JRC
EUROPEAN COMMISSION

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EUROPEAN COUNCIL FOR AUTOMOTIVE R&D

Concawe

LCA of urban transport business models

Workshop - International Transport Forum
Session 1B. LCA of different transport option

ITF workshop – 1 Oct 2019 - Paris

Marta Yugo – Concawe Science Executive (Energy & CO_2)
representing JEC Consortium

Background

DECARBONISING TRANSPORT BY 2030

THE EC-INDUSTRY JEC ANALYSIS

International Transport Forum

Session 1B

Life-cycle assessment of different transport options

What is the way we currently perform LCAs for vehicle manufacturing, fuel production, vehicle use and infrastructure construction?

What do we know in terms of results?

How were existing tools used to assess the performance of different vehicles with respect to energy and CO_2 emissions?

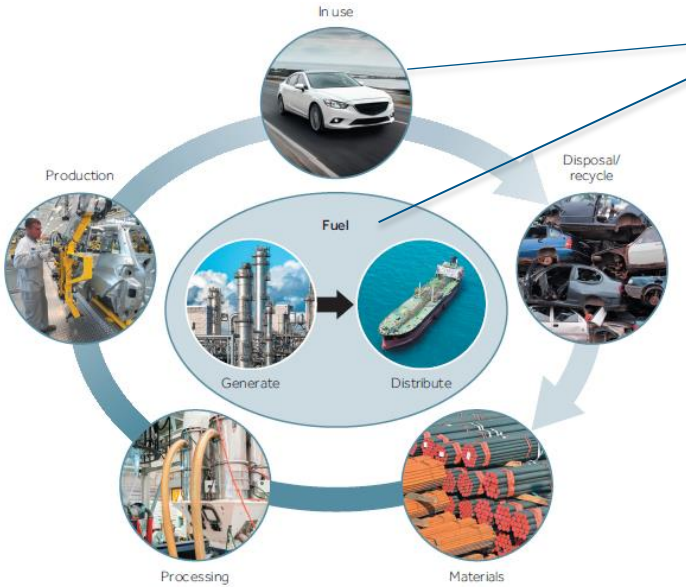
Speakers:

- Michael Wang – Manager, Systems Assessments, Argonne National Laboratory
- Marta Yugo – Science Executive, Economics and Modelling (CO_2 and Energy), Concawe
- Marine Gorner – Analyst, International Energy Agency
- Anne de Bortoli – Researcher, Ecole des Ponts
- Agnès Jullien – Director, European and international affairs, IFSTTAR

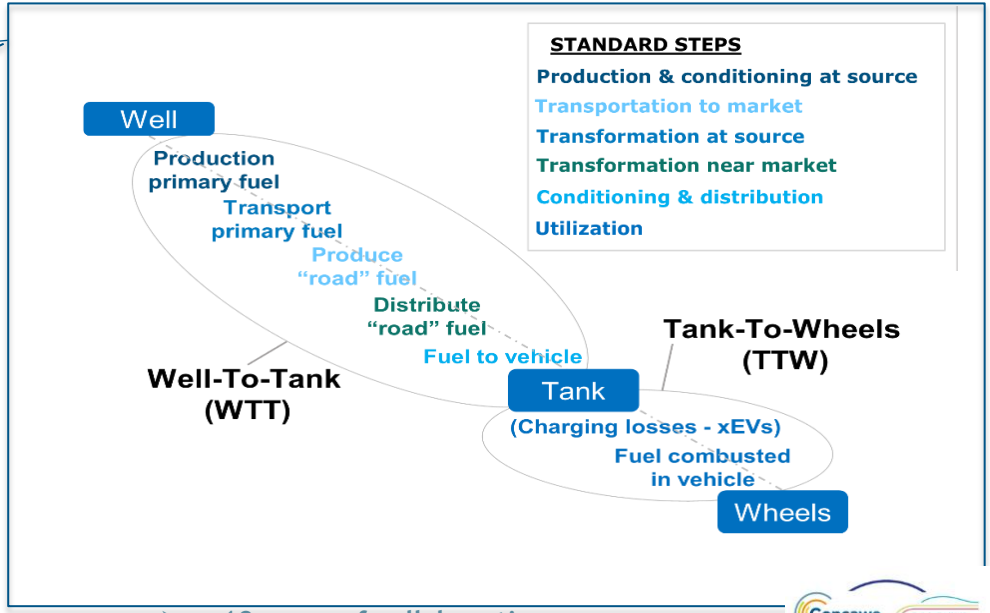
What is the scope of the JEC work?

Well-To-Wheels versus Life Cycle Analysis

LCA applied to vehicles – The big picture



JEC WTW – Energy & CO2

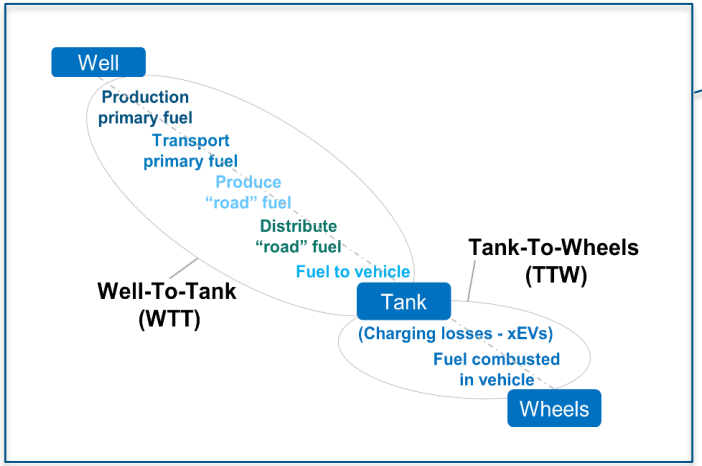


- > 10 years of collaboration.
- JEC WTW v5 not published yet

Initial results presented at the Sustainable Energy week (Brussels, June 2019)

JEC WTW analysis

Goals



Both fuel production pathway and powertrain efficiency impact are assessed in terms of GHG emissions as well as total and fossil energy use

Establish

in a transparent and objective manner

a consensual Well-to-Wheels assessment of:

energy use and GHG emissions

for a wide range of automotive fuels and powertrains relevant to Europe in 2025+

Analysis updated as technologies evolve

Common methodology and data-set

Have the outcome accepted as a reference by relevant stakeholders

JEC WTW analysis – Methodology choices

1) Marginal approach

- Well-to-Wheels analysis is essential basis to assess the impact of future fuel and powertrain options replacing conventional fuels

Marginal/ incremental approach

Aiming to assess the marginal impact of extra (or less of) any given fuel.

The marginal/incremental approach is instrumental to:

- Guide judgements on the potential benefits of substituting conventional fuels/vehicles by alternatives
- For future fuels: understand where the additional energy resource would come from (if demand for a new fuel were to increase)

☑ Marginal refining emissions (Concawe EU refinery model)
Marginal natural gas
Marginal processing of biofuel (new bio-refinery / state-of-the-art)

☒ Average emissions as proxy:
EU electricity emissions
Crops cultivation: marginal emissions for *extra* crop (from yield intensification expansion onto marginal cropland

JEC WTW analysis - Results v5

174

Major update of JEC v4 pathways

78

New pathways

New technologies, new fuels and new feedstocks.

HDV

NEW!

PC

NEDC & WLTP cycles

Modelling work!

JEC WTW analysis - Results v5

WTT

252 pathways to fuels. Examples.

(1) Fossil derived fuel (Oil & Gas)

(2) Biogas

(3) Ethanol

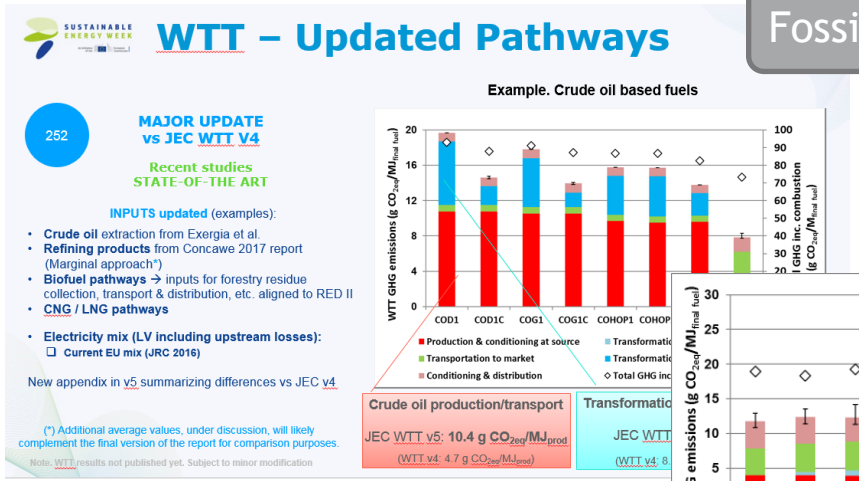
(4) Biodiesel

(5) Synfuels

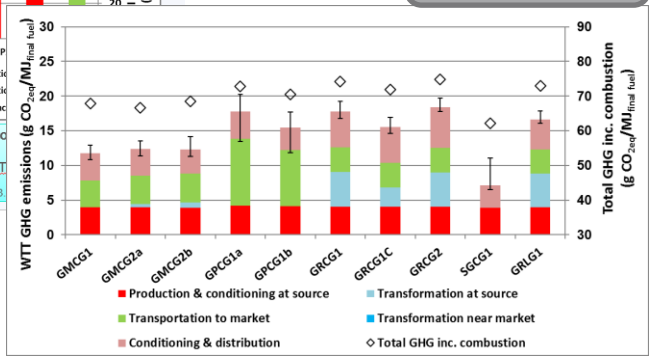
(6) Electricity

(7) Heat & Power

(8) H_2



Fossil liquids



NG / LNG

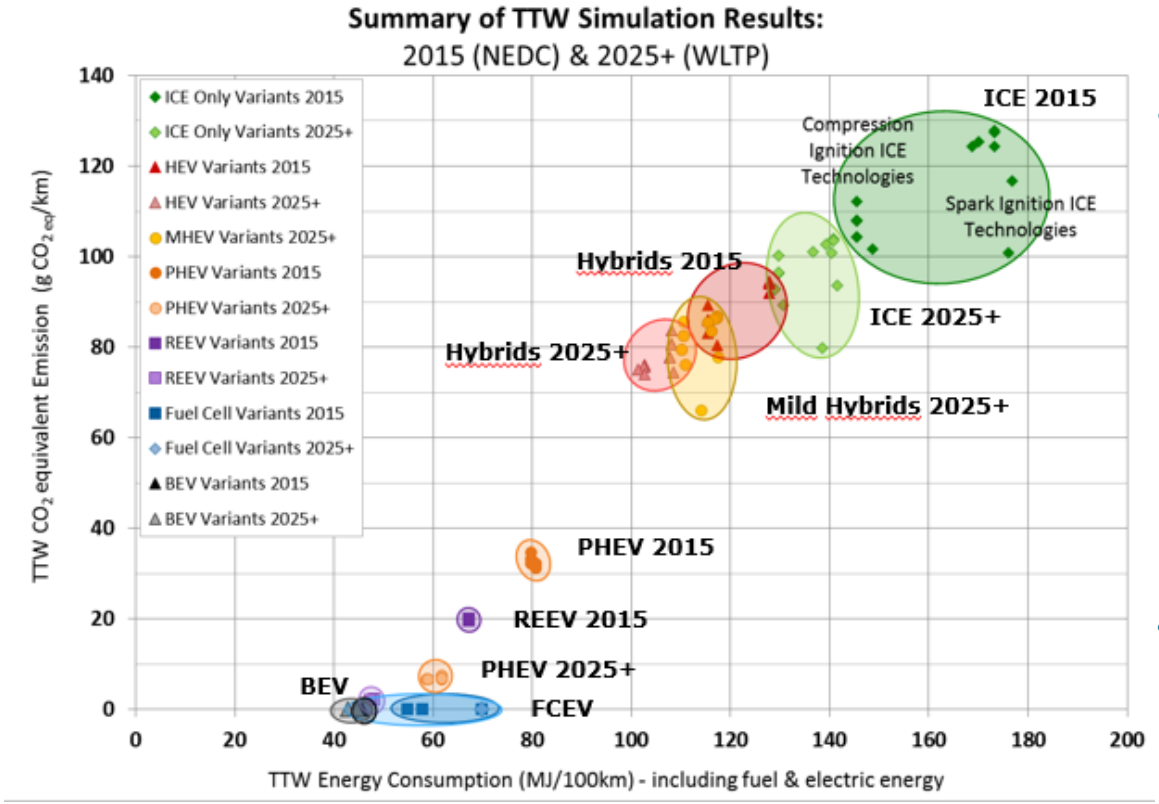
Not published yet. Subject to modifications

STATE-OF-THE-ART

- Updated / New pathways based on recent literature review and/or empirical data to reflect new technologies, fuels and feedstocks.
- Data from other Associations (e.g. NGVA), Technology Providers included.

JEC WTW analysis - Results v5

TTW



- **TTW passenger cars (PC)**
  - representative of EU market, generic C-segment passenger car (2015 and 2025+)
  - TTW simulations to reflect changes in test cycles from NEDC (New European Drive Cycle) to WLTP (Worldwide Harmonized Light duty Test Procedure)
- PC simulations have been performed by AVL List GmbH using Cruise software (as in v4).

Not published yet. Subject to modifications

JEC WTW analysis – Results v5

WTW

FUELS

- Examples.

- **Fossil diesel**
- **Biodiesel**
- **HVO**
- **Ethanol**
- **Compressed Biomethane**
- **Electricity**

Selected Pathways

COG1	Conventional gasoline
OWCG1	Municipal waste (closed digestate)
OWCG21	Manure (closed digestate)
OWCG22	Manure (open digestate)
OWCG4	Maize, whole plant (closed digestate)
WWCG2	Syn-methane from Waste wood
RECG1	Syn-methane from renewable electricity

Selection criteria:

(Max 5 WTT pathways for WTW)

Code:

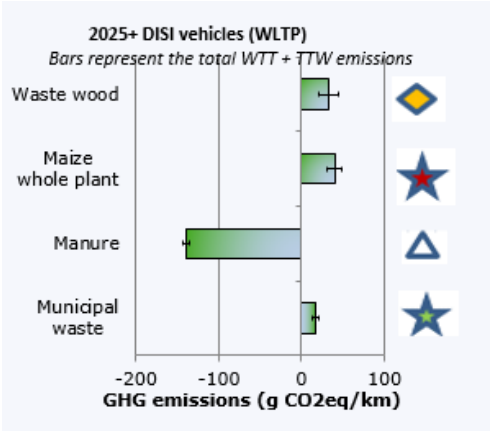
- Reference
- CO2 Max
- CO2 min
- Representative
- Special interest/only pathway

Selected Powertrain

PC: Class-C, single configuration

Main results

For a specific reference year (Current & 2025+)



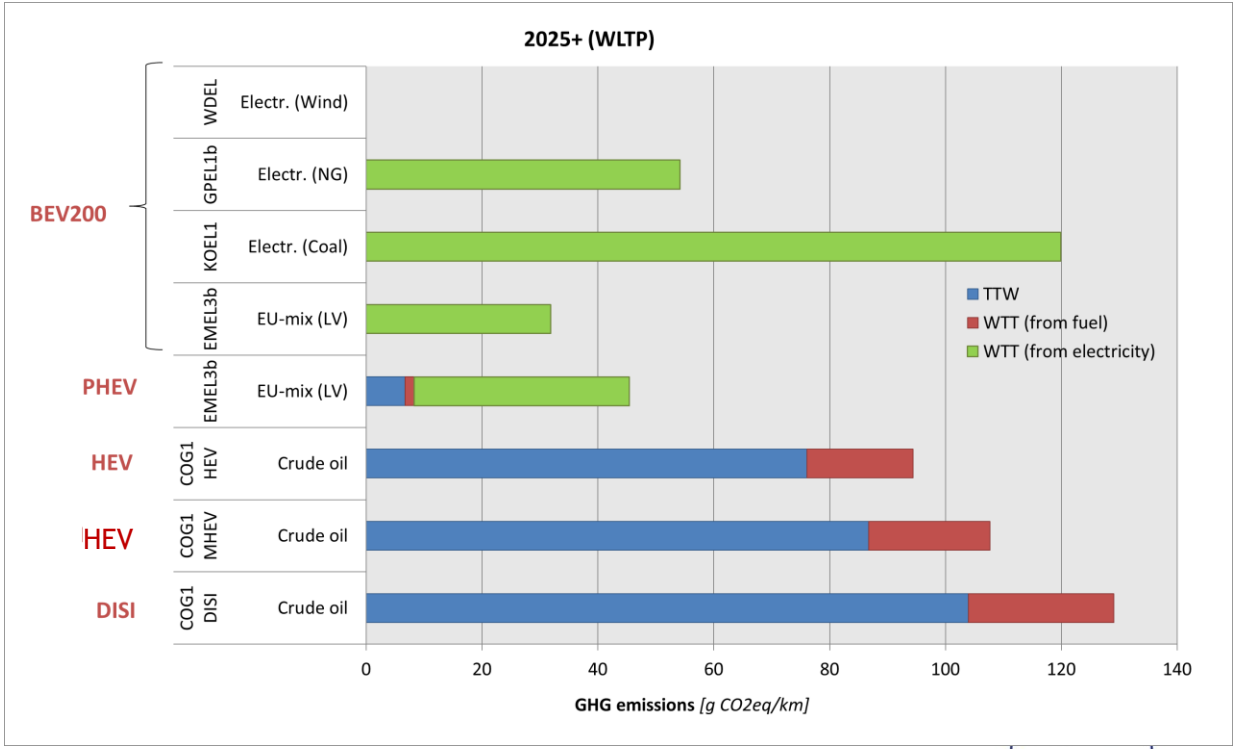
JEC WTW analysis - Results v5

WTW

Example. xEV (2025+)

Strong impact of electricity source.

Interesting performance of **PHEV** against **BEV** (strongly **affected** by the **electric** vs. **ICE** modelled **ratio**).



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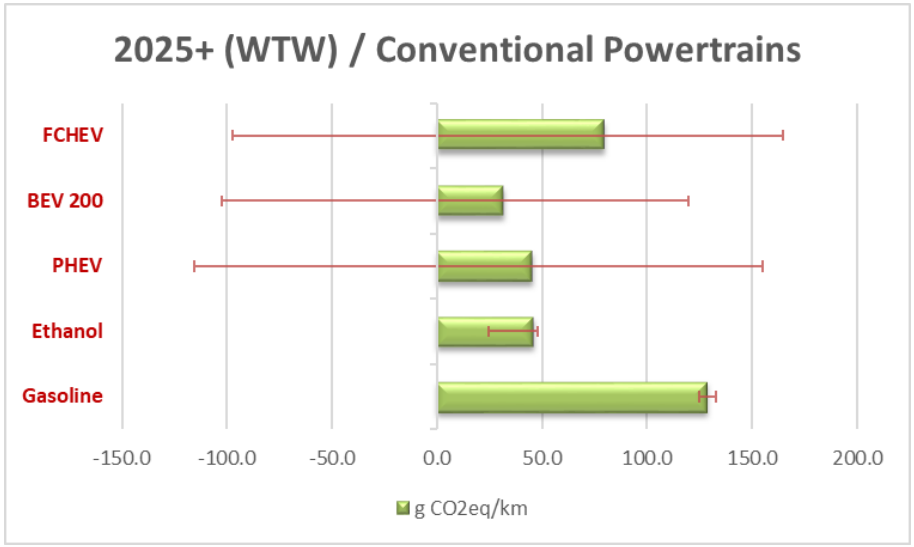
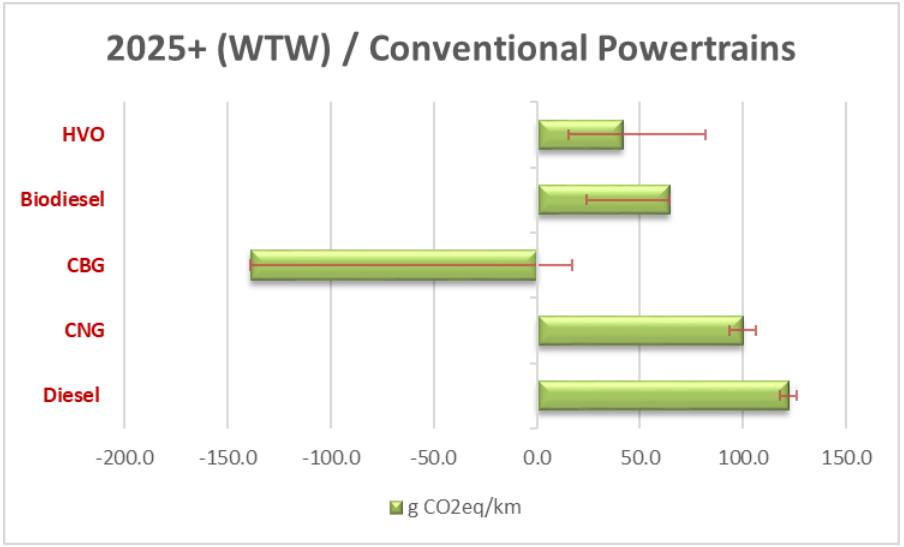
JEC WTW analysis - Results v5

WTW

PC 2025+ Conventional powertrain





Not published yet. Subject to modifications

Concawe

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- *Concawe - Marta Yugo*
- *EUCAR - Luis De Prada*

Publication soon! In the meantime…

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