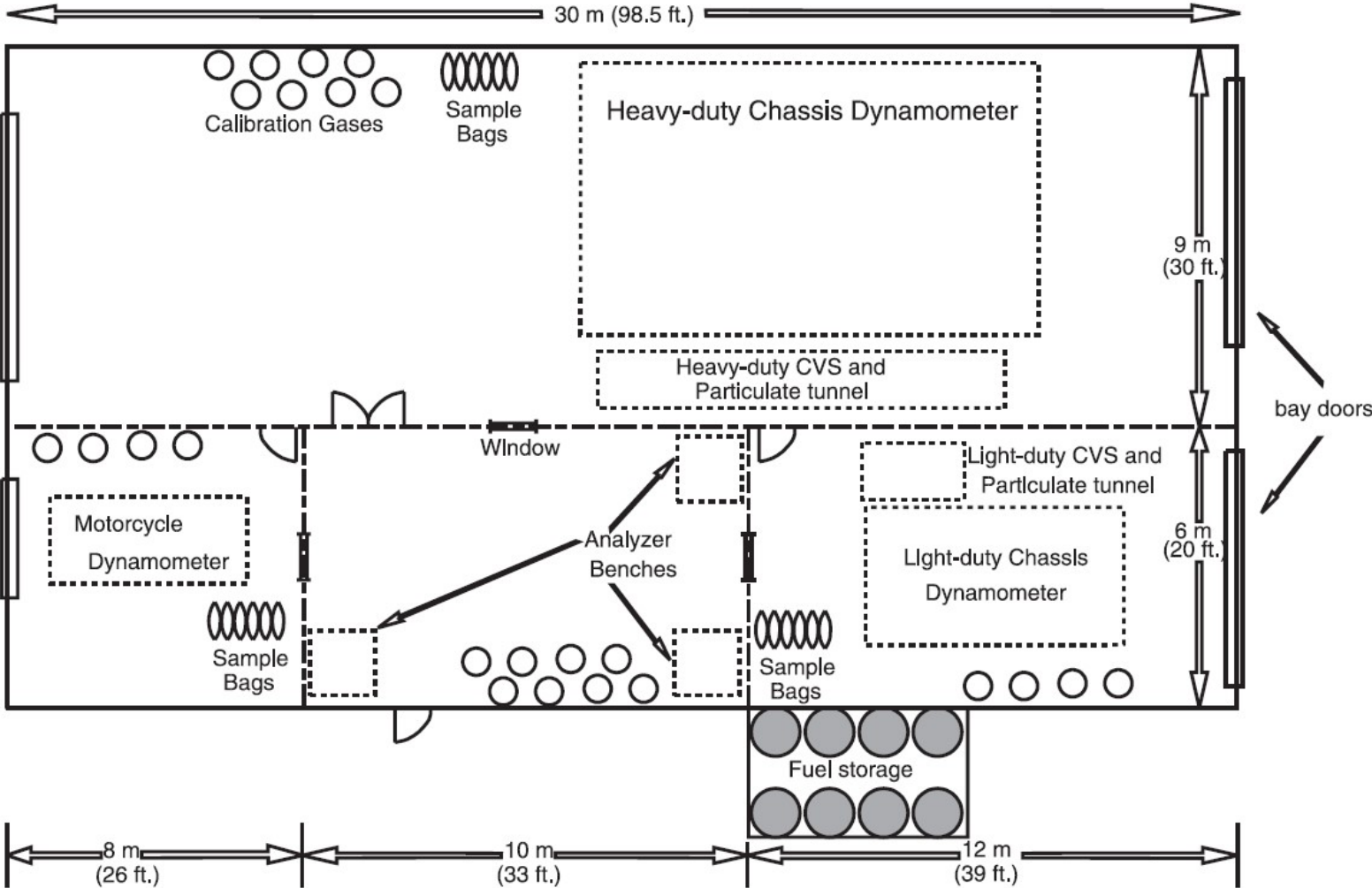


# Mobile Emissions Test Cycles

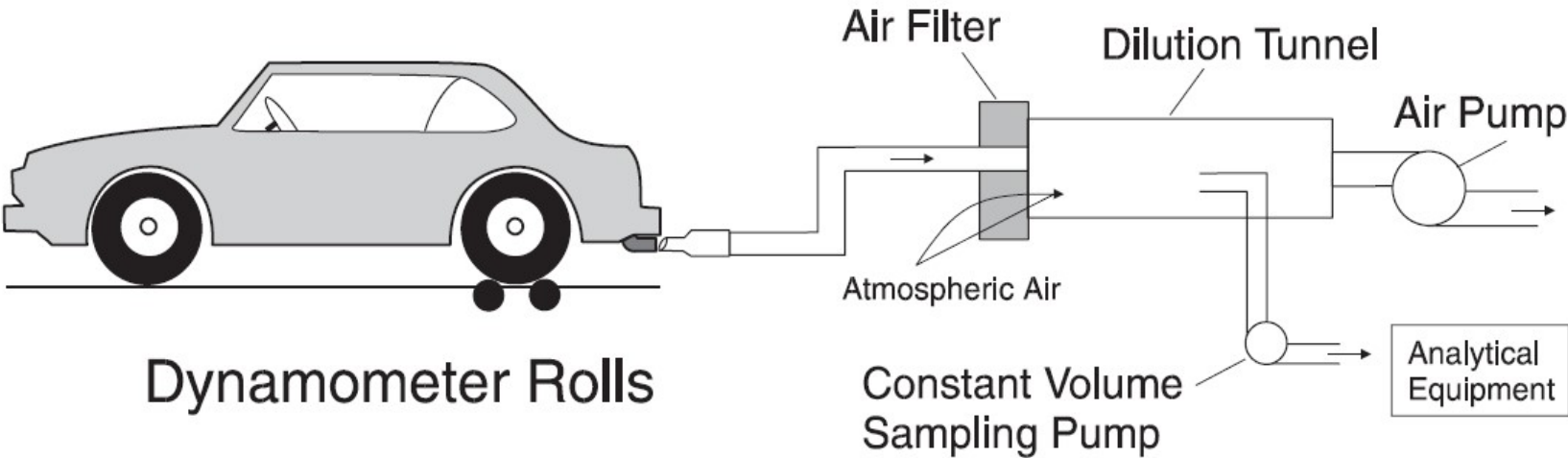
# Typical layout of an emission test laboratory



# Exhaust emissions test for LD vehicles

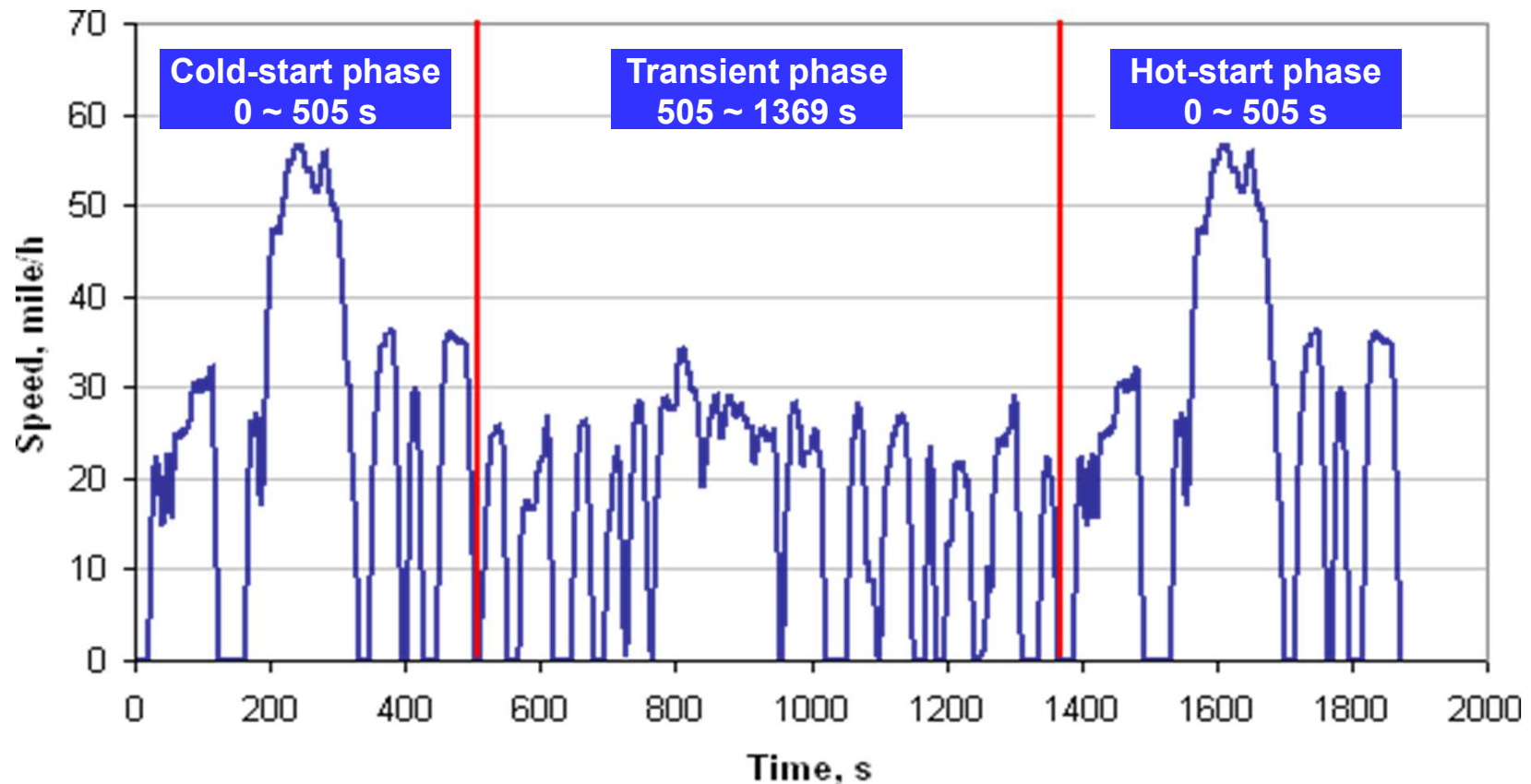
Mandatory: Chassis Test

## CVS Sampling System



# Engine-out emission tests for LDVs in USA

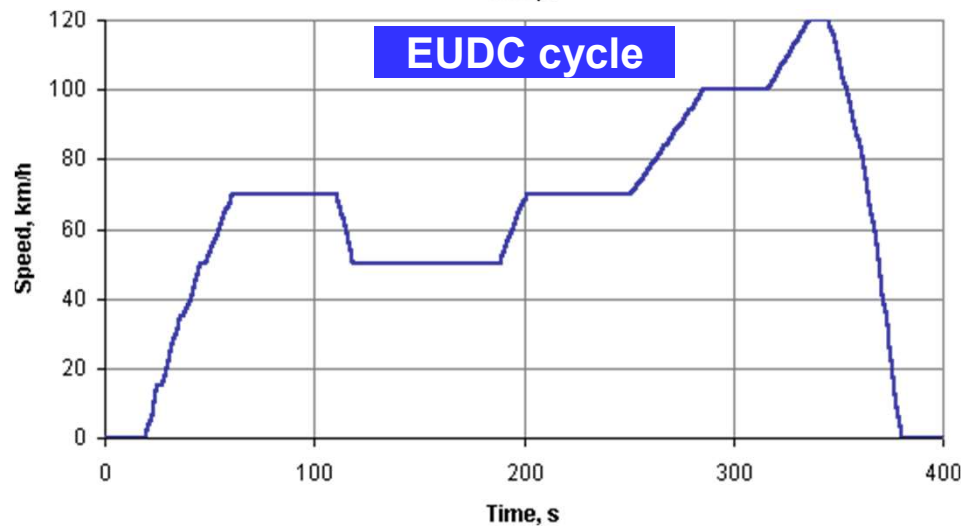
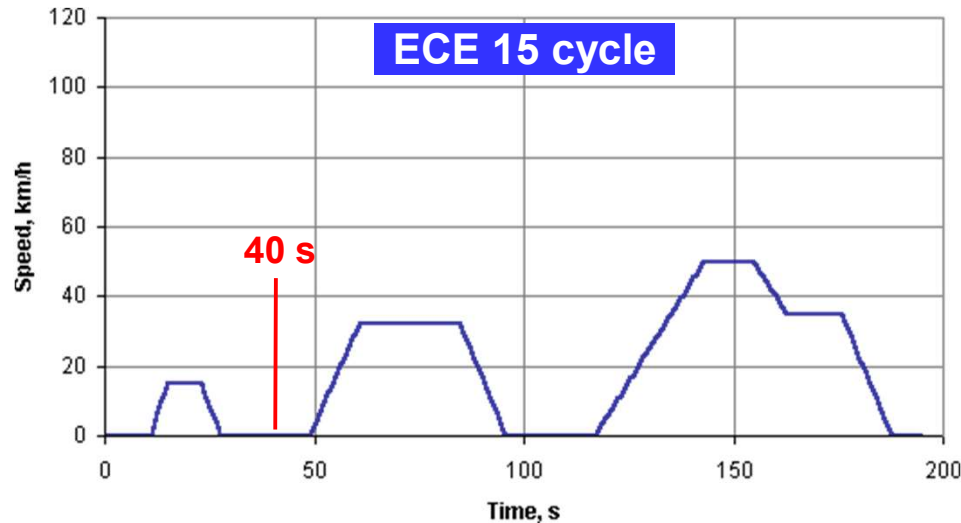
FTP 72 (1<sup>st</sup> & 2<sup>nd</sup> phase) + 3<sup>rd</sup> phase = FTP 75 cycle



Test procedure: “Cold-start phase” + “Transient phase” -> stopping for 10 min -> “Hot-start phase”.

After MY 2000, FTP 75 + Supplemental Federal Test Procedures (SFTP) = aggressive, high speed driving (US 06) + the use of air conditioning (SC03)

# Engine-out emission tests for PCs and LDVs in EU



• Up to December 31, 1999:

**ECE 15 + EUDC = MVEG-A cycle  
(Motor Vehicle Emissions Group)**

• After January 1, 2000:

**ECE 15 + EUDC = NEDC (or MVEG-B)  
(New European Driving Cycle)**

• MVEG-A cycle: begins the emission sampling after idling for 40 s.

• NEDC cycle: begins the emission sampling w/o the idling at 0 s.

**Test procedure: 4 repeated ECE cycles w/o interruption following 1 EUDC cycle.**

Source: European Union Directive 90/C81/01.

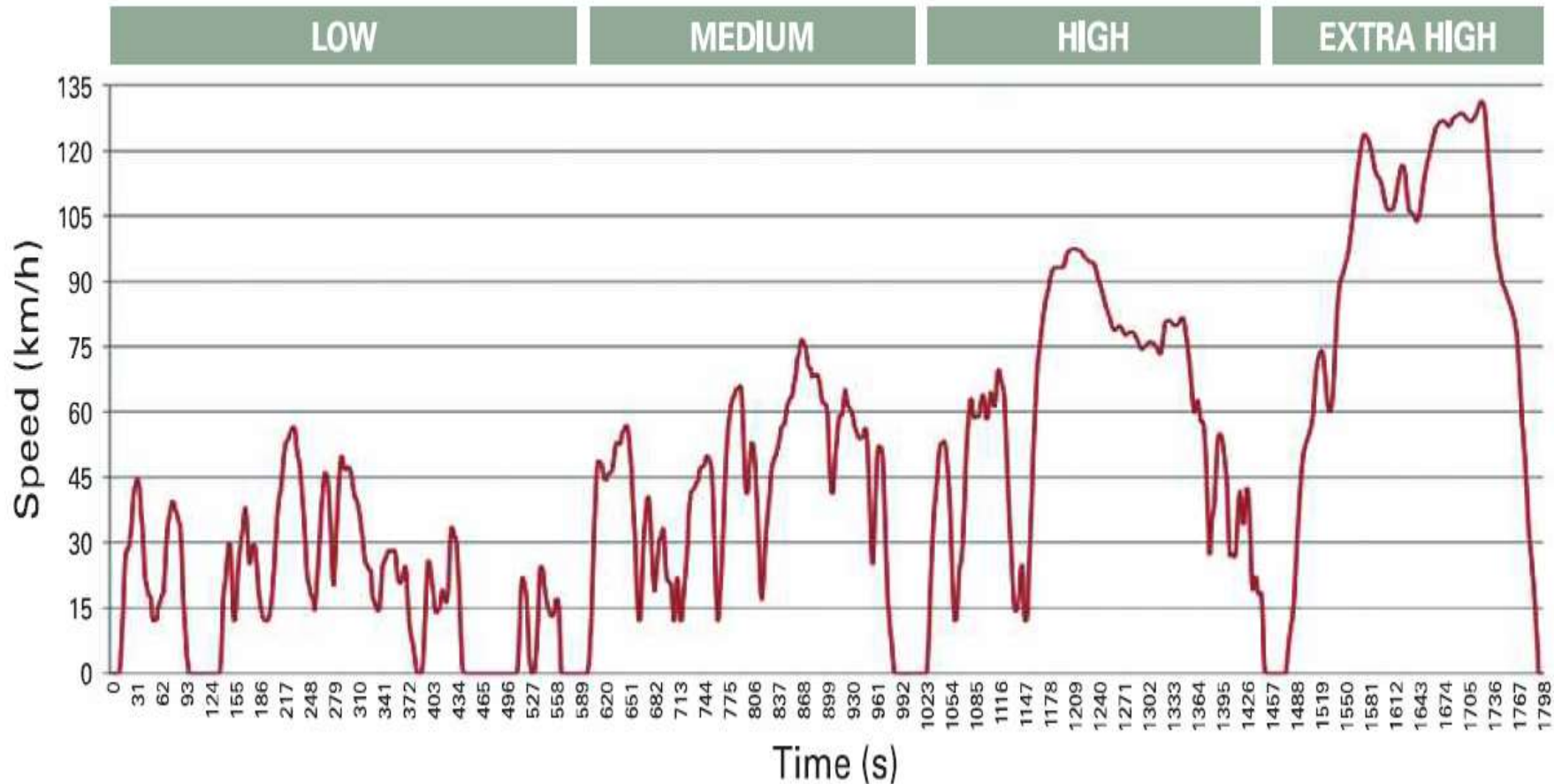
# New EU test cycles

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- **WLTC (Worldwide harmonized Light vehicles Test Cycle):** effective from September 2017.
- The WLTC cycles are part of the **Worldwide harmonized Light vehicles Test Procedures (WLTP)**, developed by the UN ECE GRPE (Working Party on Pollution and Energy) group and then published as UNECE Global technical regulation No 15 (GTR 15).
- The WLTP defines a number of other procedures—in addition to the WLTC test cycles.
- **The WLTP replaces the European NEDC based procedure for type approval testing of light-duty vehicles, with the transition from NEDC to WLTP occurring over 2017-2019.**
- The WLTP includes several WLTC test **cycles—Class 3b, Class 3a, Class 2, Class 1**—applicable to vehicle categories of different power-to-mass (PMR) ratio.
- **The WLTP is also introduced for vehicle certification in Japan and India.**
- **Additional pollutants regulations: Ethanol, Aldehydes, NO<sub>2</sub>, N<sub>2</sub>O, NH<sub>3</sub>**

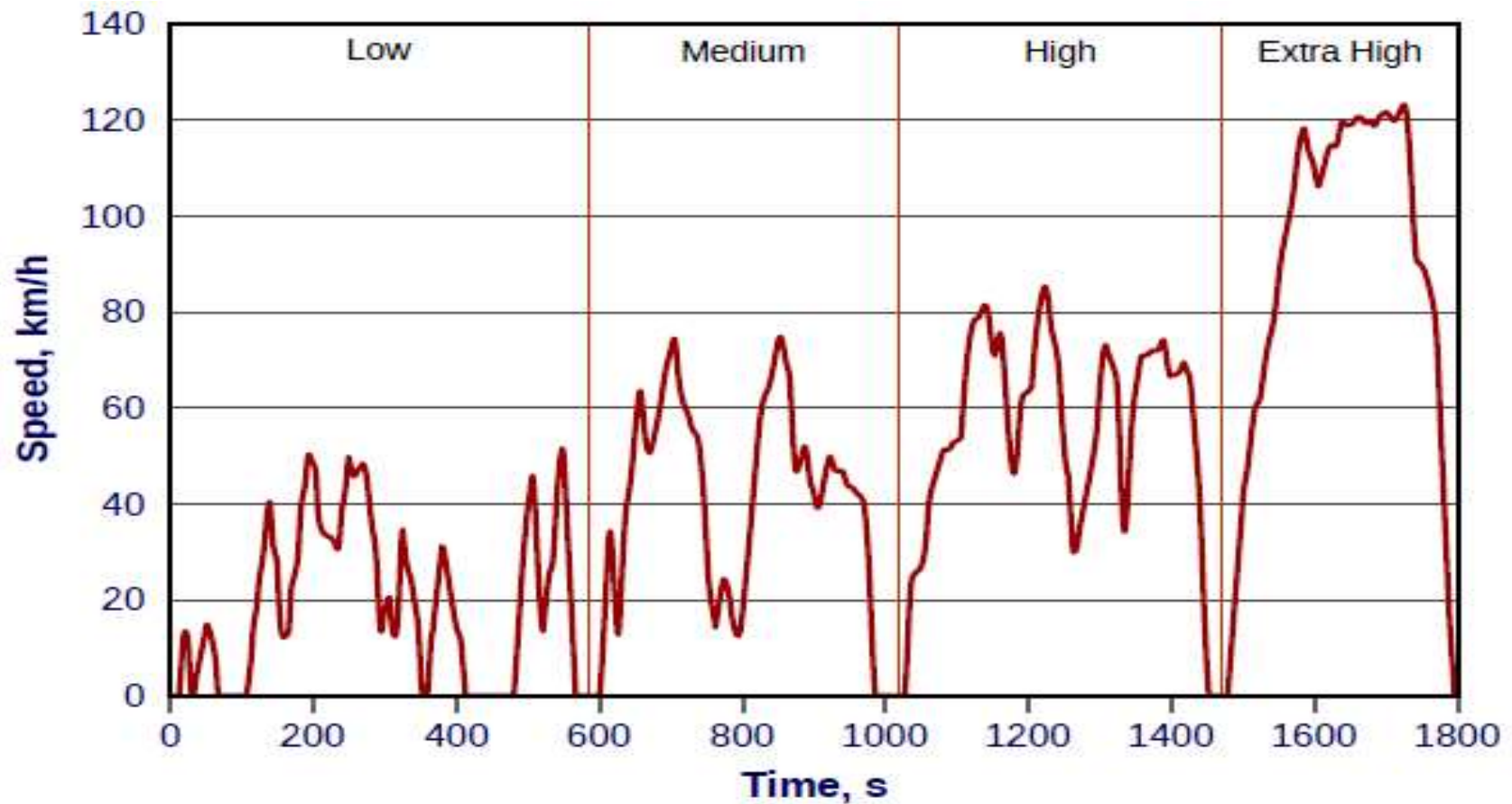
# WLTC emissions and fuel consumption tests

For Class 3b vehicles



Source: UNECE, Report of the Working Party on Pollution and Energy, 2008.

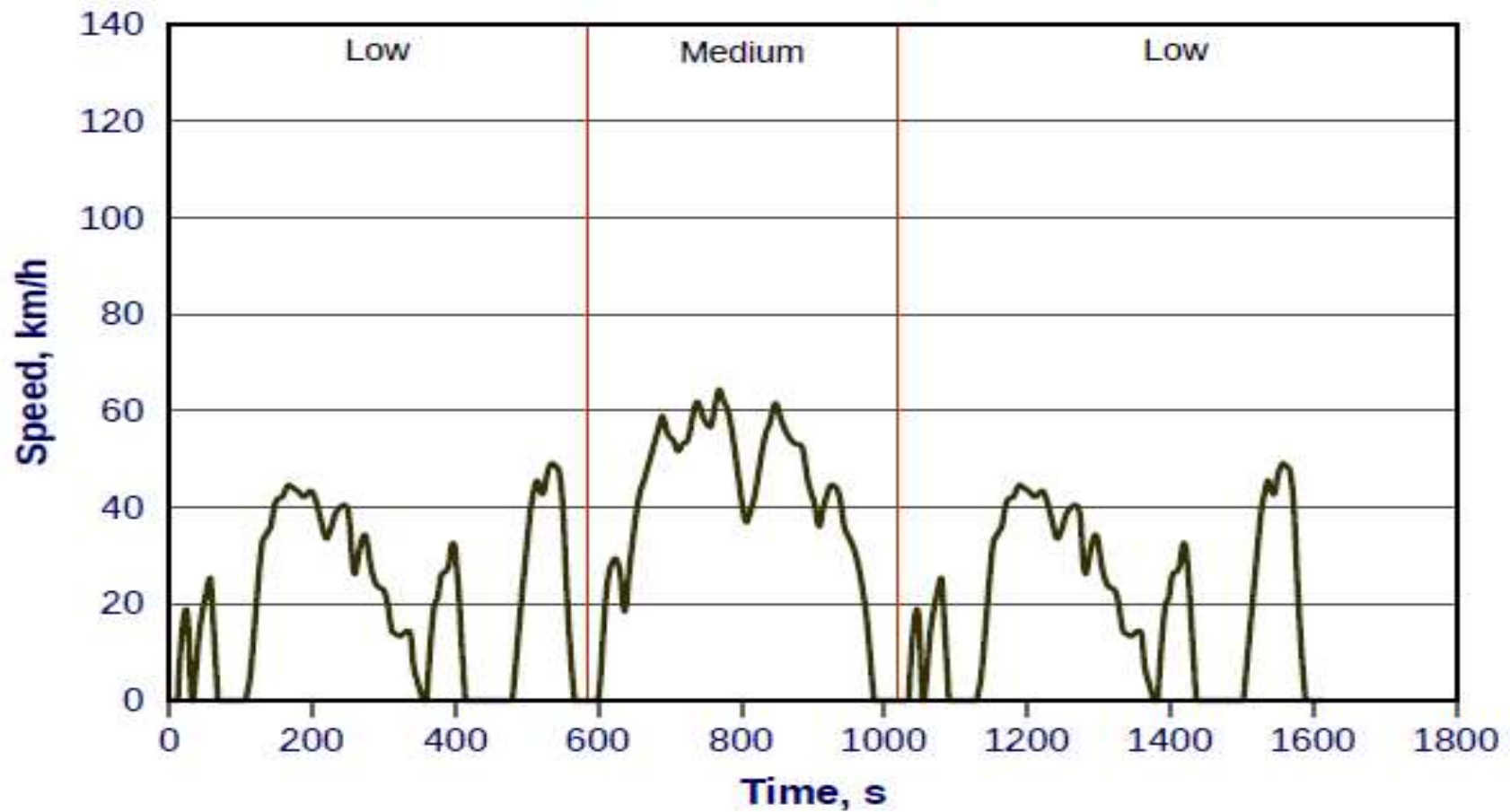
## For Class 2 vehicles



Source: UNECE, Report of the Working Party on Pollution and Energy, 2008.



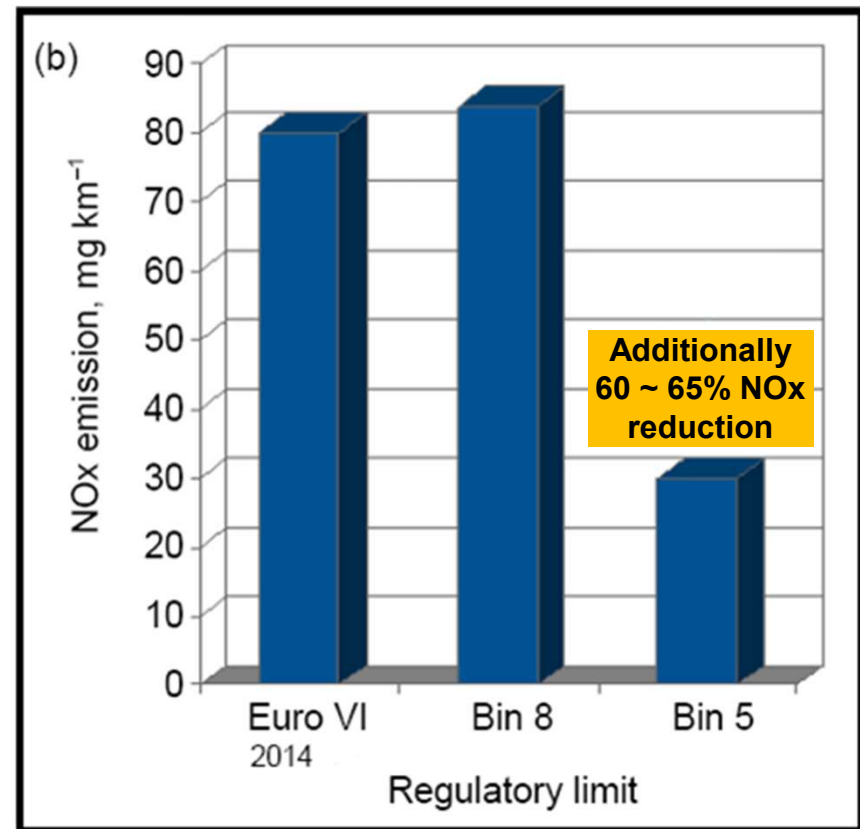
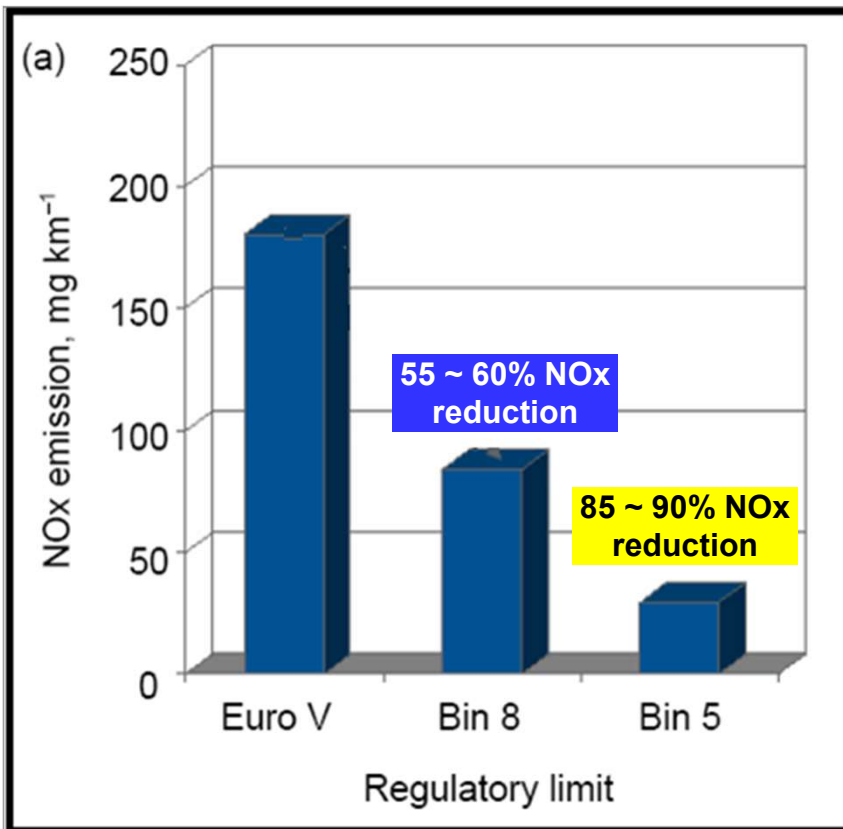
## For Class 1 vehicles



Source: UNECE, Report of the Working Party on Pollution and Energy, 2008.

# Future EU NOx emission limits for LD diesel vehicles

(a) About 55 to 60% NOx control will be needed for a Euro V (2009) diesel to hit the U.S. Bin 8 maximum allowable emission (45 states). For Bin 5 (50 states) nominally 85 to 90% NOx control is needed; (b) For Euro VI (2014), the requirement is 65 to 70% additional NOx reduction



Source: T. Johnson, Platinum Metals Rev., 52 (2008) 23.