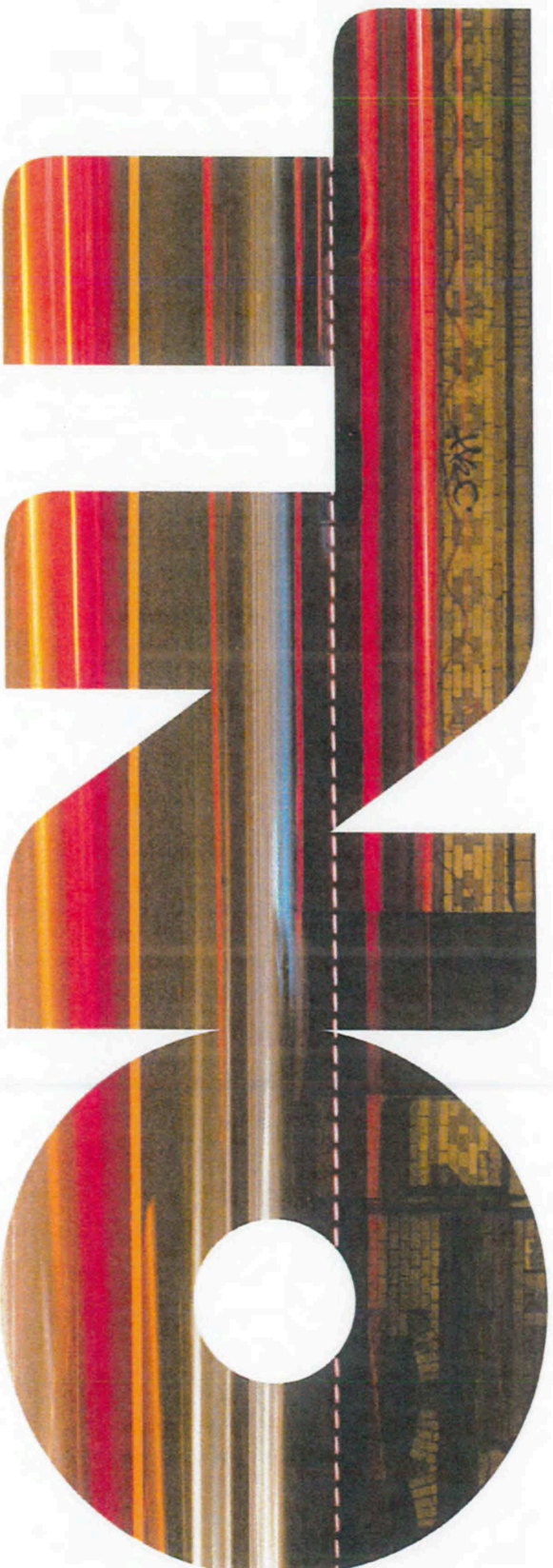




In use compliance and real world emission test results of two diesel Euro 5b vehicles

Sponsor: Dutch Ministry of Infrastructure and the Environment

Delft, April 27th 2012





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April 27, 2012

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1. Introduction

- › This presentation gives more insight in:
 - Type approval and real world emissions and road load curves
 - The effect of different road load curves on CO₂ emissions
 - Relationship of chassis dynamometer and PEMS emission tests
- Test results have been generated in
- 2011-2012 In Use Compliance project of Dutch ministry of Infrastructure and the Environment



1. Introduction

> Test activities:

- Road load tests on test track in Lommel (Ford Belgium)
- Chassis dynamometer tests in Oberusel (Horiba Germany)
- Portable Emission Measuring System tests (TNO The Netherlands)

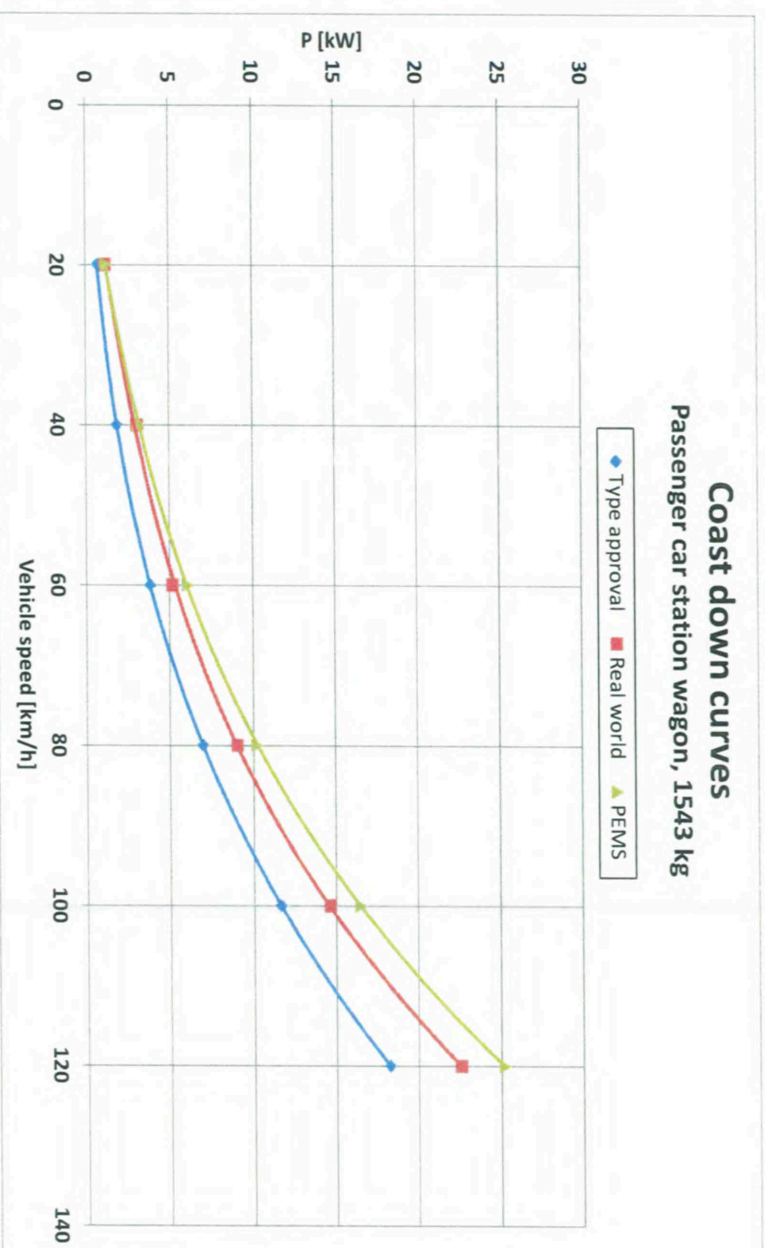


2. Vehicle selection

| | | |
|--------------------------|--------------|--------------|
| Sample | 1 | 2 |
| Date | 2011 | 2012 |
| Vehicle | 1 | 1 |
| Trade Mark | | |
| Type | | |
| Variant | Stationwagon | Stationwagon |
| Emission class | Euro 5b | Euro 5b |
| Empty mass [kg] | 1443 | 1443 |
| Model year | 2012 | 2012 |
| Fuel | Diesel | Diesel |
| Max. Power [kW] | 77 | 77 |
| Odometer | 11,000 | 8,000 |
| CO ₂ emission | 116 | 116 |



3. Results Road Load investigations



- Real world road load curve values are significant higher than type approval road load values (24-66% increase)
- PEMS equipment results in an increase of the road load of 2-18%



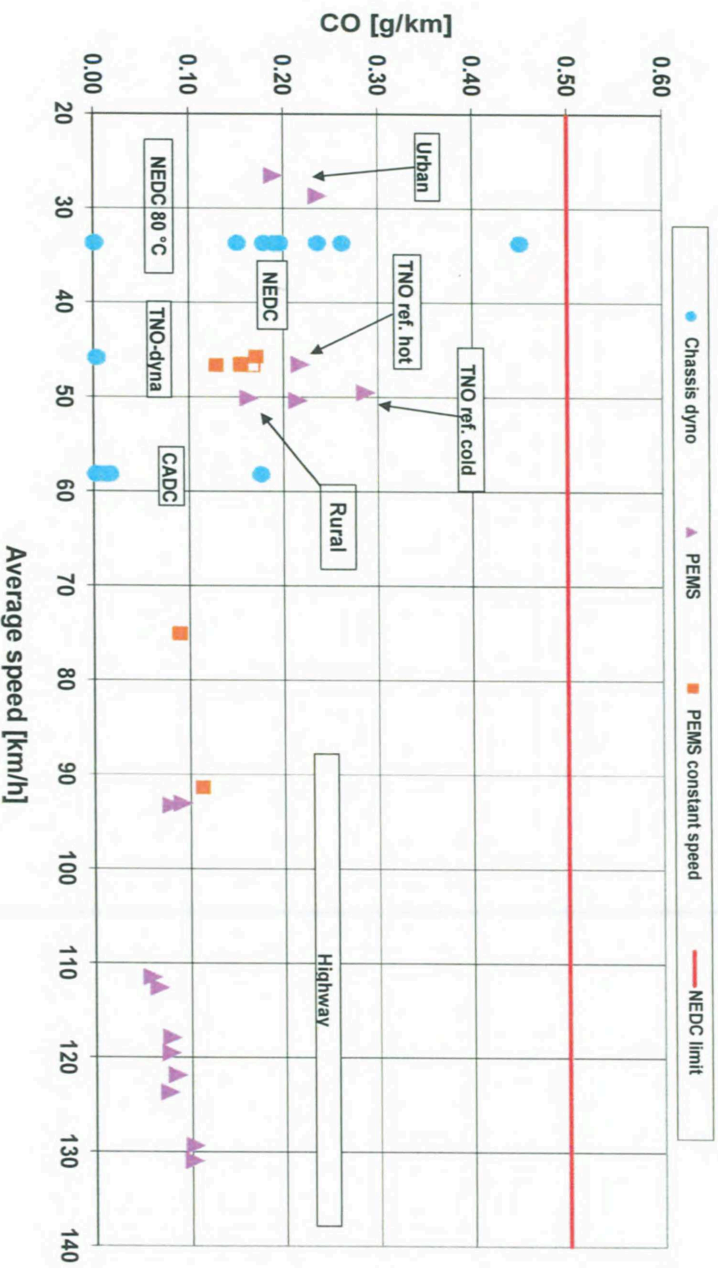
4. CO Results Emission tests

In all tests CO results are below the NEDC-limit value of 0,50 g/km

PEMS and chassis dyno CO emissions

Stationwagon Euro 5b diesel, 1543 kg

For PEMS testing air conditioning not active

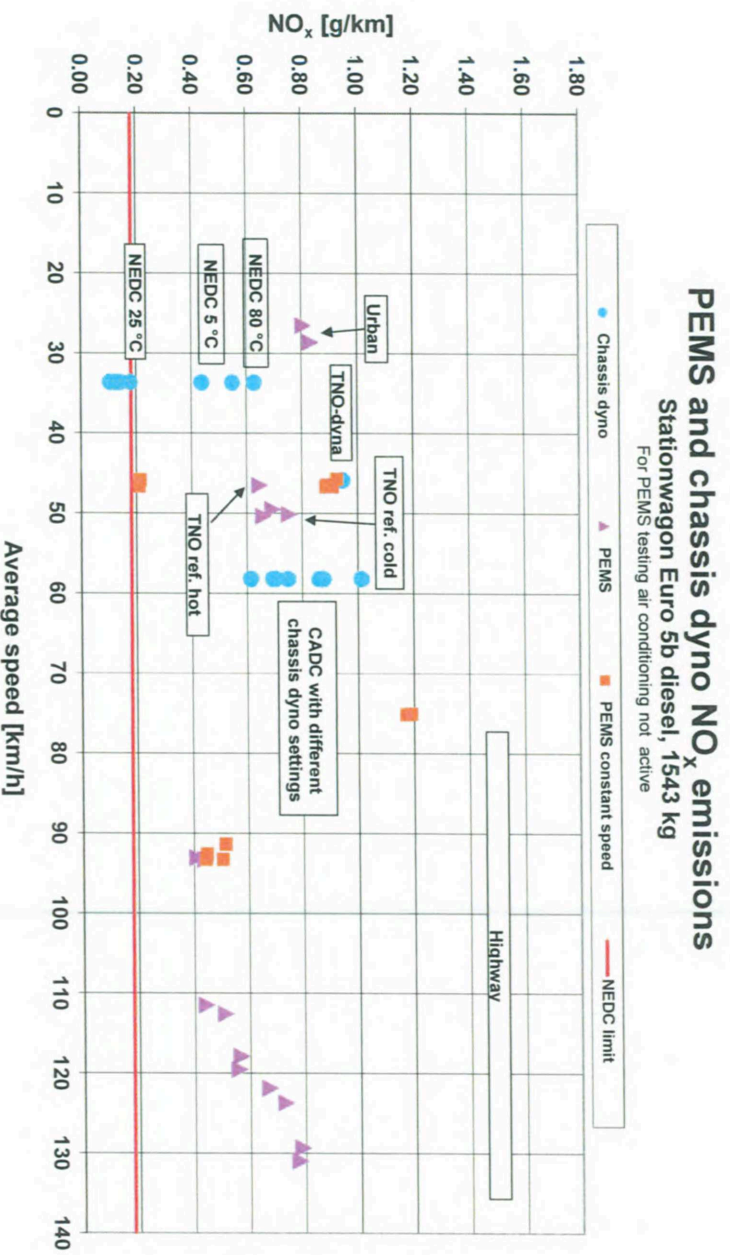




4. Nox Results Emission tests first vehicle

Under type approval conditions NOx results are below the NEDC-limit value of 0,18 g/km. A road load increase has a small NOx effect.

Real world emissions are 3 – 10 times higher.

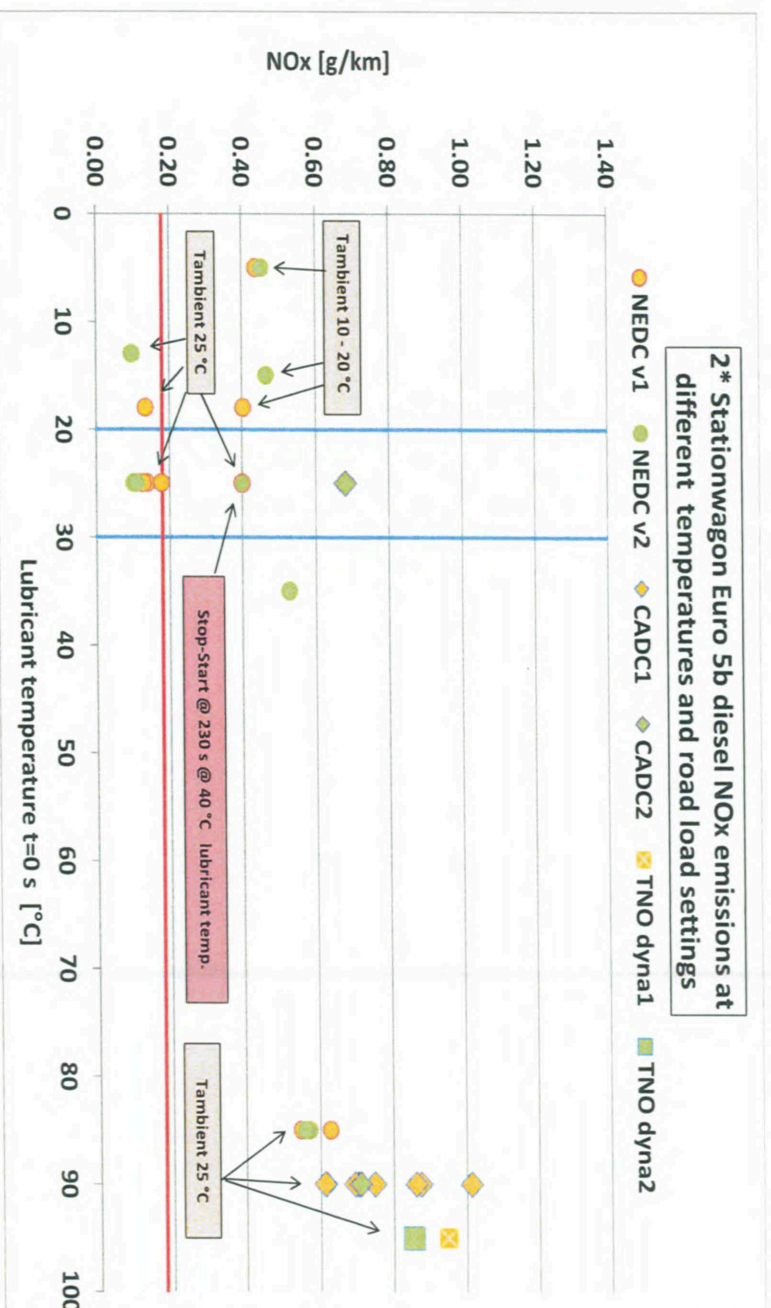




4. Nox Results Emission tests first and second vehicle

Different test cycles, soak and cell temperatures and a short engine shut off result in increased NOx emissions. Increase of road load has a small effect.

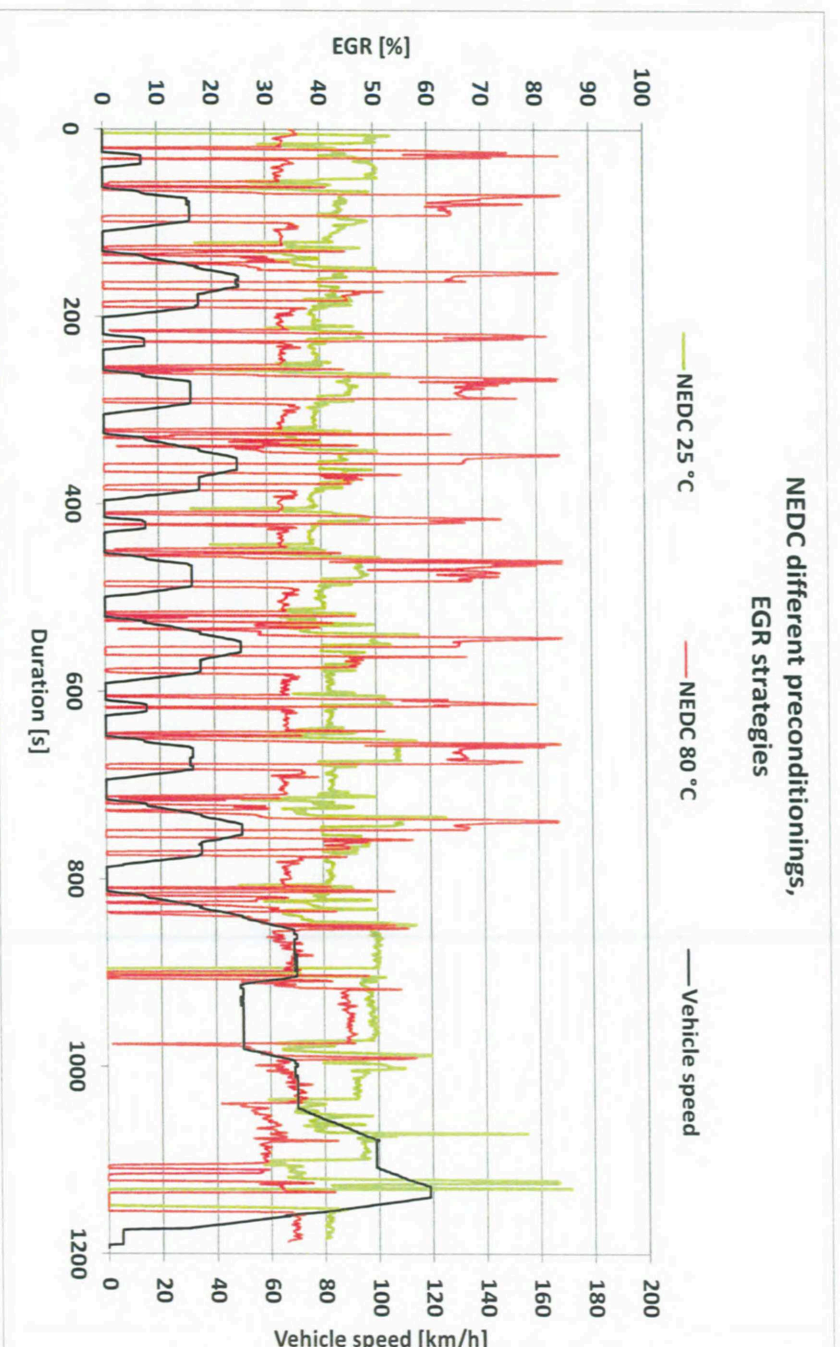
Vehicle 1 and 2 have a same emission behaviour





4. NOx Results Emission tests first and second vehicle

EGR strategies are based on coolant @ ambient temperatures @ engine load and linked with NOx test results





5. Discussion

> Items

1. Vehicles comply with type approval emission limit values with standard and increased road load settings.
2. Both vehicles have equal emission performance. Are they representative for this vehicle model?
3. Real world NOx emissions are 3-10 times higher than type approval emissions



5. Discussion

> Items

4. Different EGR-strategies and NOx emissions @ different soak conditions.
5. Different EGR-strategies and NOx emissions @ different test cycles



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**Thank you very much for your attention and
participation**