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Emission legislation at  
UNECE/WP.29/GRPE  
to consider when  
setting minimum  
requirements for used  
imports



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USED VEHICLES**

# Index – Key emissions legislation for cars, vans, trucks and buses

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## Cars:

- UN Regulation No. 83 – equivalent to Euro norm
- UN Regulation No. 101 – CO2 emissions at the tailpipe / Range determination for Electrified vehicles
- UN Regulation No. 24 – Diesel Smoke

## Trucks:

- UN Regulation No .49

## Motorcycles:

- UN GTR No. 2



# UN Regulation No. 83 – equivalent to Euro

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- Deployed since the 1970s
- Emission limits regularly tightened

Last iteration of UN Regulation No. 83:

- Contains 6 separate tests: Test Type I to VI (next slide)
- Contains specification for reference fuels
- Regulates exhaust emissions of Carbon Monoxide (CO), Hydrocarbons (HC), Nitrogen Oxides (NO<sub>x</sub>) and particulates (in mass and number)



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# UN Regulation No. 83 – Tests performed

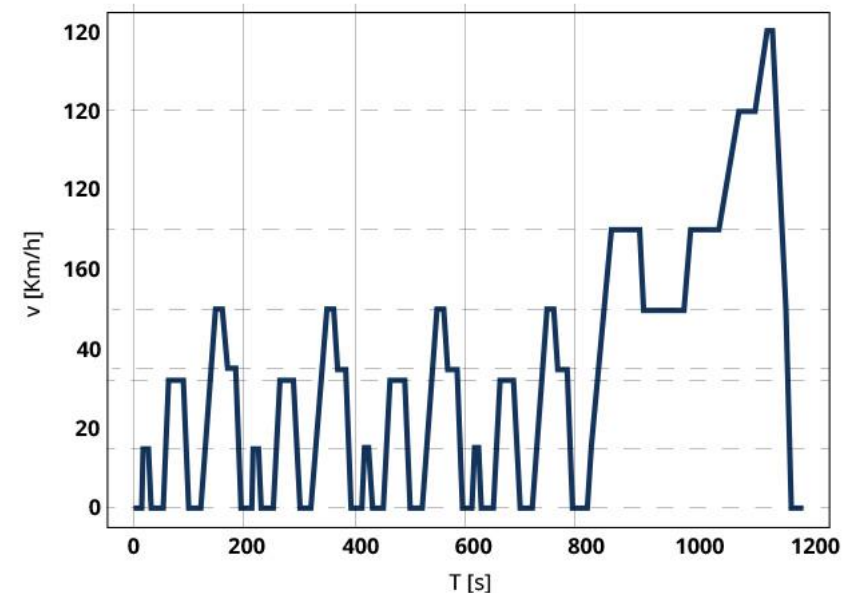
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For Gasoline engines

- Type I (verifying the average exhaust emissions after a cold start);
- Type II (carbon monoxide emission at idling speed);
- Type III (emission of crankcase gases);
- Type IV (evaporation emissions);
- Type V (durability of anti-pollution devices);
- Type VI (verifying the average low ambient temperature carbon monoxide and hydrocarbon exhaust emissions after a cold start);

# UN Regulation No. 83 – Test Type I

- Replicates a test drive in a laboratory
- NEDC test cycle (now replaced by WLTP in UN Regulation No. 154)
- Exhaust gases captured in bags
- Average content for each regulated pollutant in g/km
- Expensive and complex equipment

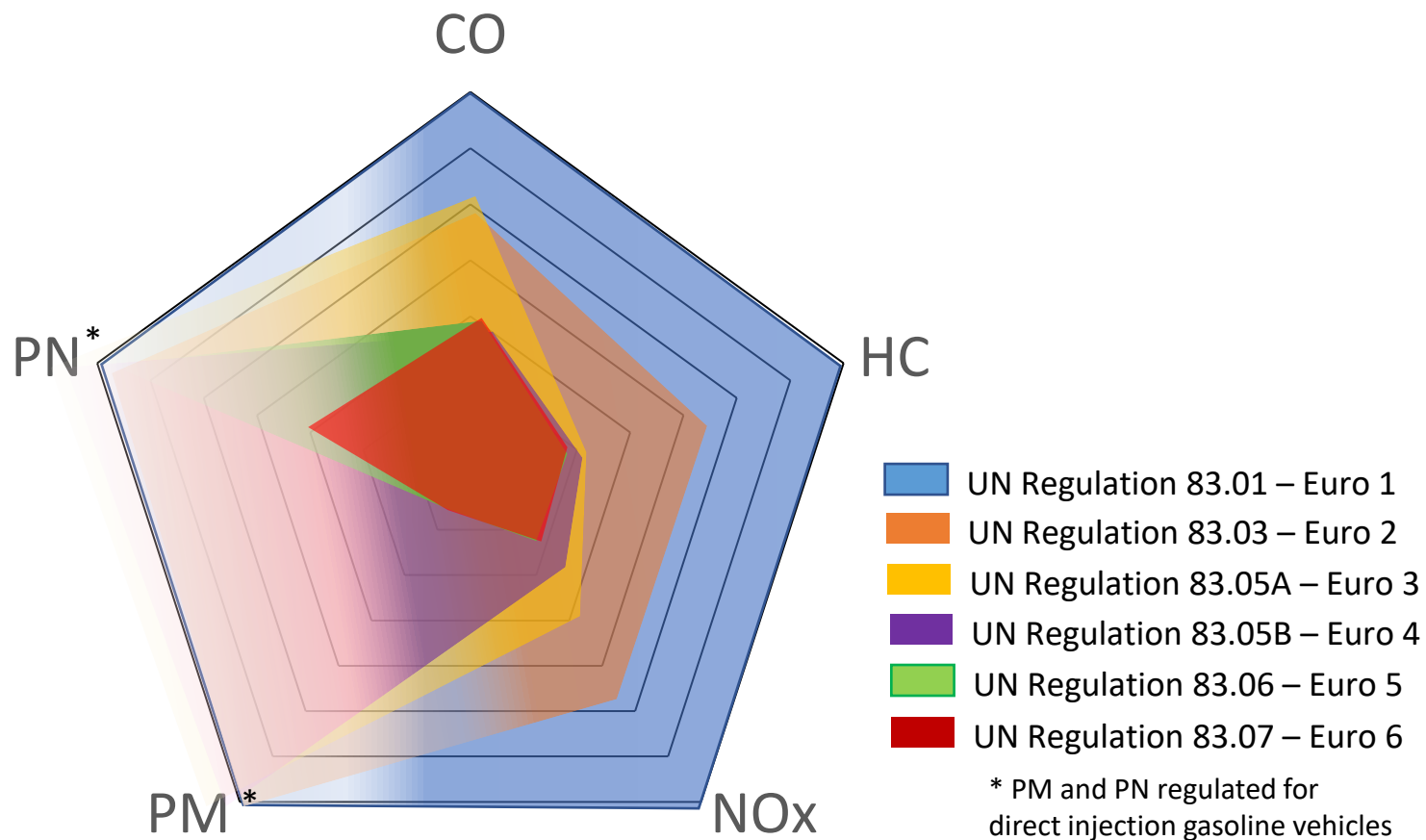


Characteristics	Unit	NEDC
Distance	km	10.9314
Total time	s	1180
Idle (standing) time	s	267
Average speed (incl. stops)	km/h	33.35
Average driving speed (excl. stops)	km/h	43.1
Maximum speed	km/h	120
Average acceleration	m/s <sup>2</sup>	0.506
Maximum acceleration	m/s <sup>2</sup>	1.042



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# Emission limits over time, Test Type I



# UN Regulation No. 83 – Other tests, examples

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Test Type II, carbon monoxide emission at idling speed

- Also used during periodic technical inspection (PTI)
- Does not require dynamometer nor very expensive equipment
- $\text{CO} < 0.2\%$



Test Type IV, evaporation emissions

- Vehicle enclosed in sealed box
- Measures all fuel evaporating from the fuel tank for several hours
- $\text{HC} < 2\text{g} / \text{test}$



# UN Regulation No. 83-05B – Euro 4 as a minimum requirement

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## Gasoline

- Euro 4 vehicles required installation of
  - 3-Way catalytic converter to treat HC, CO and NOx
- Good performance under most driving conditions (when warm)
- Durability of 3-Way catalytic converter proved to be good

## Diesel

- Some engines fitted with particulate filters, Exhaust Gas Recirculation to lower NOx (not always durable and effective in real driving conditions)

In the EU; Introduced in 2005, stopped in 2010: European Euro 4 vehicles are between 12 and 17 years old





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# UN Regulation No. 101 – CO<sub>2</sub> and range

- Same test as UN Regulation No. 83 – Test Type I
  - NEDC test cycle
- Measurement procedure for CO<sub>2</sub> emissions using in Fuel Economy labels
- Range for Electrified vehicles
  - Plug-in hybrids
  - Pure Electric Vehicles

Vehicle Information																	
<p>CO<sub>2</sub> emission figure (g/km)</p> <p>A scale of CO<sub>2</sub> emission classes from A to G. Class A is the most eco-friendly (&lt; 120 g/km) and Class G is the least (&gt; 225 g/km). The scale uses a color gradient from green to red.</p> <table border="1"><thead><tr><th>Class</th><th>CO<sub>2</sub> Emission Range (g/km)</th></tr></thead><tbody><tr><td>A</td><td>&lt; 120</td></tr><tr><td>B</td><td>120+ to 140</td></tr><tr><td>C</td><td>140+ to 155</td></tr><tr><td>D</td><td>155+ to 170</td></tr><tr><td>E</td><td>170+ to 190</td></tr><tr><td>F</td><td>190+ to 225</td></tr><tr><td>G</td><td>225+</td></tr></tbody></table>	Class	CO <sub>2</sub> Emission Range (g/km)	A	< 120	B	120+ to 140	C	140+ to 155	D	155+ to 170	E	170+ to 190	F	190+ to 225	G	225+	<p><b>A</b> 104 g/km</p>
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<p><b>Fuel Use (estimated) for 18,000 kilometres</b> A fuel use figure is indicated to the consumer as a guide for comparison purposes. This figure is calculated by using the combined drive cycle (urban and extra urban fuel consumption cycles).</p> <p><b>Motor Tax for 12 months</b> Motor Tax varies according to the CO<sub>2</sub> emissions of the vehicle.</p> <p><b>Vehicle Registration Tax (VRT) Rate</b> Percentage rate of VRT payable of the value of the vehicle is dependant on the CO<sub>2</sub> emissions.</p>	<p><b>774 litres</b></p> <p><b>€100</b></p> <p><b>14%</b></p>																

# UN Regulation No. 24 – Diesel smoke

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- Free acceleration test, similar to Test Type II
- Also used during PTI for diesel engines
- Looks at opacity of the exhaust gases
  - Previously on paper filter, now digital optical sensors
- State of the art engines with particulate filters only let very small particulates pass by
  - Opacimeters not always able to detect any opacity
- Opacimeters to be gradually replaced by particulate counters, such as in the Netherlands, Belgium, Germany during PTI

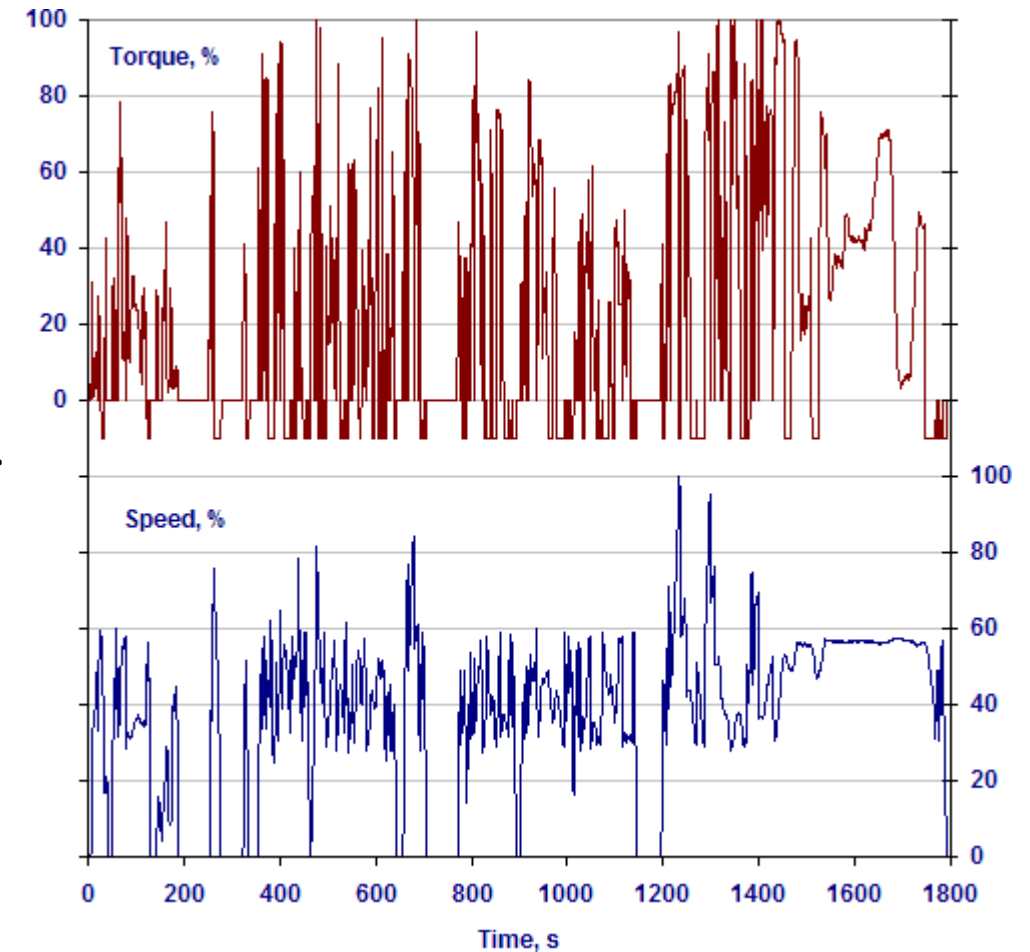


# UN Regulation No. 49 – Truck exhaust emissions



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- Similar to Euro I to VI
- Full vehicle not tested, only the engine
  - Emission limits in g/kW.h, not g/km
- Steady and transient cycles
  - From Euro VI, WHTC (developed at UNECE) ->

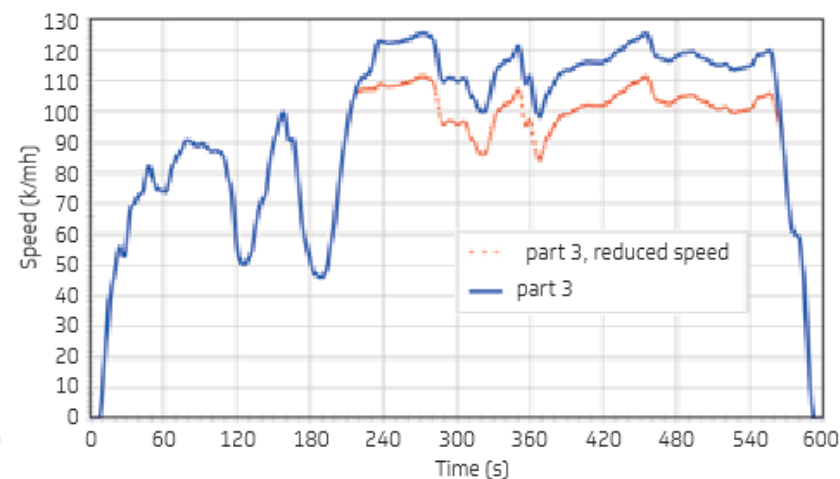
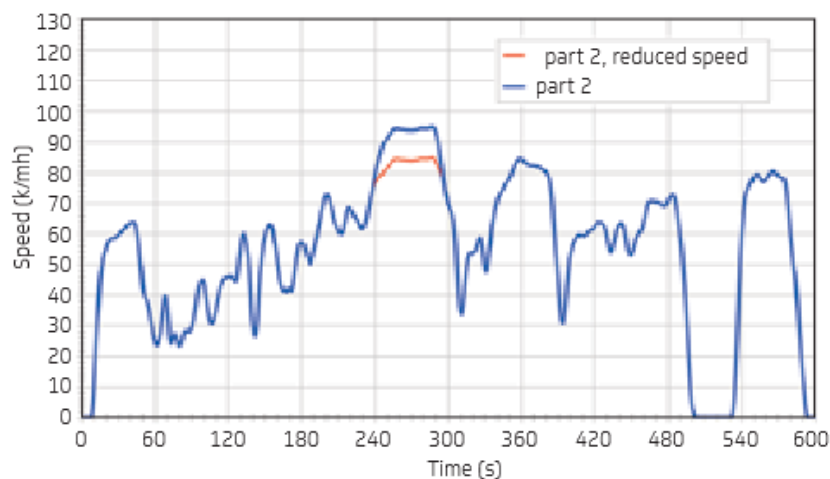
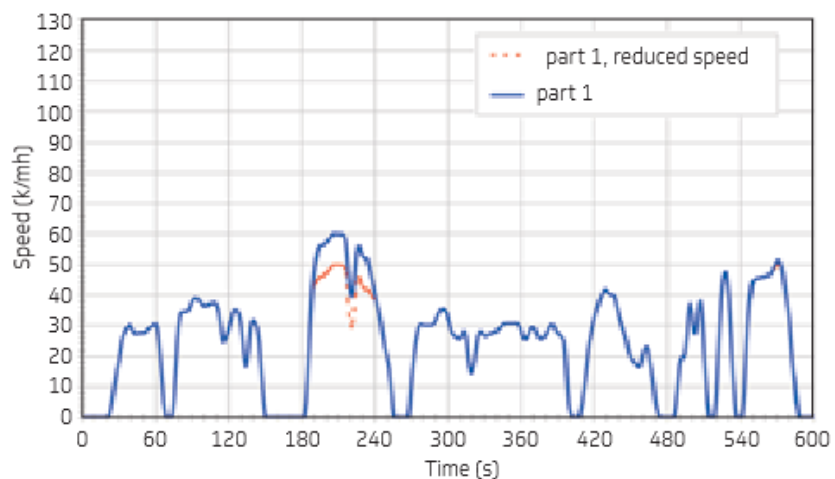




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# UN GTR No. 2 : 2-/3- Wheelers emissions

- Similar to Euro 1 to 5 in Europe
- Updated test cycle developed at UNECE
  - WMTC



# Conclusions

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- For cars, Euro 4 represents a good minimum performance requirements, especially for gasoline cars in most driving conditions
- Fuel quality must be met before switching to latest emission control technologies
- Relying on compliance with UN Regulations offer a more robust global solution than EU standards
  - Many countries have similar standards, but named differently => UN Regulations are universal and global

Thank You for your attention



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# UN Regulation No. 154 – WLTP

- WLTP cycle, developed at UNECE, is longer, covers wider range of operating conditions
- Test conditions more realistic
- Much closer to real life

COMPARISON: NEDC VS. WLTP		
	NEDC	WLTP
CYCLE TIME	20 MINUTES	30 MINUTES
DISTANCE	11 KM	23.25 KM
MAXIMUM SPEED	120 KM/H	131.3 KM/H
AVERAGE SPEED	34 KM/H	46.5 KM/H
DRIVING PHASES	2 PHASES	4 MORE DYNAMIC PHASES
INFLUENCE OF OPTIONAL EQUIPMENT	NOT CONSIDERED	ADDITIONAL FEATURES (WHICH CAN DIFFER PER CAR) ARE TAKEN INTO ACCOUNT
GEAR SHIFTS	FIXED GEAR SHIFT POINTS	DIFFERENT GEAR SHIFT POINTS FOR EACH VEHICLE
STOP TIME	24%	12,5%

