Heavy Duty Vehicles CO_2 Policy Issues in Europe and VECTO tool

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European Commission

DG Climate Action

Workshop on Heavy-Duty Fuel Efficiency Regulations

New Delhi, India 29 April 2015

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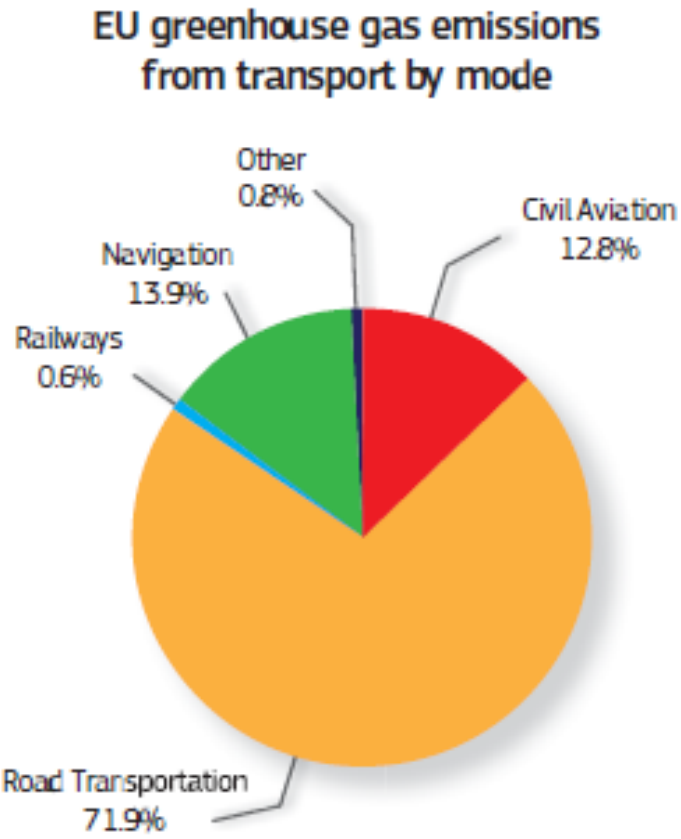
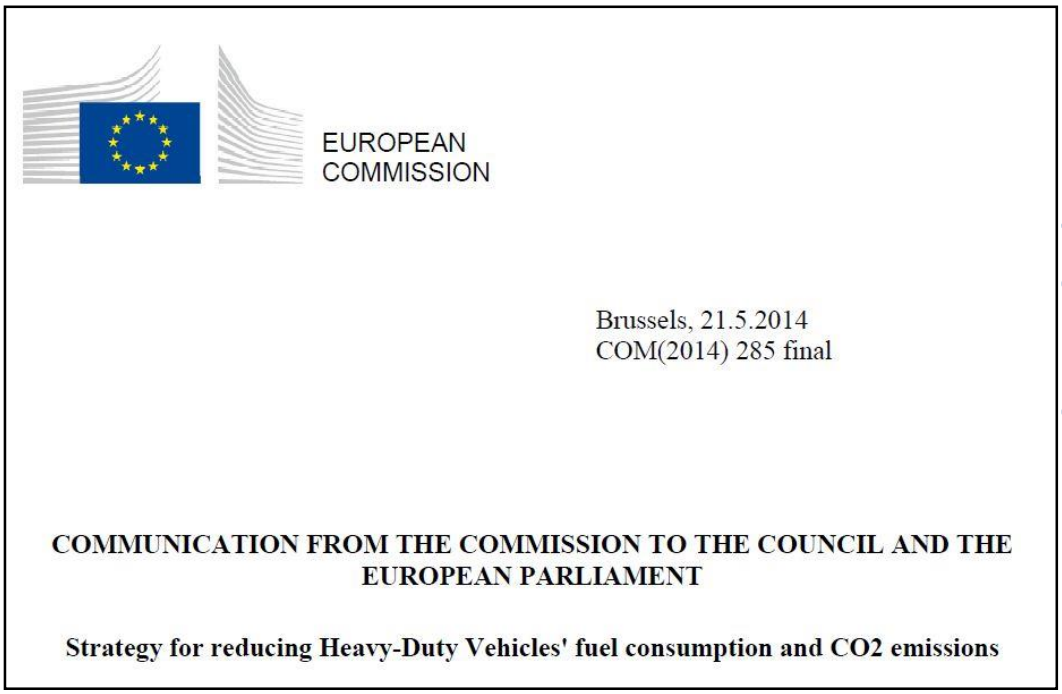
HDV CO_2 in the EU Policy context

Transport within the EU is responsible for around one fifth of our greenhouse gas emissions.

While these emissions fell by 3.3% in 2012, they are still 20.5% higher than in 1990. Road transport accounts for the vast majority – around 80% – of all transport emissions.



Communication strategy



EUROPEAN
COMMISSION

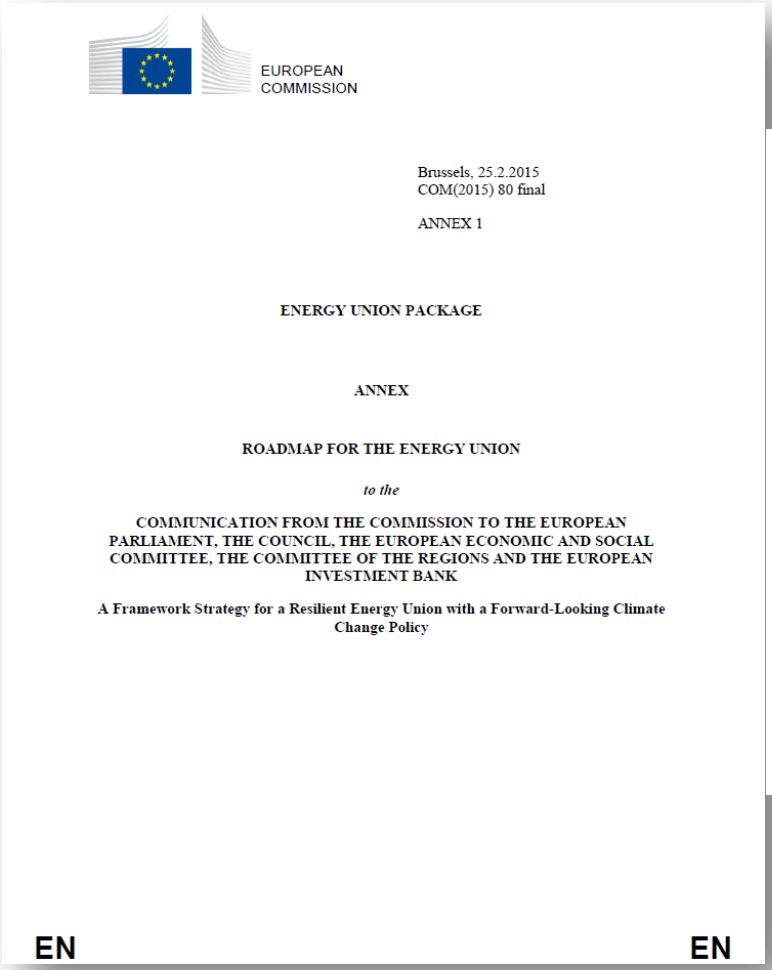
Brussels, 21.5.2014
COM(2014) 285 final

COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

Strategy for reducing Heavy-Duty Vehicles' fuel consumption and CO2 emissions

In May 2014 the Commission adopted a Communication entitled "Strategy for reducing HDV fuel consumption and CO_2 emissions" COM(2014)285

Roadmap for the energy union (Feb 15)



EUROPEAN COMMISSION

Brussels, 25.2.2015
COM(2015) 80 final

ANNEX 1

ENERGY UNION PACKAGE

ANNEX

ROADMAP FOR THE ENERGY UNION

to the

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE, THE COMMITTEE OF THE REGIONS AND THE EUROPEAN INVESTMENT BANK

A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy

EN EN

Actions	Responsible party	Timetable	SoS	IEM	EE	GHG	R&I
2030 Climate and Energy Framework							
Transport actions							
Fair and efficient pricing for sustainable transport – revision of the Eurovignette Directive and framework to promote European electronic tolling	Commission	2016			X	X	
Review of market access rules for road transport to improve its energy efficiency	Commission	2016			X	X	
Master Plan for the deployment of Cooperative Intelligent Transport Systems	Commission Member States Industry	2016			X	X	X
Review of Regulations setting emission performance standards to establish post-2020 targets for cars and vans	Commission	2016 - 2017			X	X	X
Establishing a monitoring and reporting system for heavy duty vehicles (trucks and buses) with a view to improving purchaser information	Commission	2016-2017			X	X	X

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CO_2 growth-reduction of fuel saving potential

Current trends in CO_2 emissions from HDVs are unsustainable.

Between 1990 and 2010 CO_2 emissions are estimated to have grown by about 36%, despite the economic crisis interrupting the previous steady growth.

HDVs account for about a quarter of road transport emissions and around 5% of total EU CO_2 emissions - a greater individual share than international aviation or shipping.

CO_2 growth-reduction of fuel saving potential

Without action, CO_2 emissions from HDVs are expected to remain at best stable over the long term at around 35% above their 1990 level.

Such 'no policy change' outcomes are clearly incompatible with the EU long term objective of reducing greenhouse gas emissions from transport by around 60% by 2050 (vs. 1990 levels).

Lack of market transparency

CO_2 emissions from, and fuel consumption of, cars and vans are established when vehicles are manufactured. However, there is no system of measurement for CO_2 emissions from HDVs in the EU and this reduces transparency for prospective vehicle purchasers in the EU market.

Absence of a measurement methodology

This lack of knowledge is a barrier to the purchase of more efficient HDVs and is a gap that needs to be addressed.

To this end the Commission has put great effort in recent years into developing the VECTO computer simulation tool to estimate HDVs' fuel consumption and CO_2 emissions for the whole vehicle.

Accordingly, the first priority is to close the knowledge gap on these emissions and to start their registering and monitoring.

Challenges

Further development of the VECTO simulation methodology; its testing to ensure its accuracy compared to real world emissions and its adaptation as a downloadable executable file;

Working with DG GROW to amend the "type approval" legislation to enable the application of VECTO when the vehicle is produced/registered;

Preparing co-decision legislation to require the monitoring and reporting of data when the vehicle is produced/registered.

EU: a Global Leader in Climate Action

*I want to kick off before summer a wide debate on our policies for emissions reductions in **road transport** and organize a conference where all stakeholders come together and reflect about what has worked well and what can be improved for the period after 2020, for which I would very much welcome your ideas (and active involvement)**

*Miguel Arias Cañete - Commissioner for Climate Action and Energy, Brussels 11/11/2014
Speech before the ENVI committee of the European Parliament
**Scheduled now for the 18th of June 2014

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VECTO

Vehicle Energy Consumption Calculation Tool

Simulation tool to calculate both, fuel consumption and CO_2 emissions from the **whole** vehicle

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Vecto development

- VECTO has been developed by the Commission (DG CLIMA and JRC) with TUG support over the last two years

- ACEA, OEMs and component manufacturers have been also involved and provided key input and test vehicles

- DG CLIMA is the leader for this project

- Further development will take place in the next years.

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Passenger cars: Easy to measure CO_2

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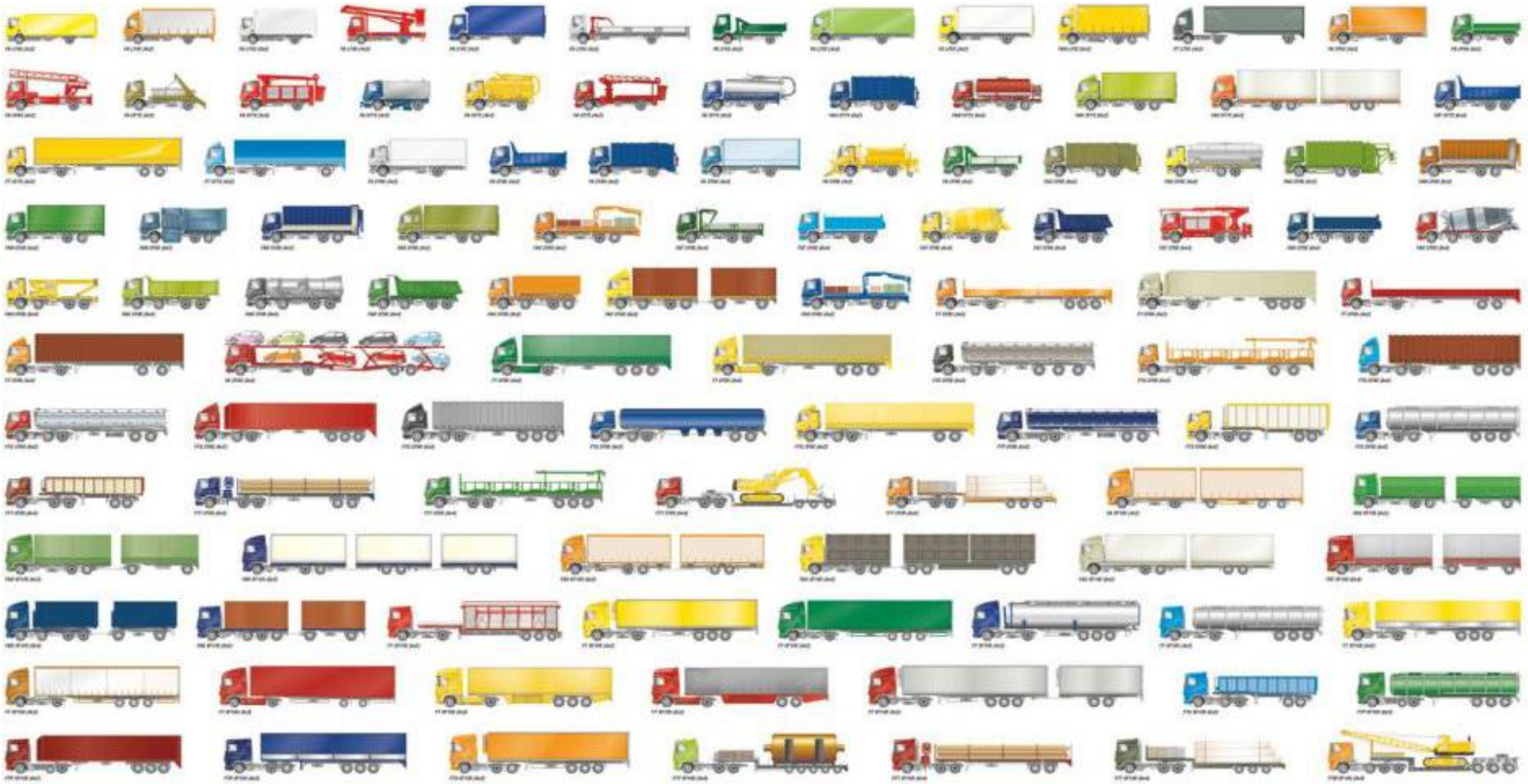
Heavy Duty Vehicles…??????



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*Source: ACEA

Regulatory situation in EU

Existing Regulations setting performance standards for:

- **Cars (Reg. 443/2009), and**
- **Vans (Reg. 510/2011)**

Currently no legislation setting performance standards for HDV CO_2 emissions or parts thereof

Current test cycle procedure for HDVs is based on the engine (e.g. for regulation air pollutant emissions), not the whole vehicle

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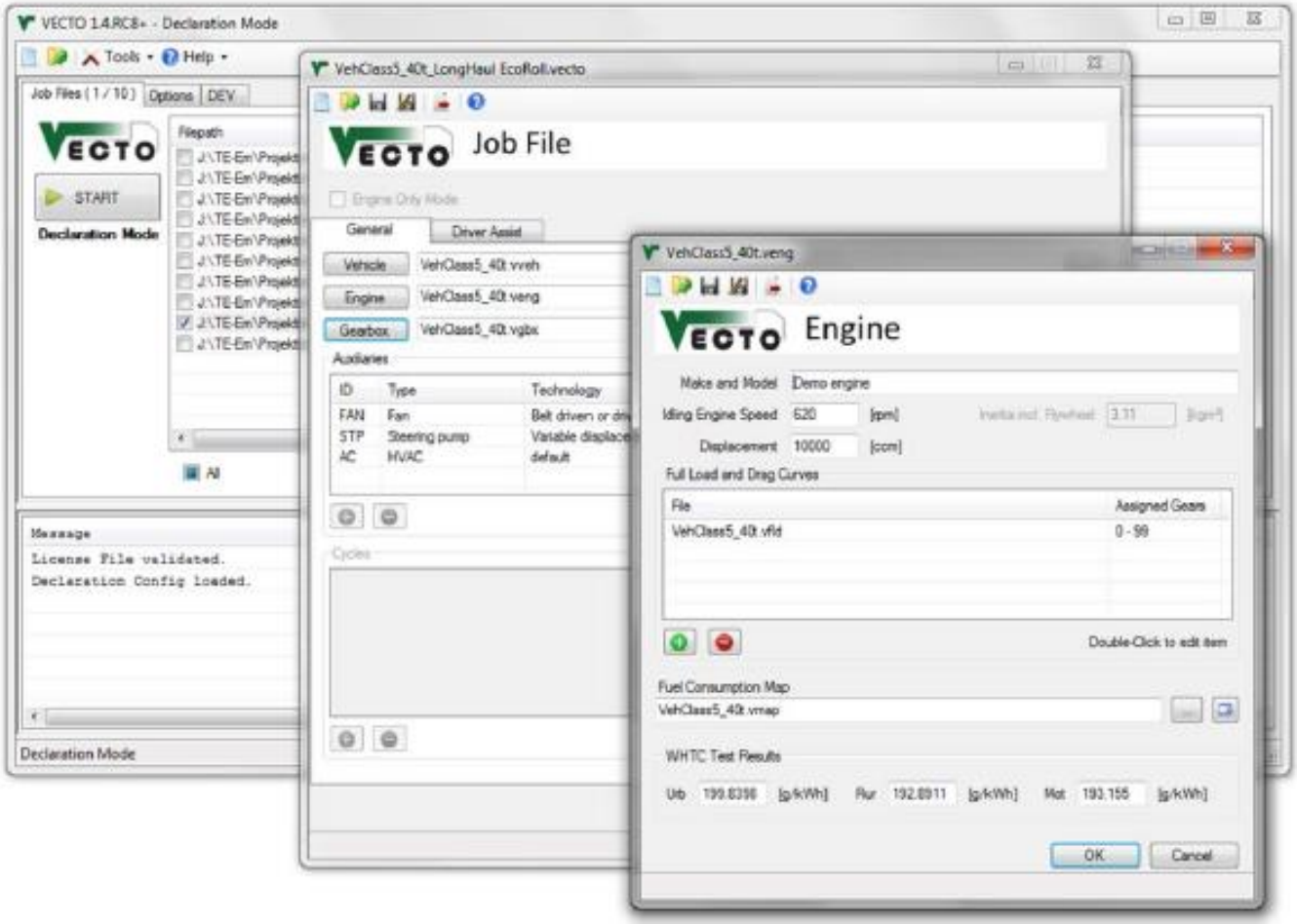
VECTO Graphical User Interface (GUI)



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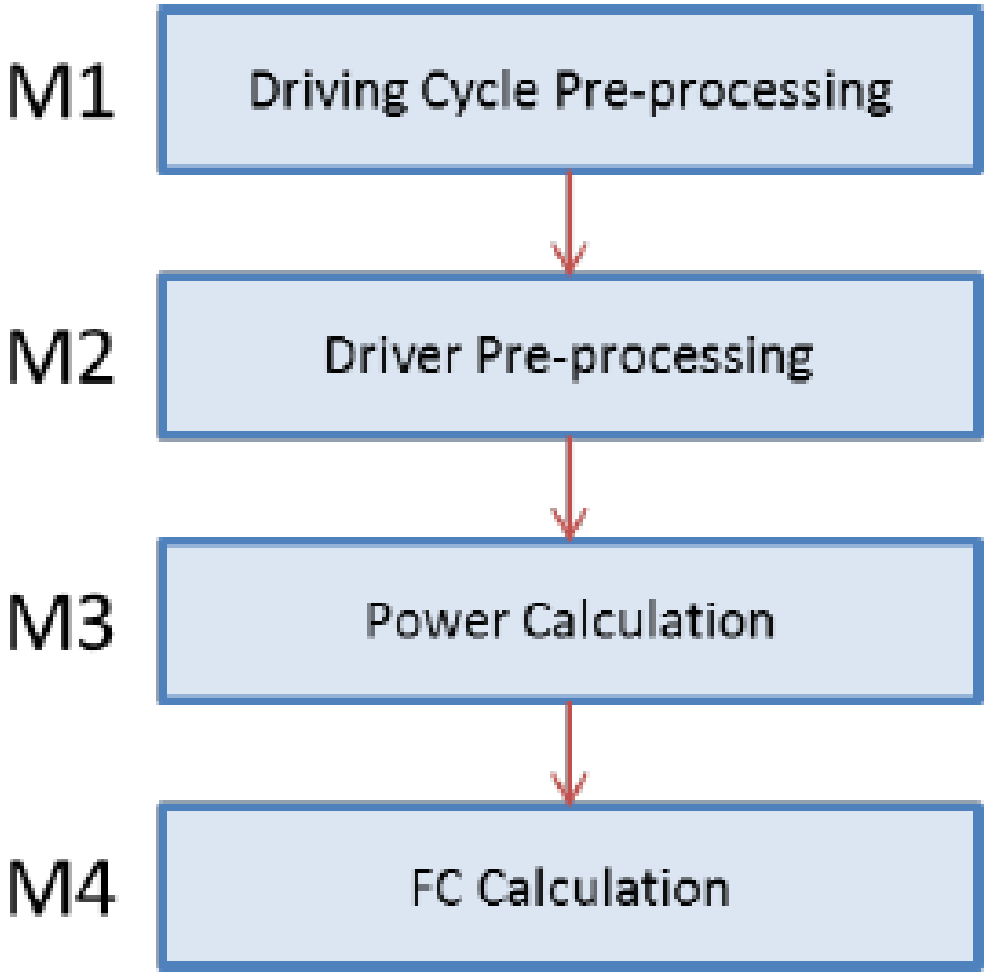
Model structure – Four main modules



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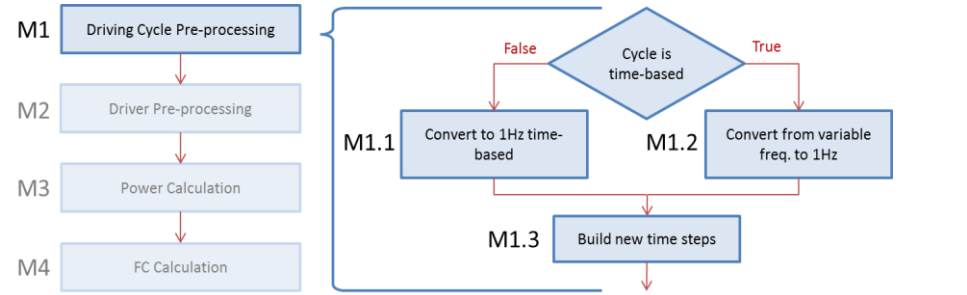

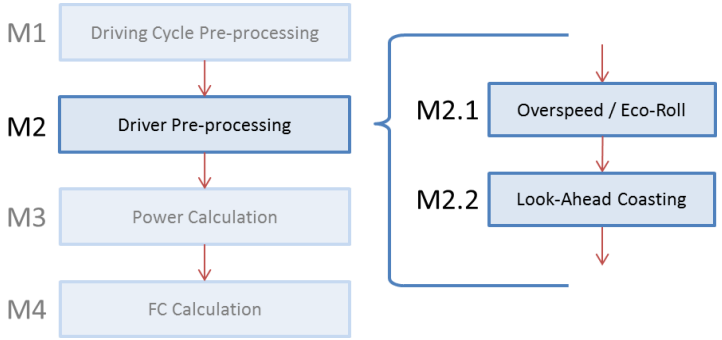

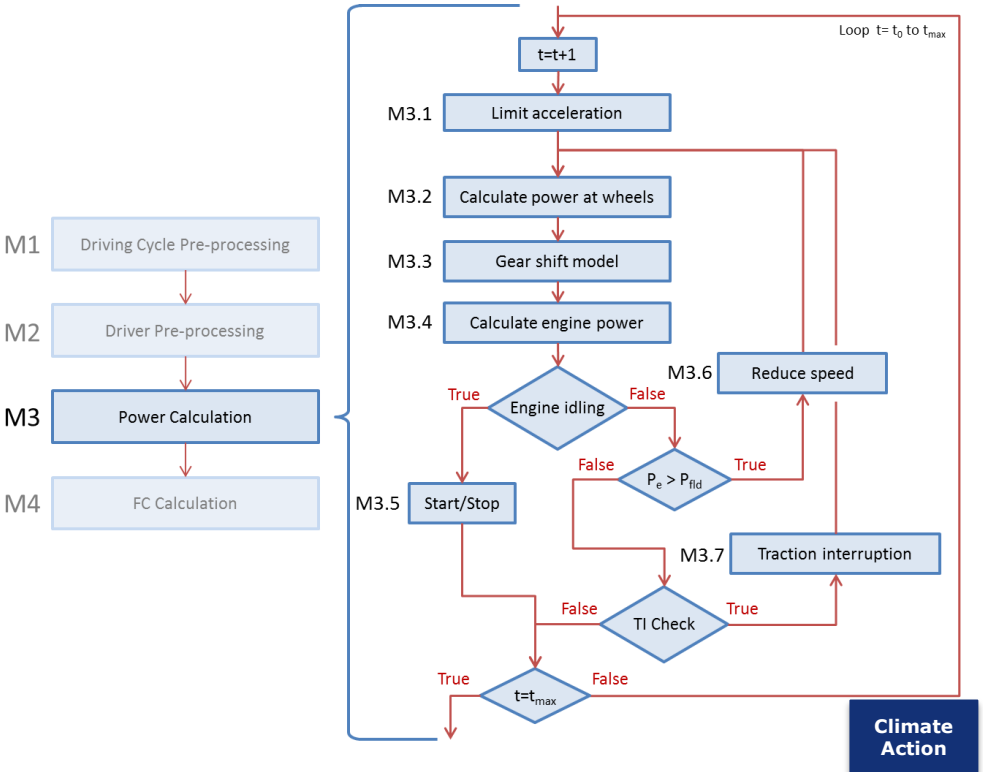

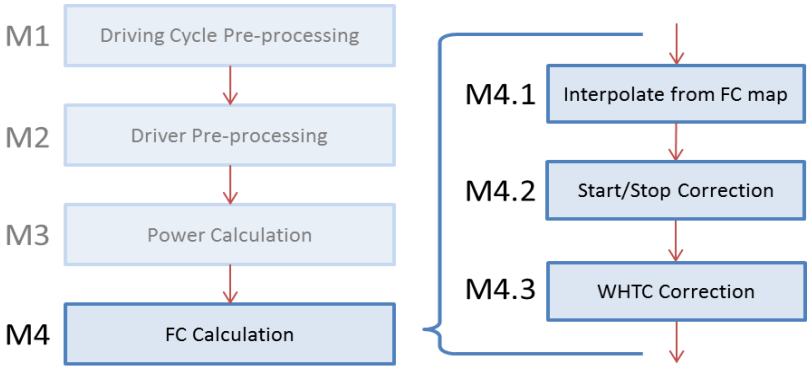

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Vehicles used

OEM	Daimler	DAF
Model	Actros	CF75
Maximum vehicle weight [kg]	40000	18600
Test mass [kg]	33580	14270
Engine Emission Standard	Euro VI	Euro V
Rated power [kW]	330	265
Rated Torque [Nm]	220	1050
Displacement [l]	12.8	9.2
Fuel Consumption Map	From steady state RPM vs Torque points as measured by manufacturers	
Gearbox & Final Drive characteristics	As provided by manufacturers	

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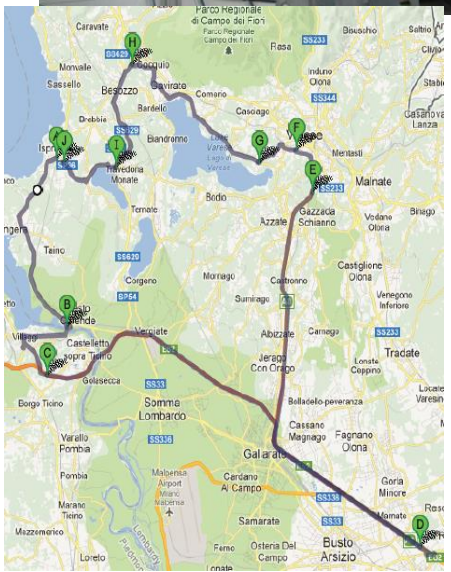
Equipment used

Torque measurement	Wheel rim (Actros) Axis (CF75)
Zeroing	Daily basis to eliminate drift
Positioning / speed	High precision GPS (Actros) Sensors at fixed points on ground (CF75)
Wind speed and wind angle	Ultrasonic Wind Anemometer (both)
Ambient temperature, humidity, pressure	Weather station installed on board (both)
Fuel consumption	OEM integrated flow meter (both) AVL KMA flowmeter (where possible)
Vehicle mass	JRC's balance

Test vehicles-Route



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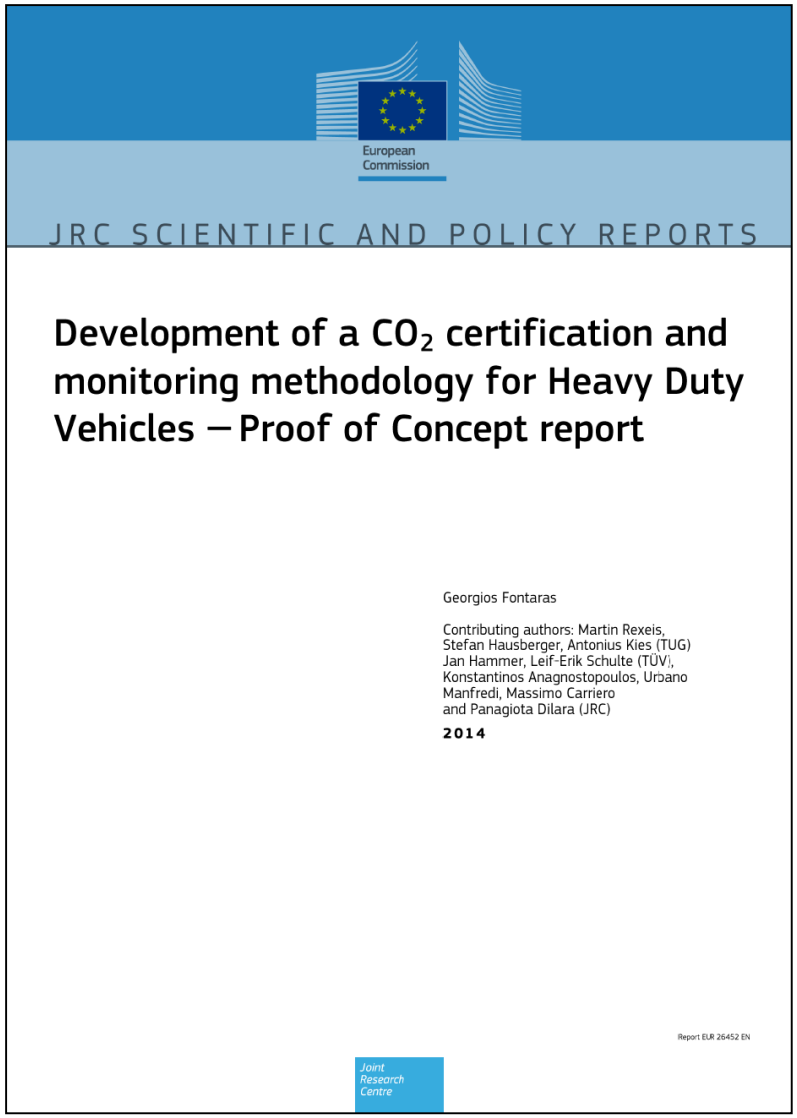

The full report can be found on DG Clima's website

http://ec.europa.eu/clima/policies/transport/vehicles/heavy/docs/hdv_co2_certification_en.pdf

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Monitoring CO_2 Emissions from HDV in Europe – An Experimental Proof of Concept of the Proposed Methodological Approach

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Abstract

The European Commission in joint collaboration with Heavy Duty Vehicle manufactures, the Graz University of Technology and other consulting and research bodies has been preparing a new legislative framework for monitoring and reporting CO_2 emissions from Heavy Duty Vehicles (HDVs) in Europe. In contrast to passenger cars and light commercial vehicles, for which monitoring is performed through chassis dyno measurements, and considering the diversity and particular characteristics of the HDV market, it was decided that the core of the proposed methodology should be based on a combination of component testing and vehicle simulation. Emphasis is put on accurately simulating the performance of different vehicle components and achieving realistic fuel consumption results. A proof of concept was launched aiming to test and prove that these targets are achievable.

A series of experiments were conducted on 2 different trucks, a Daimler 40ton Euro VI, long haul delivery truck with semi-trailer and a DAF 18 ton Euro V rigid truck. Measurements were performed at the Joint Research Centre's HDV chassis dyno labs and on the road. A vehicle simulator (Vehicle Energy Consumption Calculation Tool - VECTO) has been developed to be used for official monitoring purposes and the results of the measurements were used for its validation. As inputs the simulation based methodology considers test track measurement of driving resistances (eg air drag), determination of drivetrain losses (e.g. gearbox), determination of power demand of engine auxiliaries (eg. cooling fan) and other consumers (e.g. steering pump), measurement of the engine fuel consumption map as extension to the engine's type approval tests (as described in EURO VI legislation). CO_2 emissions of the vehicle are then calculated using the aforementioned input data for predefined representative driving cycles and mission profiles.

For the two Heavy Duty vehicles tested and simulated on the same test route, fuel consumption was calculated always within a ±3% range from the real world measurement, and in several cases even closer than that (in the order of ±1.5%). Given the variability of the actual measurement (σ = 2%), it is concluded that a future certification scheme can be based on vehicle simulation tools.

Introduction

Heavy-Duty Vehicles (HDV) represent about a quarter of the European Union's (EU) road transport CO_2 emissions and some 6% of the total CO_2 emissions. In spite of some improvements in fuel efficiency in recent years, overall HDV CO_2 emissions are still rising, mainly due to increasing road freight traffic. The need for a strategy addressing CO_2 emissions from the transport sector has been recognized by the European Commission (EC) in its 2010 Strategy on Clean and Energy Efficient Vehicles. Moreover, the EC's 2011 White Paper on transport (EC 2011) describes a pathway to increase the sustainability of the transport system with technological innovation, enabling the transition to a more efficient and sustainable European transport system.

One key factor for achieving such targets is a robust CO_2 and fuel consumption monitoring method that reflects to the best possible extent the actual performance of the vehicles over real operating conditions and the comparative advantages of different vehicle models and technology packages available in the market. This in turn provides appropriate information to the end user and better supports the introduction into the market of vehicles with lower fuel consumption(AEA-Ricardo 2011). It also allows the collection of valuable information needed for implementing necessary policy measures to facilitate the achievement of the targets set.

While car and van CO_2 emissions (M1-N1 vehicles) are being measured according to an agreed method, HDV emissions so far are not measured in a standardized and consistent way. Consequently no reliable baseline as to the actual amount of these emissions exists. To fill this gap, a series of still on-going projects was initiated by EC. Aim of the research performed was the creation of standardized method to quantify and report CO_2 emissions from HDVs. Initial studies and feedback received from OEMs suggested that the approach that best fits the characteristics and particularities of the HDV

Published in TAP Conference, Graz, Austria, September 2014

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Report's conclusion and follow-up

- Simulated FC was calculated with a range of **±3%** from the real world measurements or even less.
- Finalize and validate topics remaining open in the methodology such as gearbox and driveline efficiency, auxiliary units power consumption, automatic gear shifting strategies, mobile air-conditioning simulation for city buses.
- Perform a sensitivity analysis in order to more accurately quantify the uncertainty of the method for different vehicle types/categories.
- Investigate the necessary conditions for expanding the methodology to other HDV categories.

Timeline

- VECTO development: on-going

- Dissemination and trials: from 2013 to mid-2016

- Preparation of possible legislative proposals: 2015-2016

- Possible first reporting year: 2018

Thank you for your attention!

- I will be happy to address your questions
- More info can be found at: http://ec.europa.eu/clima/policies/transport/vehicles/heavy
- Contact details:

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