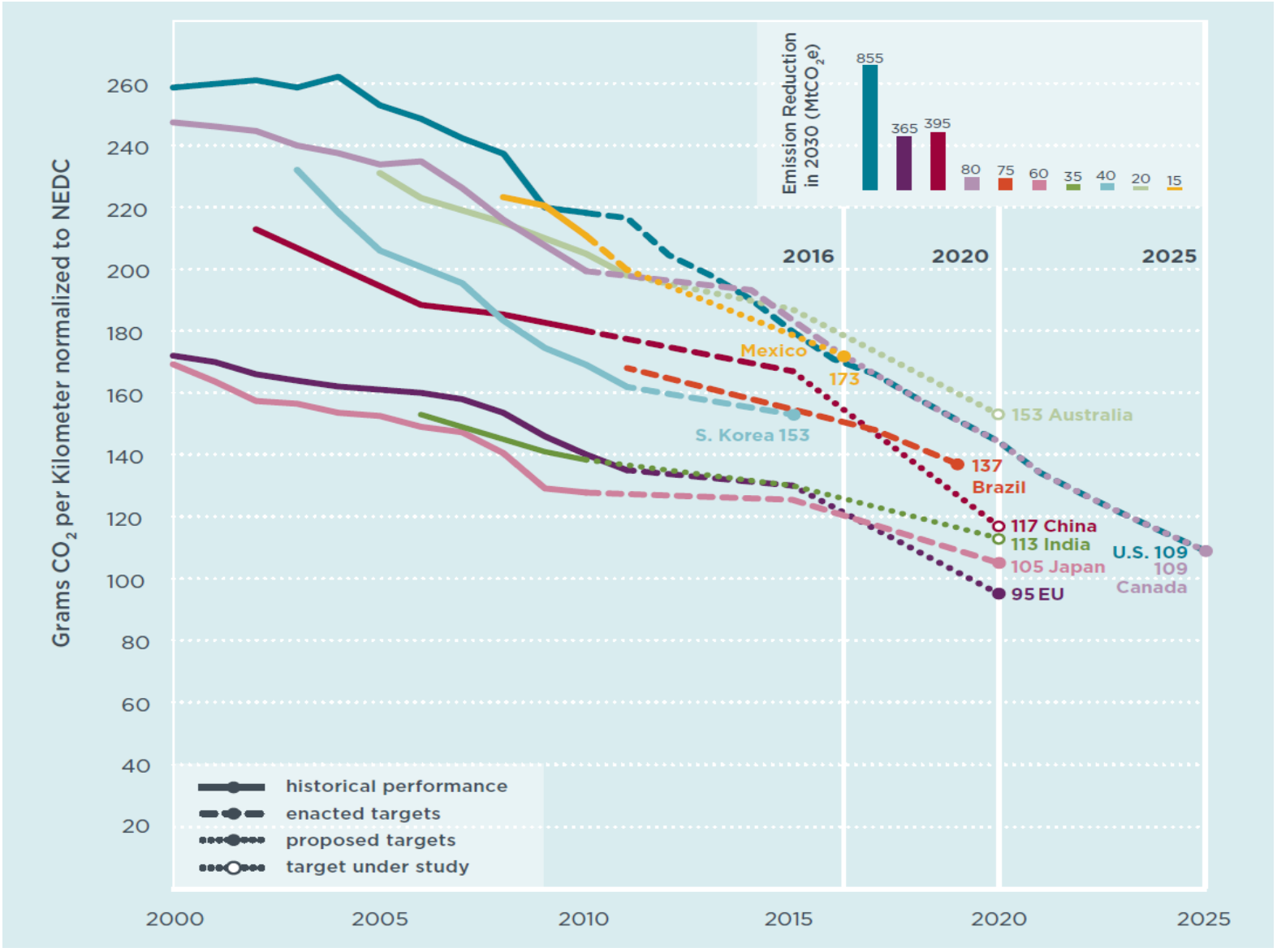


Europe



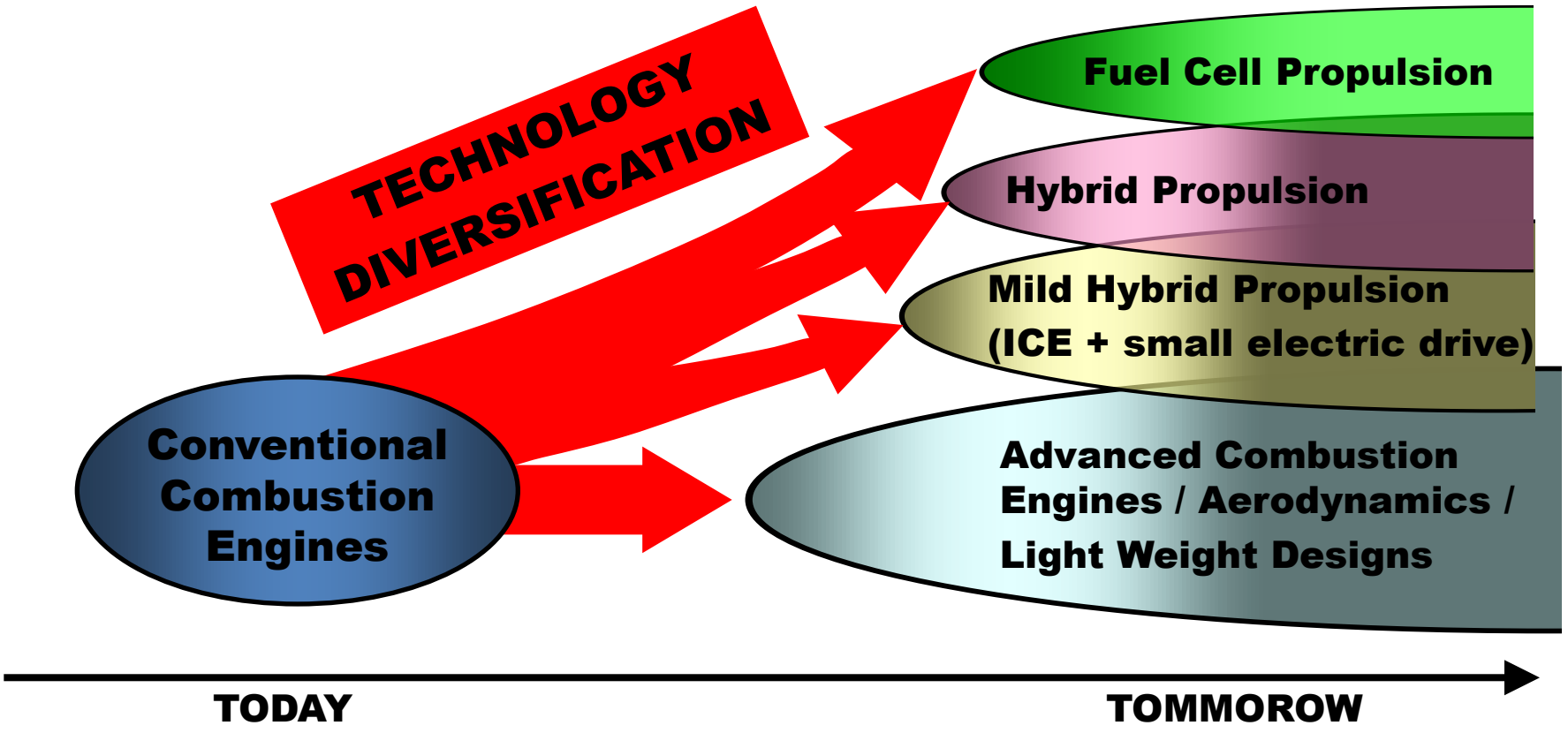
FUEL ECONOMY

- **Comparison of LDV CO_2 Emission Rates**



CLEANER VEHICLES

- Roadmap of Advanced Power-train Technologies



CLEANER VEHICLES

- **Advanced / Emerging Technologies for New Vehicles: Propulsion System Improvements**
  - ✓ Direct Fuel Injection
  - ✓ Secondary Air Injection
  - ✓ Pre-chamber / Swirl Chamber
  - ✓ Cylinder Deactivation
  - ✓ Variable Valve Timing
  - ✓ Controlled Auto-ignition
  - ✓ Advanced turbochargers
  - ✓ Friction Reduction
  - ✓ Smart Cooling
  - ✓ Variable Compression Ratio
  - ✓ High Pressure Fuel Injection
  - ✓ Camless Valve Trains

Medium Term (5 – 10 yrs)

Up to 10 % Improvements in Fuel Economy

Long Term (10 – 30 yrs)

Up to 35 % Improvements in Fuel Economy

CLEANER VEHICLES

- **Advanced / Emerging Technologies for New Vehicles: Non-propulsion System Improvements**
  - ✓ Vehicle Aerodynamics
  - ✓ Tire Rolling Resistance
  - ✓ Vehicle Weight Reduction

  } **3 – 8 % Improvements in Fuel Economy**

- **Alternative Fuels / Technologies**
  - ✓ Electric
  - ✓ Hybrid
  - ✓ Bio-fuels (Ethanol, Biodiesel, Biogas)
  - ✓ Hydrogen IC / Hydrogen Fuel Cell

Electric

- ✓ **EV: 5 km / kWh (η = 60%)**
- ✓ **Limited range per full charge**

Fuel Economy Benefits of Hybrid

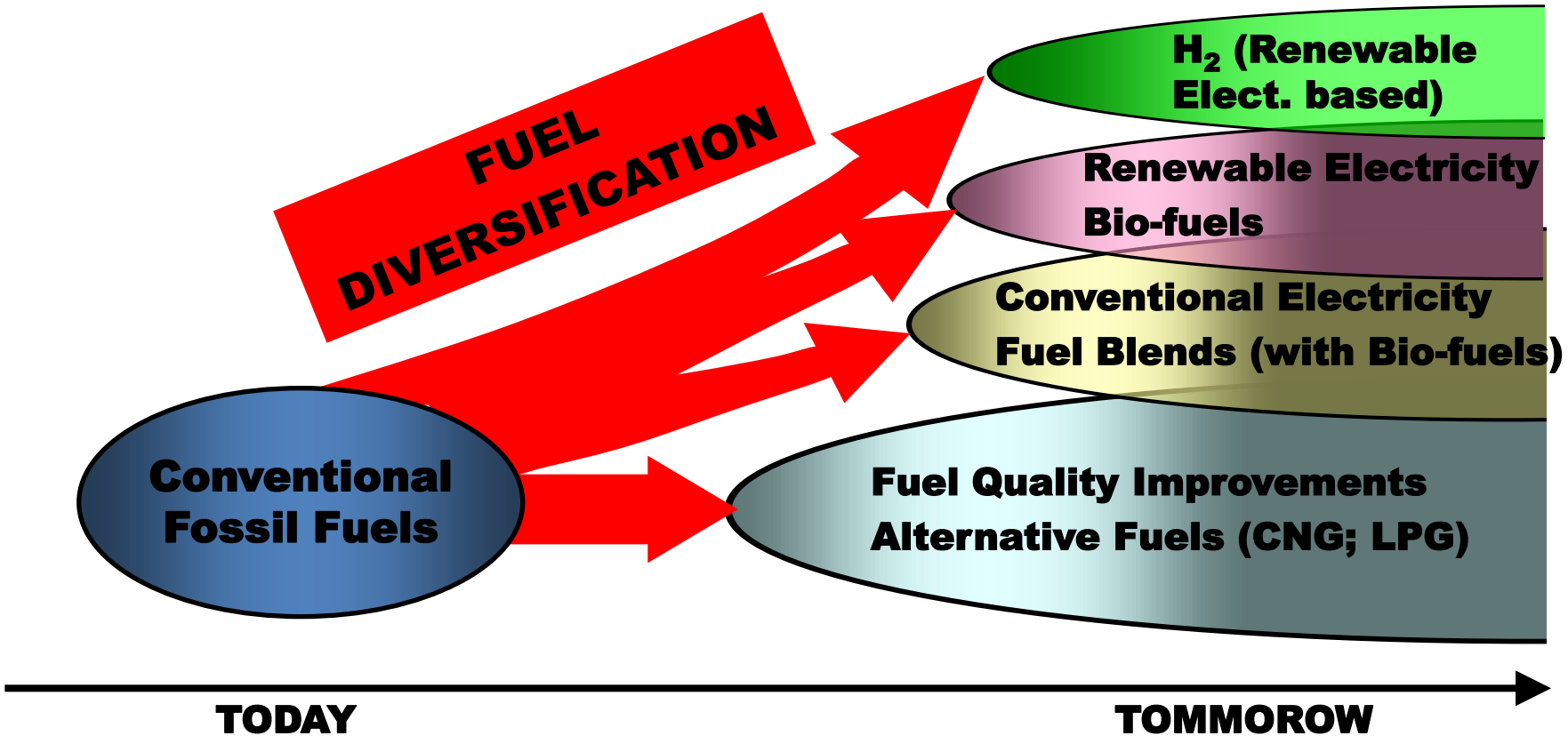
- ✓ **Weak Hybrid: Up to 20%**
- ✓ **Mild Hybrid: Up to 50%**
- ✓ **Full Hybrid: Up to 80%**

Hydrogen

- ✓ **Production of 1 kg of H_2 needs 55 kWh of electricity (η=70%)**
- ✓ **IC Engine: 25 km / kg H_2 (η=6%)**
- ✓ **Fuel Cell : 80 km / kg H_2 (η=20%)**

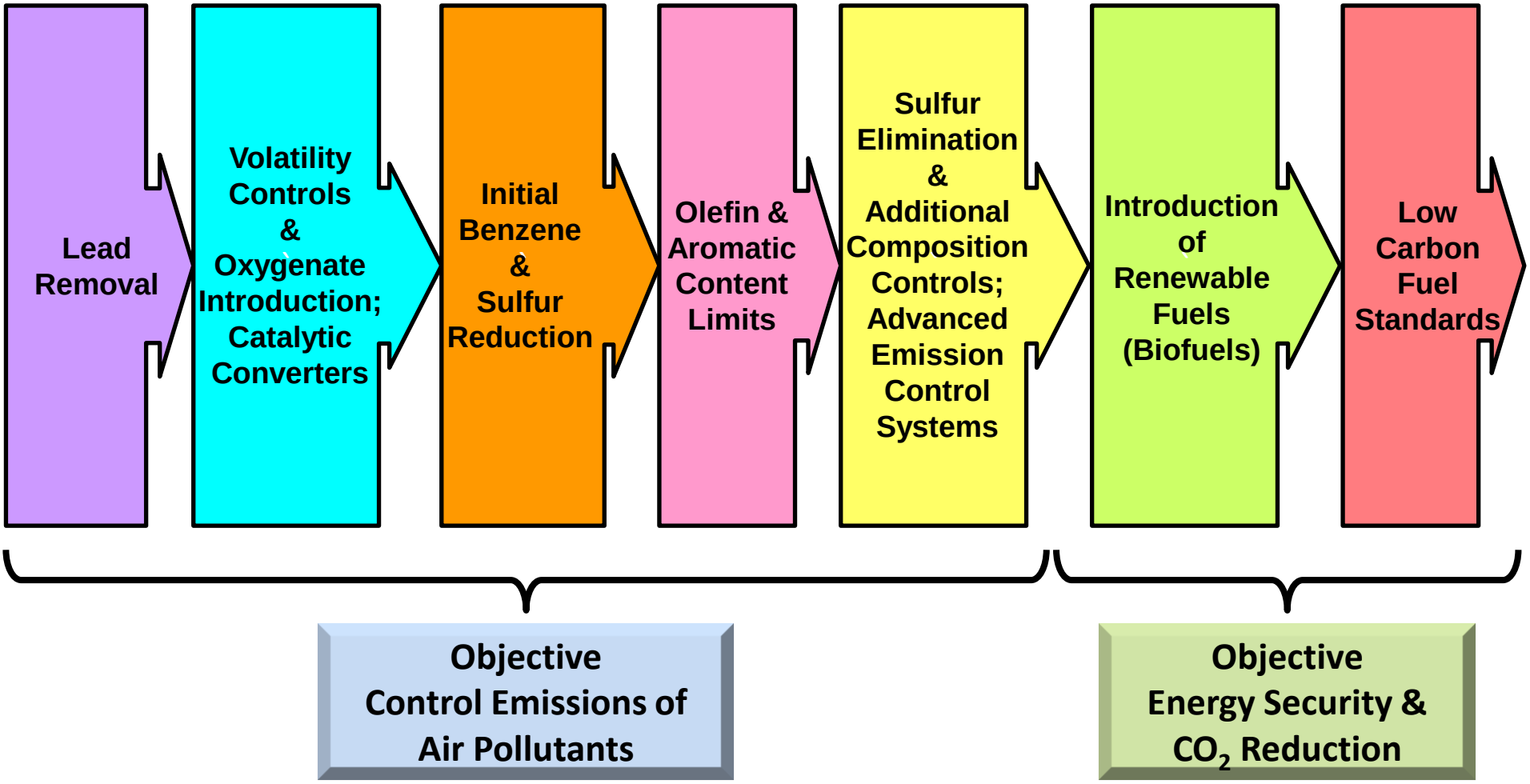
CLEANER FUELS

- Road Map for Cleaner Fuels:



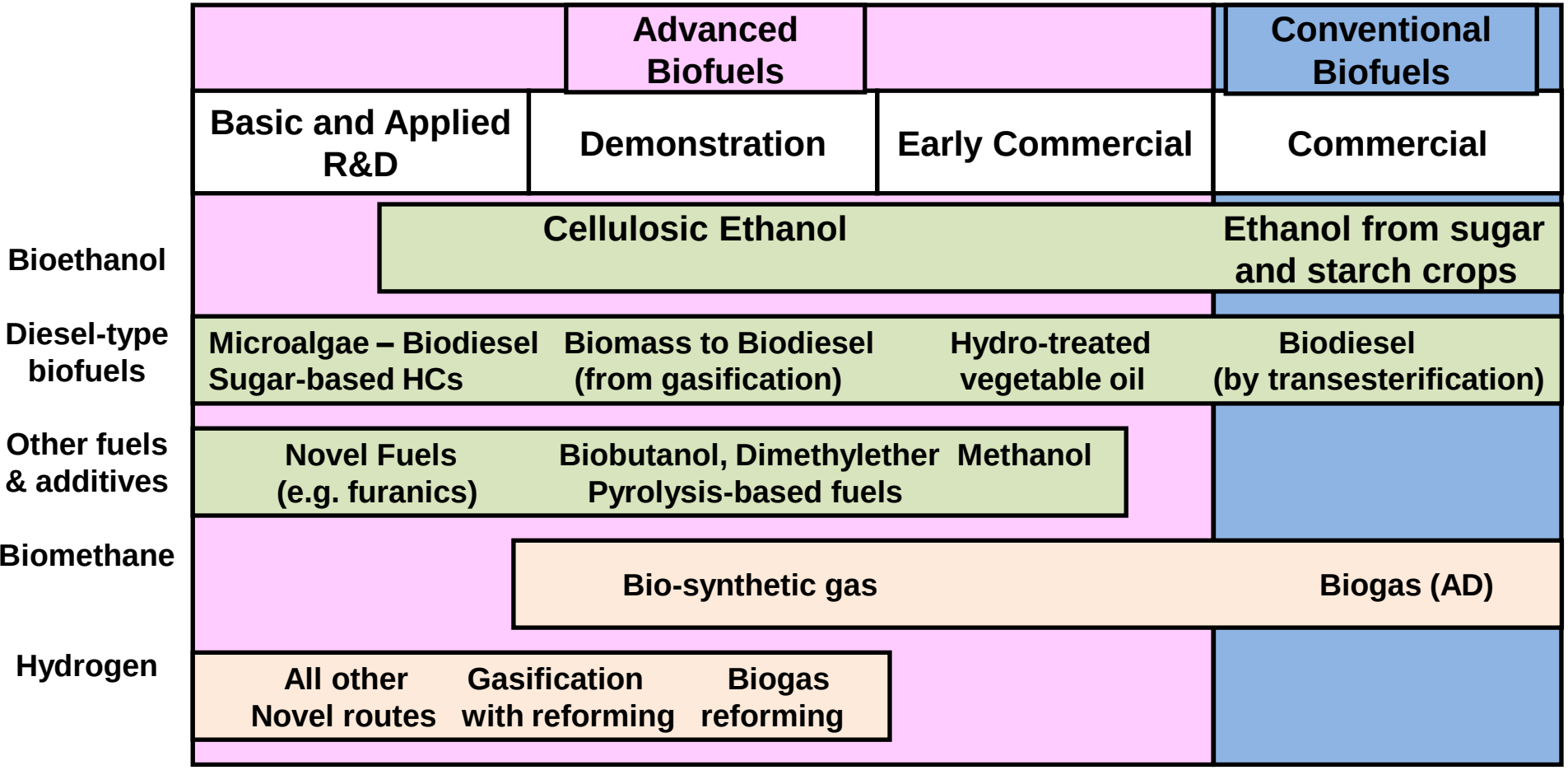
CLEANER FUELS

- **Global Fuel Quality Developments:**



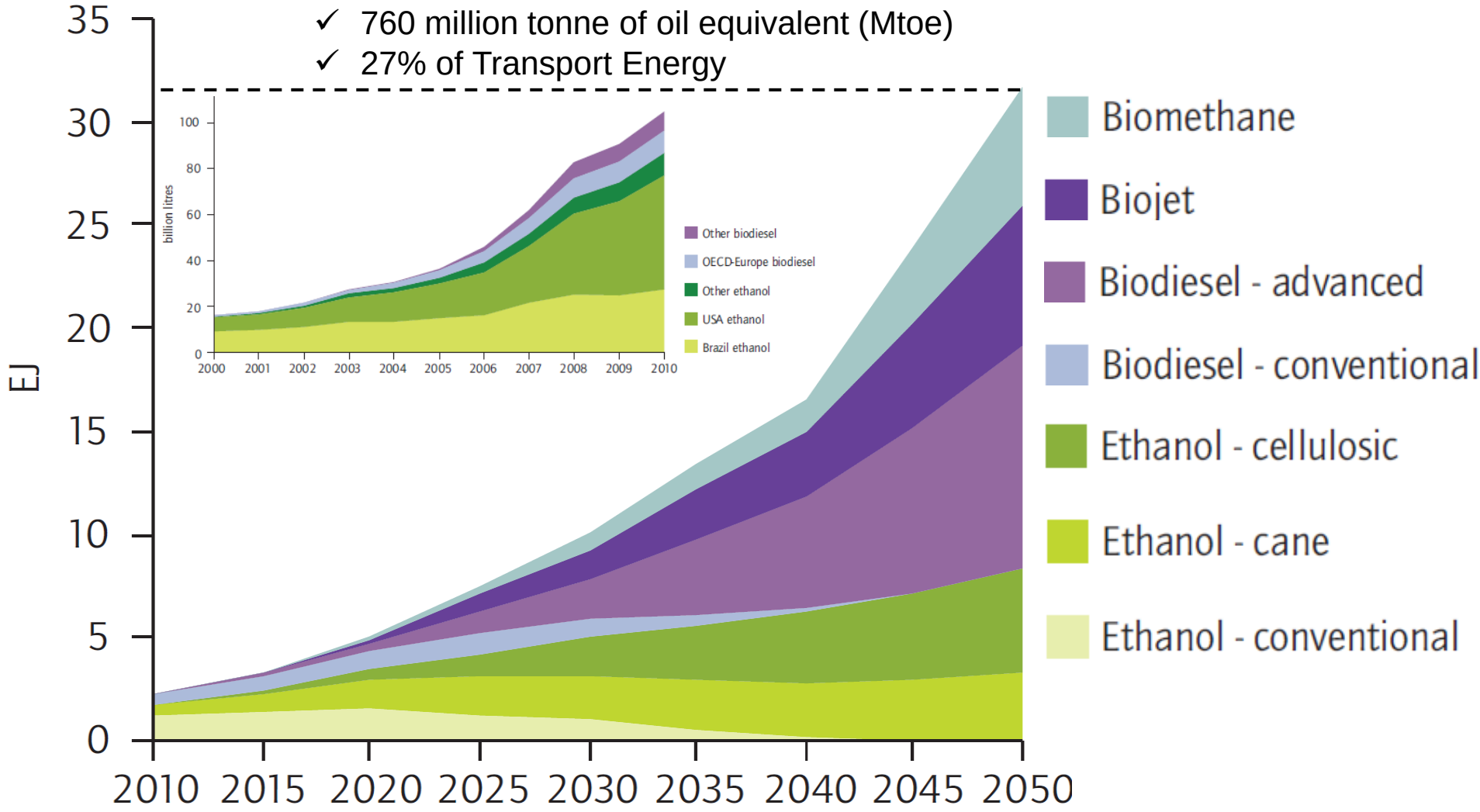
CLEANER FUELS

- **Conventional and advanced biofuel conversion technologies**



CLEANER FUELS

- **Demand for Biofuels – IEA BLUE Map Scenario**



Thank You