# Key Messages from AMF Research

## Annex 49 10/2016

# "COMVEC": Fuel and Technology Alternatives for Commercial Vehicles

**Operating Agent: VTT Technical Research Centre of Finland Ltd**
**Partners: Canada, Chile, China, Denmark, Japan, Korea, Sweden and Thailand**

## Main Conclusions

There is a clear need to reduce regulated emissions, as well as greenhouse gas emissions, from commercial vehicles that will be dependent on internal combustion engines for many years to come. Measurements within COMVEC show that the latest generation of vehicles (Euro VI) have significantly reduced regulated emissions, including during testing under conditions that correspond to real-life operation. These findings should be used as a guide in countries with less stringent emission regulations and also for procuring transport services. The recommendation is to leapfrog directly from less sophisticated technology to Euro VI. Advanced renewable fuels will help to reduce greenhouse gas emissions in applications for which electrification is not feasible.

## Background

Commercial goods vehicles, light-, medium- and heavy-duty vehicles, together, represent some 25 % of the total energy used in transport, and are the second largest segment after passenger cars. Therefore, this vehicle category is important; not only for its contribution to economic activities, but also for its share of energy use and emissions. The COMVEC project was set up to complement previous IEA AMF work on alternative fuels and vehicle technologies for buses (Annex 37), trucks (Annexes 38 & 39) and passenger cars (43). With data covering all road vehicle classes, it will eventually be possible to evaluate the best fit for alternative fuels and new vehicle technologies for road transport, meaning that alternative technologies can be allocated in the most effective way.

## Research Protocol

In the "COMVEC" project, eight partners from four continents teamed up to generate performance data (energy efficiency, exhaust emissions) for commercial vehicles. Altogether, 35 different vehicles were tested on chassis dynamometers, with vehicles ranging from light commercial vehicles (vans) to heavy-duty vehicles for trailer combinations. In addition, one engine installed in an engine dynamometer was tested. The World Harmonised Vehicle Cycle (WHVC) was used in vehicle testing and the World Harmonized Transient Cycle (WHTS) for engine testing. For the chassis dynamometer measurements, the recommended load was set at 50 % of full load. All tests were carried out with fully warmed-up engines. Tank-to-wheel (vehicle performance) data was combined with well-to-tank data from the JEC - Joint Research Centre-EUCAR-CONCAWE collaboration, to form well-to-wheel performance data.

## Key Findings

- Euro VI vehicles perform extremely well (Figure 1 for $NO_x$ emissions).
- Going from Euro III to Euro IV or Euro V vehicles does not necessarily deliver real emission benefits; one should leapfrog directly to Euro VI or to US 2010 regulations to obtain real-life low emissions.
    - This has implications for those regions that are contemplating more stringent emission regulations, as well as for the tendering of transport services.
- The regulated emissions of a vehicle are, first and foremost, determined by the emission control technology and not the fuel.
- The response to substitute fuels (fuels that can replace conventional diesel in existing vehicles) varies from vehicle to vehicle, as well as by vehicle category (light-duty vehicles vs. heavy-duty vehicles).
    - Heavy-duty Euro VI engines are so clean that any effect of the fuel will be negligible.
- The carbon intensity of the fuel or the energy carrier is decisive for well-to-wheel $CO_2$ emissions, not vehicle technology.
- $CO_2$ assessment should be carried out on a well-to-wheel basis and not only look at tailpipe $CO_2$ emissions.
- Electrification, with low-carbon electricity, is a good option for local emissions as well as WTW $CO_2$ emissions.
    - One should keep in mind that not all applications are suitable for electrification.
- Euro VI (alternatively US 2010) in combination with a renewable fuel is a good option for the local environment as well as the climate.

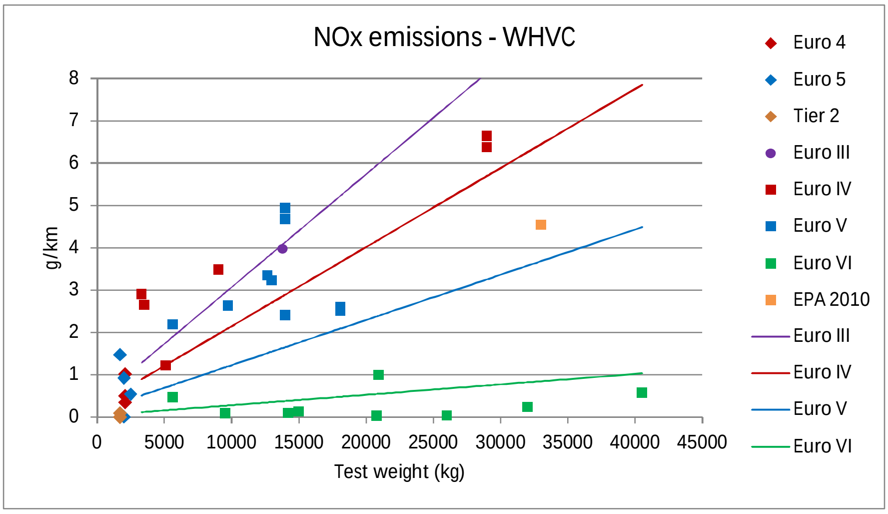


*Figure 1. Nitrogen oxide emissions by emission class (identified by colour). The solid lines depict the expected performance of various emission classes. For each colour, dots below the solid lines represent compliance, dots above the lines non-compliance.*