ETIP Bioenergy
European Technology and Innovation Platform

Workshop:
WG3 / Markets & End-use

30.11.2021

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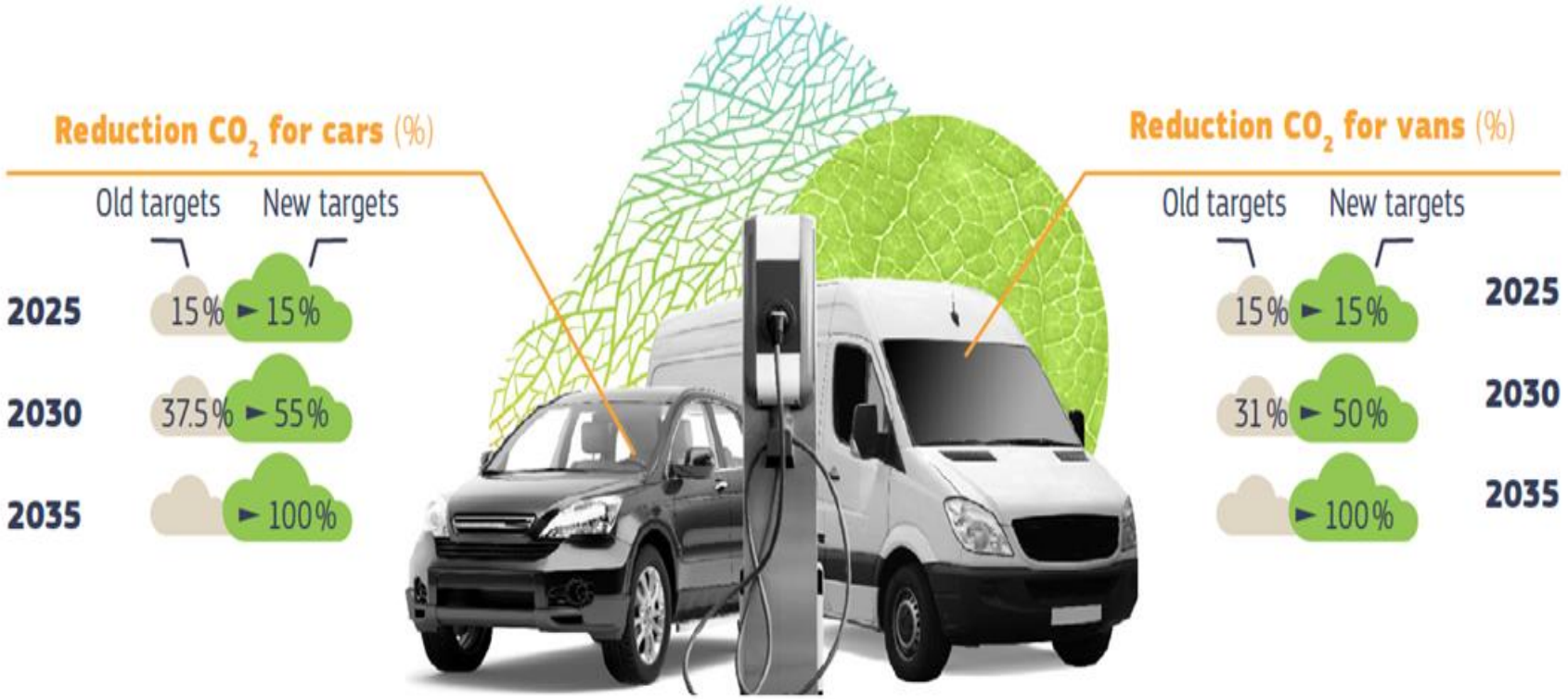
WG3: identify and promote the most promising avenues of R&D once the transformation of biomass has produced suitable molecules that help reduce the carbon footprint of energy in transport

July 2021, the European Commission published its Fit for 55 package to deliver on the Green Deal→ How to decarbonise the EU transport sector & how to decrabonise EU energy system?



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Fit for 55 package still sees some liquid fuel demand in transport by 2050

Figure 22 - Energy consumption in transport (incl. international aviation and maritime) in the EU; Source PRIMES

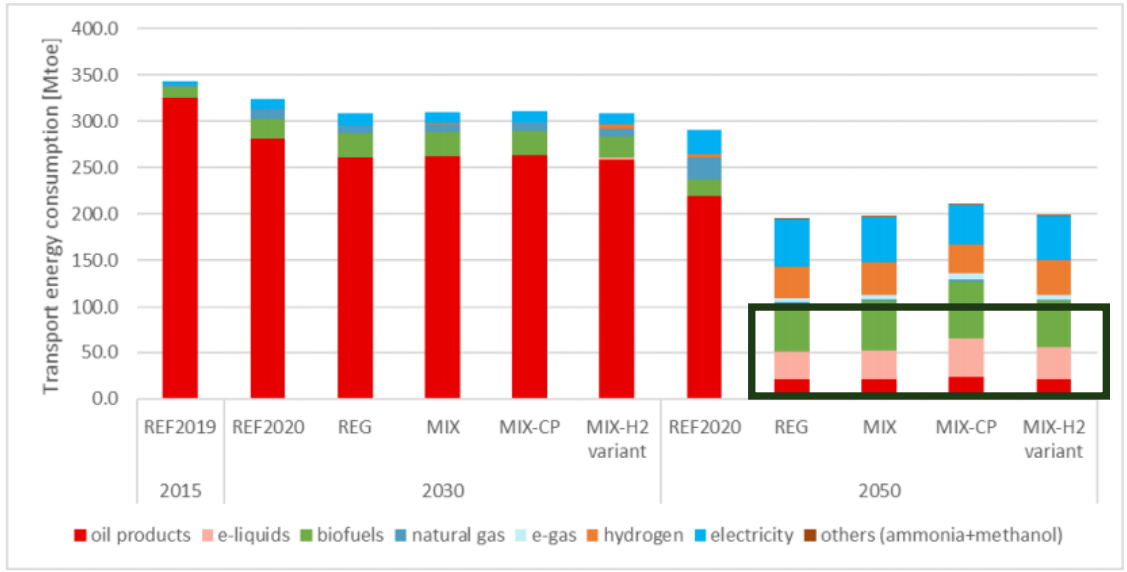
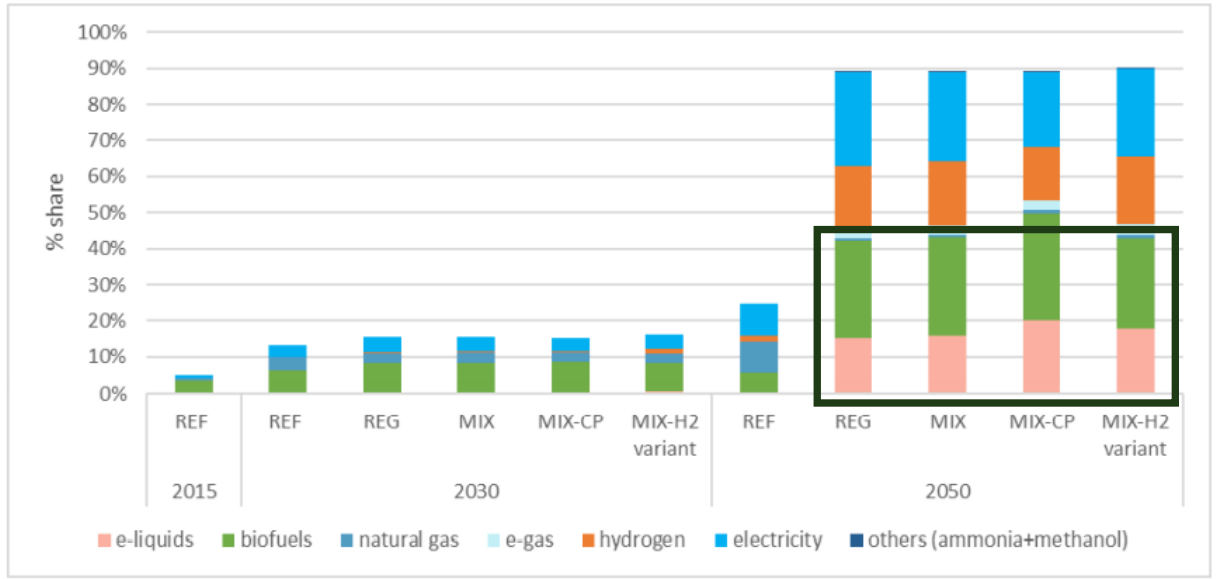


Figure 23 - Share of alternative fuels in Transport (incl. aviation and maritime navigation); Source PRIMES



Source: RED3 Impact assessment, SWD(2021) 621 final

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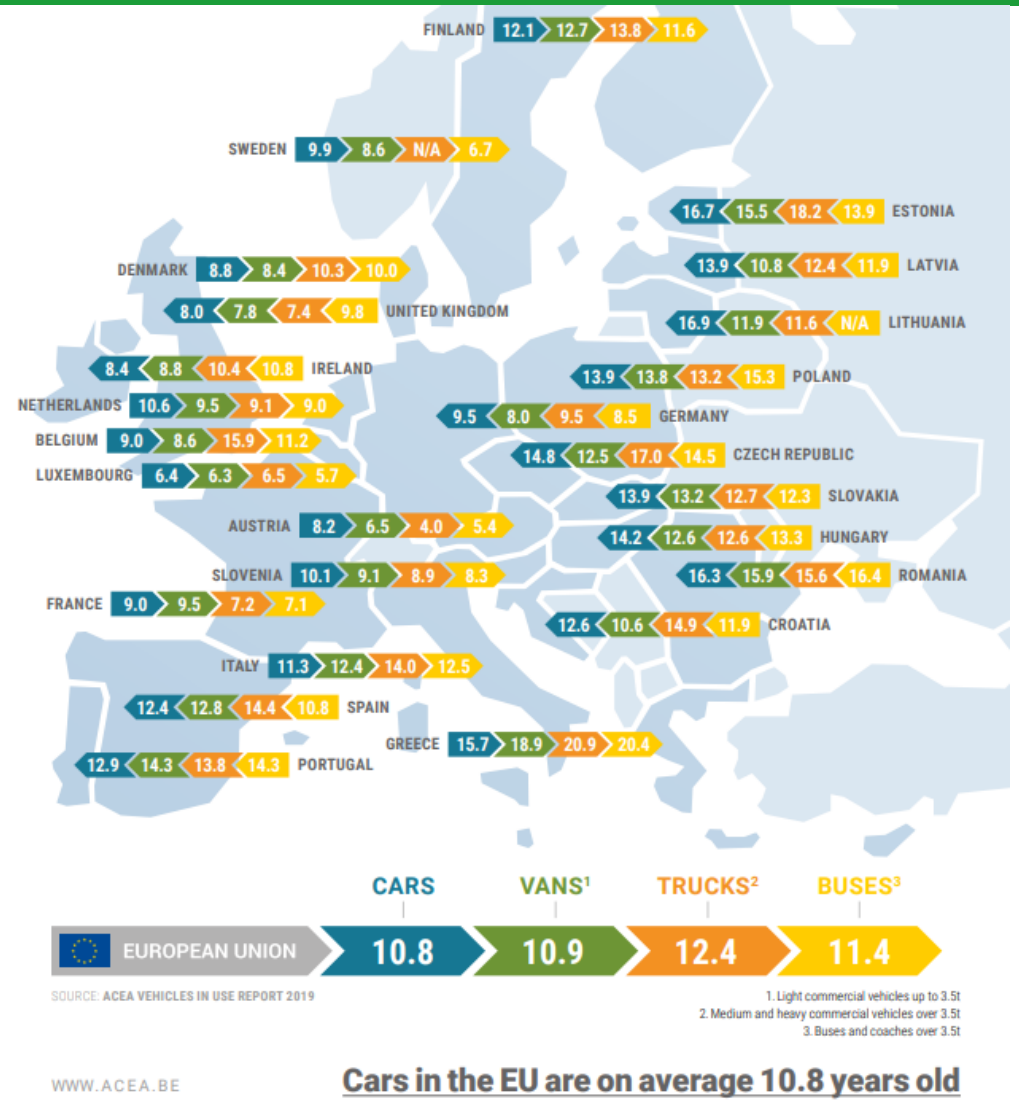
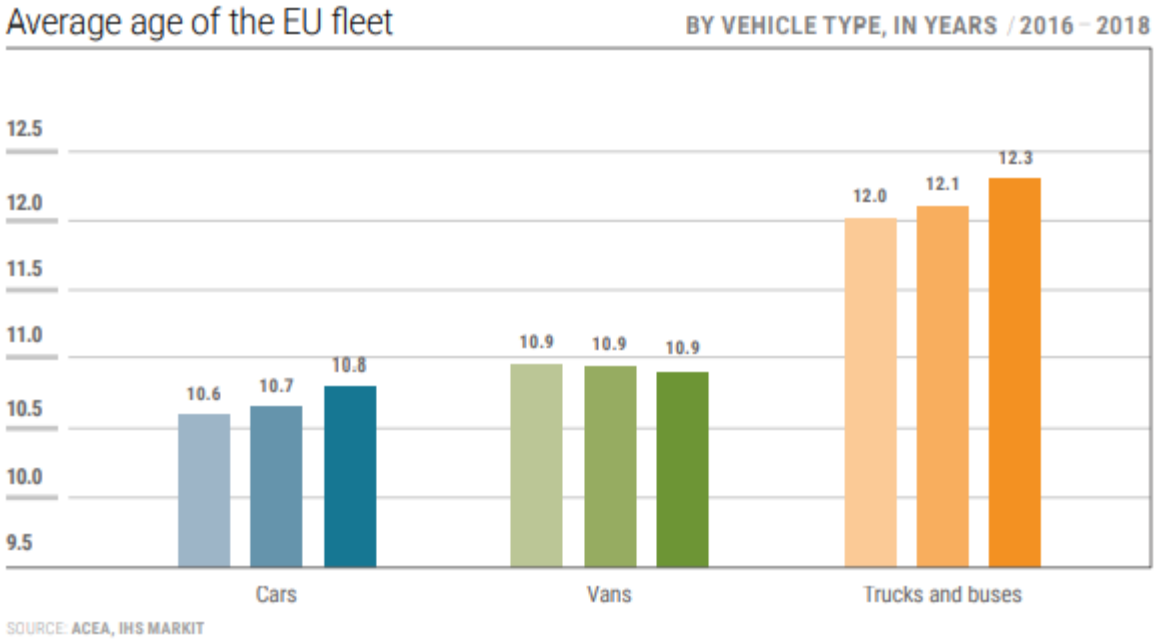
EU legacy fleet: > 310 million vehicles on the road. 17.8 mio new registration





Source: ACEA_Pocket_Guide_2020-2021.pdf

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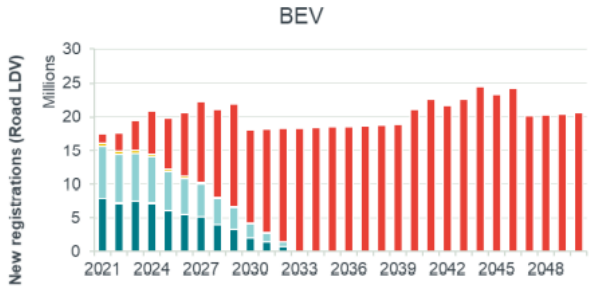
EU legacy fleet will continue to demand liquid fuels

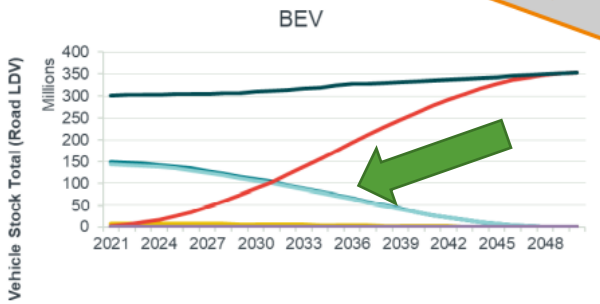
We model fleet development across all technologies based on technical lifetime …

Example BEV

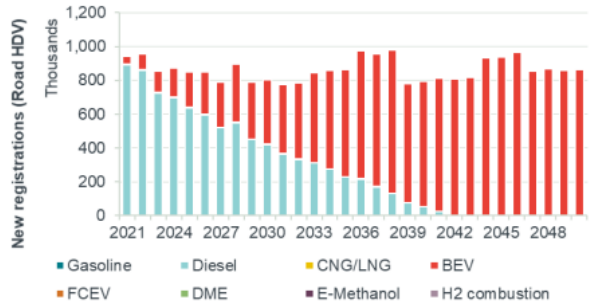
FVV

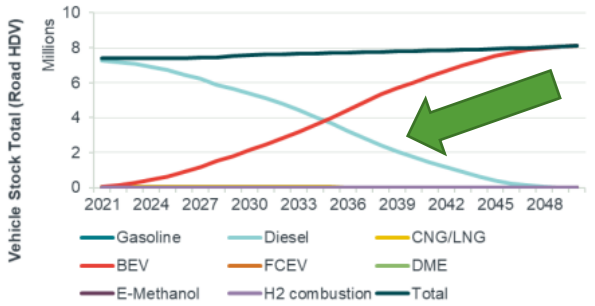
LDV





HDV





Approach

Fleet-development is modelled based on various corner stones / assumptions

- **100% fleet** of one single drivetrain (e.g. BEV) in 2050
- Based on assumed lifetime (e.g. 17years LDV) latest date for **100% share in new vehicles** is deducted (e.g. LDV 2033)
- Assumed **linear ramp-up** in new vehicle share from 2020 on until this date (analogue for FT fuel share)

Legacy fleet will demand liquid fuels

Source: Detail | FVV (fvv-net.de); Future Fuels: FVV Fuels Study IV Nov 2021

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- Role of electrification in road transport with EC proposal for -100% CO2 for new registration in 2035 (vs 20221). This will reduce liquid fuels demand from new vehicles

But what about legacy fleet (PC/van/HD & buses)?

Long lifetime → **liquid fuels will be needed for a long time and must be increasingly decarbonised**

How can WG3 support research for the decarbonistaion of the EU legacy fleet? :

Concawe's Fleet & Fuel outlook towards 2030

30 November 2021 - ETIP Bioenergy WG 3 webmeeting

Ehsan Shafiei *Marta Yugo* *Roland Dauphin*
Alba Soler

Outline

- RED II and RED III proposal context – Reminder
- Concawe's Fleet & Fuel outlook towards 2030
  - *(Assessment made before the fit-for-55 package!)*
- Contribution of low-carbon fuels in high electrification scenarios
- Conclusions – Next steps

The RED II transport proposal

- Adopted in 2018 and to implemented by member states by June 2021.
- Binding target for transport of 14%E to be met by obligation on fuel suppliers.
- A cap of 7% on feed or food crops
- A sub-target on advanced biofuels of 3.5% (including double counting)
- Recognition of renewable liquid and gaseous transport fuels of non-biological origin (RFNBO) and recycled carbon fuels (RCF)

The RED III transport proposal

- **An overarching 2030 GHG target for transport**
  - *13% versus a baseline based on a fossil fuel default value*
  - *Extends towards the aviation and maritime sector.*
- **A sub-target for advanced biofuels (2.2%E in 2030) and synthetic fuels (2.6%E in 2030).**
- **Nearly complete elimination of multiple counting**
- **Remains a directive**

Outline

- RED II and RED III proposal context – Reminder
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Concawe's Transport & Fuel Outlook towards EU 2030 Climate Targets

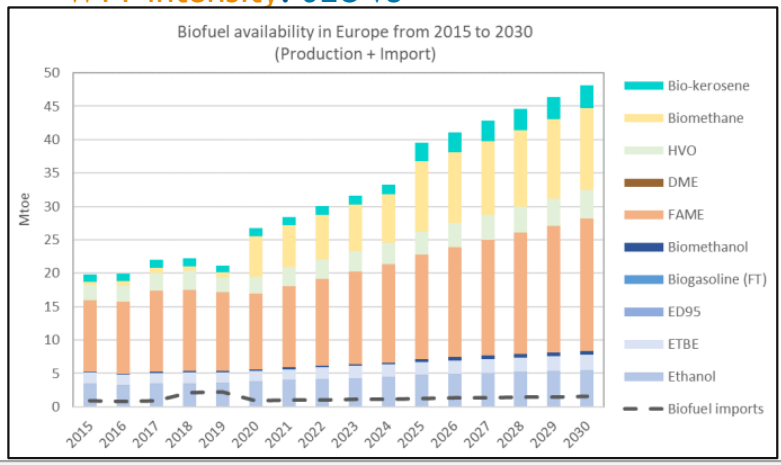
Fleet
(Fleet composition / evolution towards 2030, TTW)

Baseline:

- **Calibration based on recent published data / statistics** (activity, efficiency improvement, scrappage rate, etc)
- **2030: Current 2030 targets (pre-FF55!) met (TTW)**
  - Aviation, Rail, Maritime modelled as aggregated data
- **Total energy demand for transport (details per type of fuel)**

Fuels
(Availability, WTT CO2 intensity)

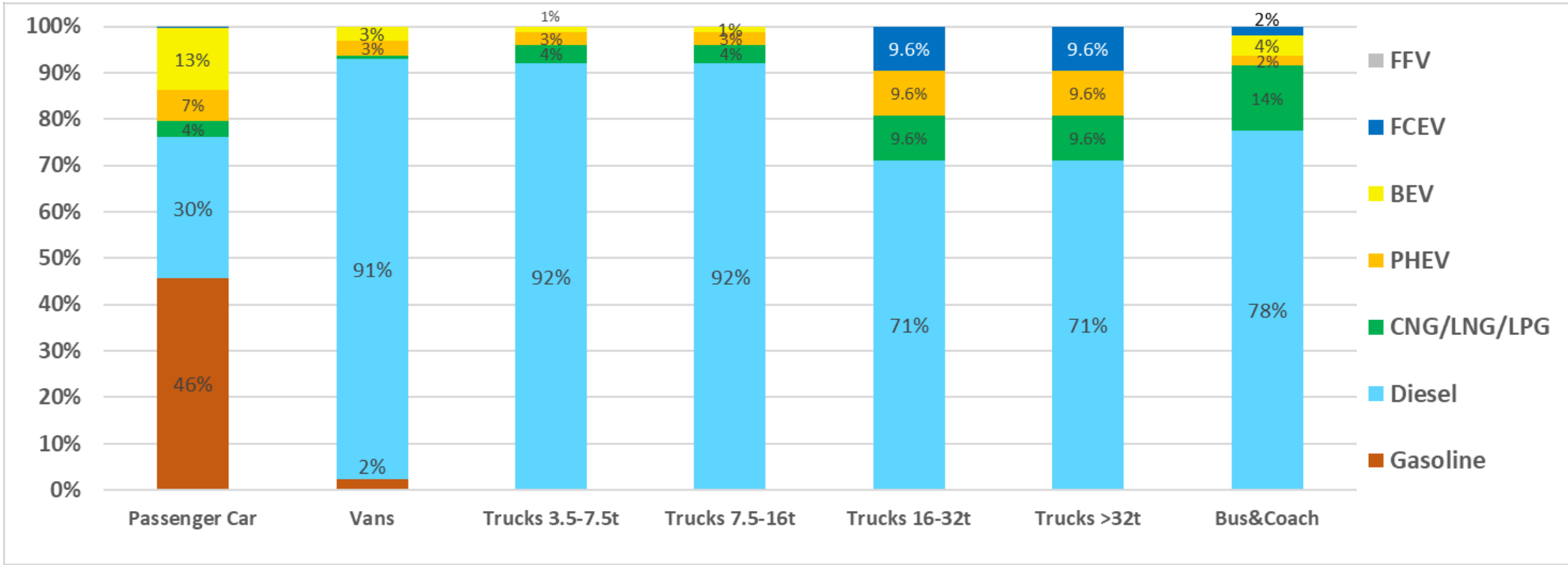
- Availability: Market based outlook (STRATAS / JRC)
- WTT intensity: JEC v5



Tool now ready to explore sensitivities / scenarios for current / future **RED II / FQD targets**

Baseline Results

New sales mix in 2030 to meet CO2 emission target



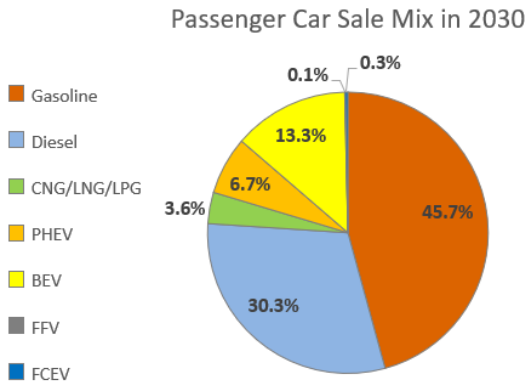
37.5% emissions reduction vs 2021

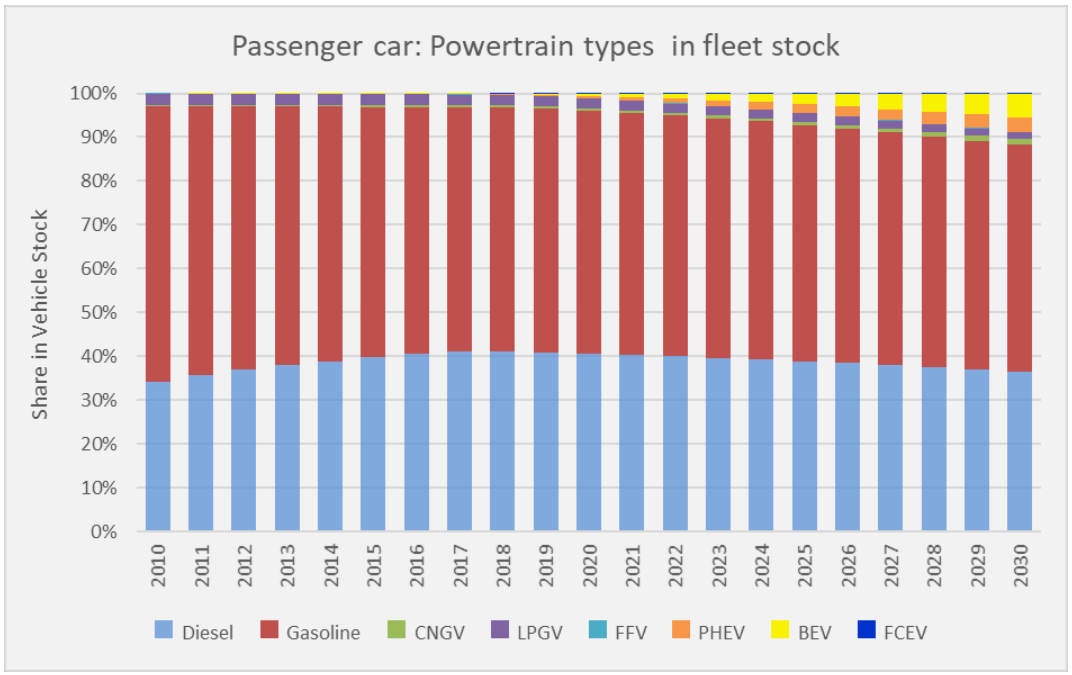
31% emissions reduction vs 2021

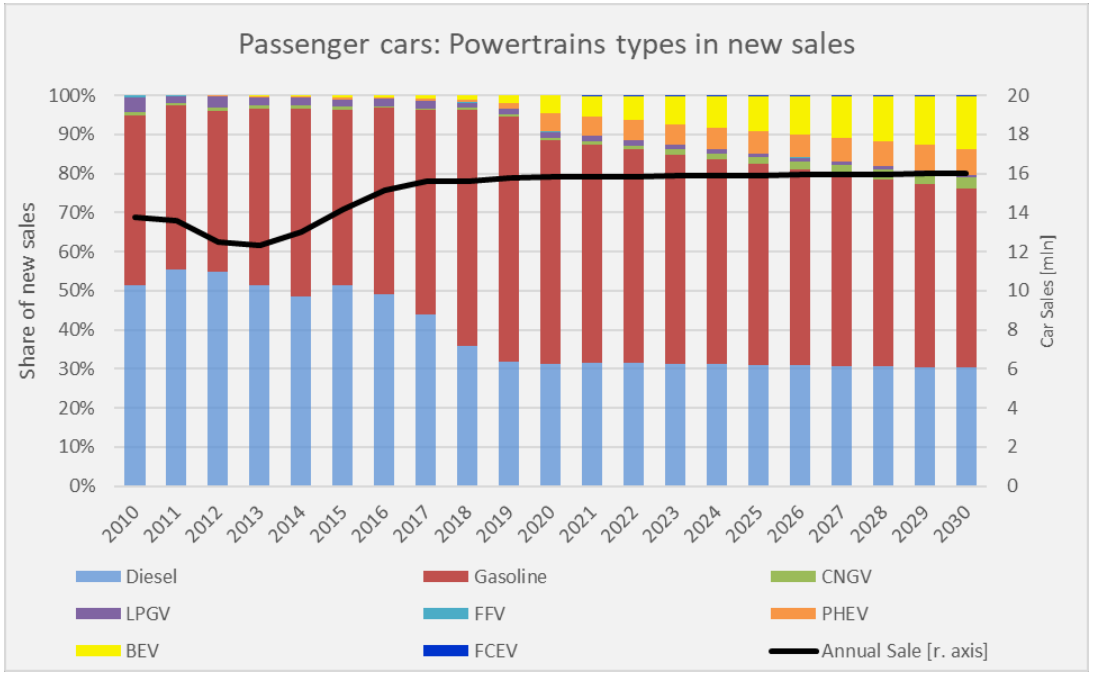
30% CO2 emission reduction by 2030 vs 2019

Baseline Results

Passenger Car Fleet Mix

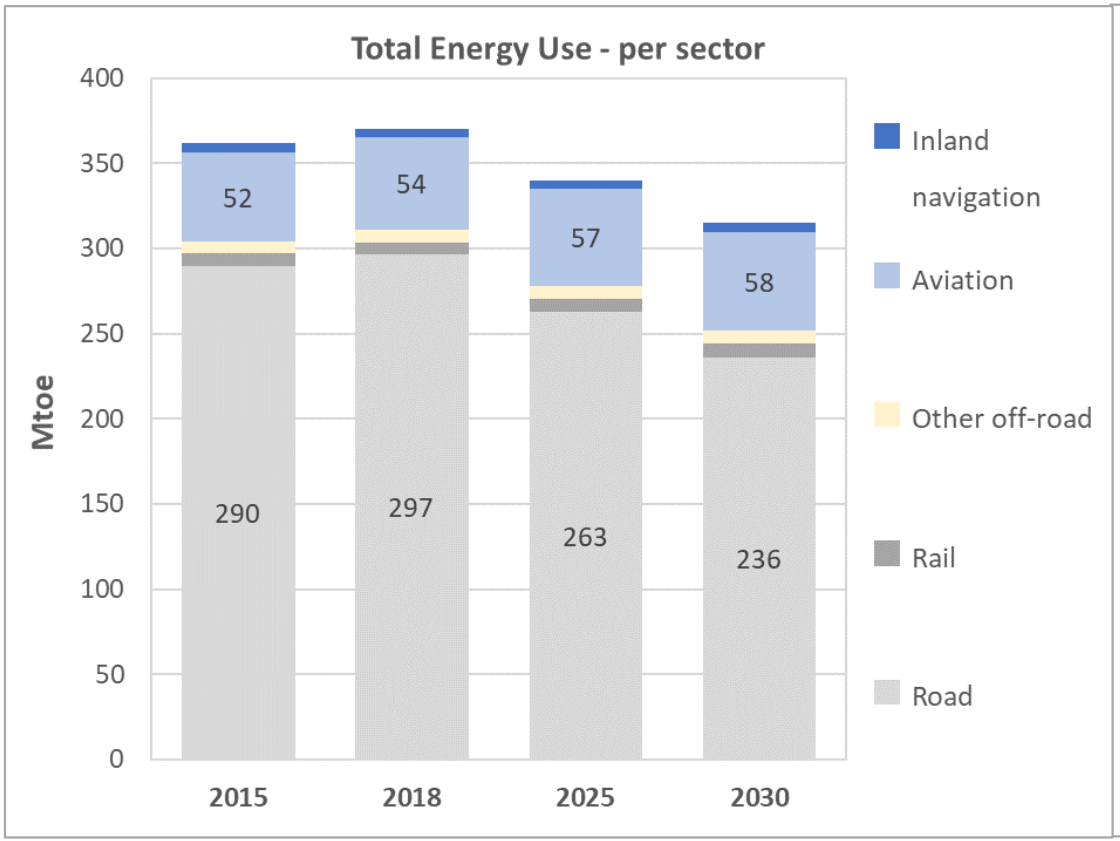


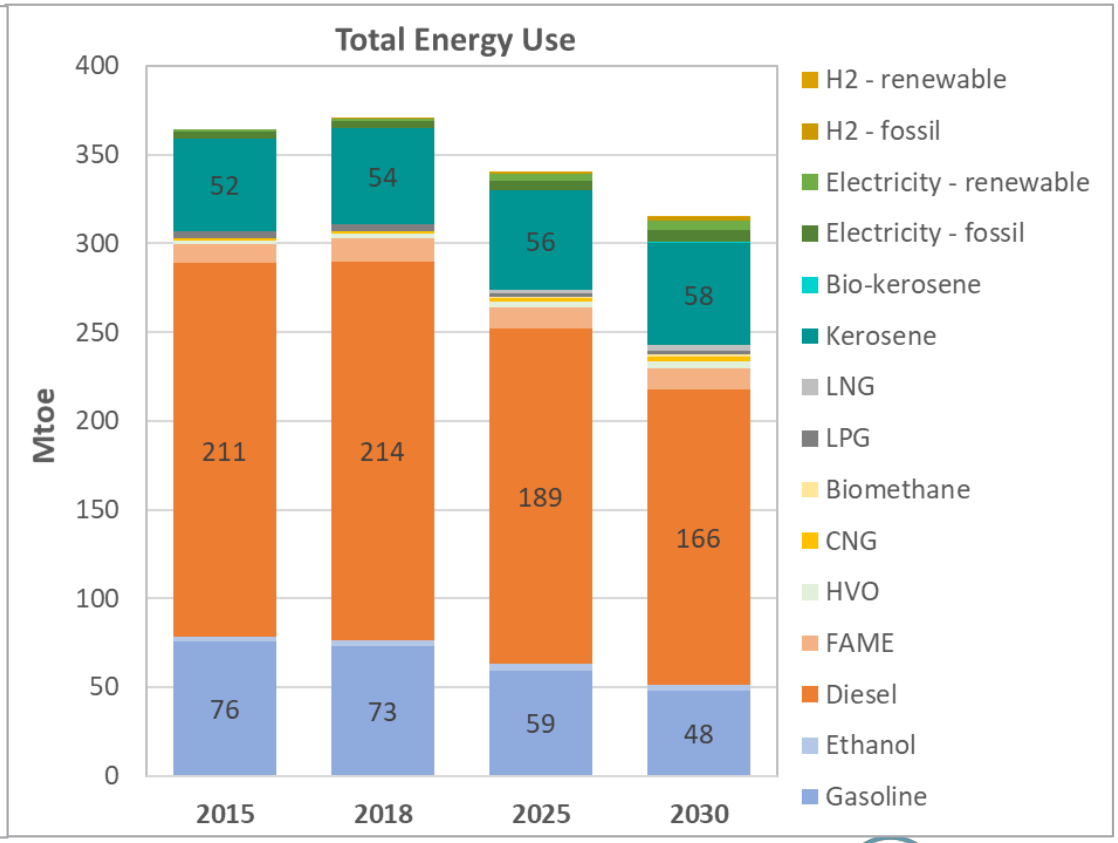




Baseline Results

Fuel Demand by Type and Sector





Summary of RES-T Results

Baseline – Two different interpretations of additionality for RES electricity

Additionality in:

1

$$RES_{Interp\,1} = Share_{RES\ electricity\ (2028)} * Electricity_{use\ in\ transport\ in\ road\ and\ rail\ (2030)} - Share_{RES\ electricity\ (2018)} * Electricity_{use\ in\ transport\ in\ road\ and\ rail\ (2020)}$$

Transport

2

$$RES_{Interp\,2} = Share_{RES\ electricity\ (2028)} * Electricity_{use\ in\ transport\ in\ road\ and\ rail\ (2030)}$$

EU energy system

(1) 15.5%

(2) 16.9%

Fuel or energy carrier	Target/cap	Without CF	With CF in numerator	With CF in both	With CF in numerator
Ren. electricity in road transport		0.8 %	3.0 %	2.9 %	3.4 %
Ren. electricity in rail transport		0.5 %	0.7 %	0.7 %	1.8 %
Ren. electricity in all other transport modes		0.0 %	0.0 %	0.0 %	0.0 %
Compliant biofuels		8.8 %	11.5 %	10.8 %	11.5 %
Advanced part A	3.5% (min)	1.1 %	2.2 %	2.1 %	2.2 %
First generation	7.0% (max)	6.1 %	6.1 %	5.8 %	6.1 %
Advanced part B	3.4% (max)	1.6 %	3.2 %	3.0 %	3.2 %
Other compliant biofuels		0.0 %	0.0 %	0.0 %	0.0 %
Non-compliant biofuels		0.0 %	0.0 %	0.0 %	0.0 %
Other renewable energies		0.2 %	0.2 %	0.2 %	0.2 %
Total RES-T share	14% (min)	10.2 %	15.5 %	14.6 %	16.9 %

2030 Impact Assessment

Scenario	2015	BSL
RED II transport) - including multipliers	5.6%	17.5%
RED II transport - multipliers eliminated	*4.5%*	*8.9%*

Concawe

Sensitivity Cases

RED II transport: Ranges: 14%-18.2% (2030 IA ambition up to 25%)

Scenario	2015	BSL	REG	CPRICE	ALL
RED II transport) - including multipliers	5.6%	17.5%	25.2%	21.8%	25.4%
RED II transport - multipliers eliminated	*4.5%*	*8.9%*	*12.4%*	*11.3%*	*12.7%*

Case	RED-II % Interpr. 1	RED-II % Interpr. 2	Key Outcome
Baseline	15.5%	16.9%	1.7% cap (physical)
30% BEV+PHEV in 2030 sales	16.2%	17.6%	Additional sales of 1.6 million new EVs in 2030 raises RED-II by ~0.8%
5% bio-kerosene in 2030 aviation fuel	16.5%	18.0%	Rising RED-II by 1.1%, but the realisation of feedstock potential gain could be at risk
Higher HVO use to reach 3.5% Annex A feedstock	16.8%	18.2%	The use of feedstock A is ~60% higher than baseline
40% share of biomethane in total gas	16.7%	18.1%	Towards meeting all RES-T targets and biofuel feedstock sub-targets with Annex A at risk (3.4%)
Annex B feedstock: administrative cap	14.0%	15.4%	Explores the 1.7% cap being applied to the multipliers (not physical) → the impact is 1.5% lower RED-II
E10 limited uptake (78% of fuel grades by 2030)	15.3%	16.7%	0.2% reduction in RED-II
Only E5 grade (theoretical assessment)	14.5%	15.9%	1% reduction in RED-II
Liquid biofuels: 20% in maritime & 10% in non-electric rail	15.9%	17.3%	0.5% increment in RED-II
LNG trucks with dual-fuel HPDI technology in 2030	15.4%	16.8%	Small decrease in RED-II due to lower use of biomethane

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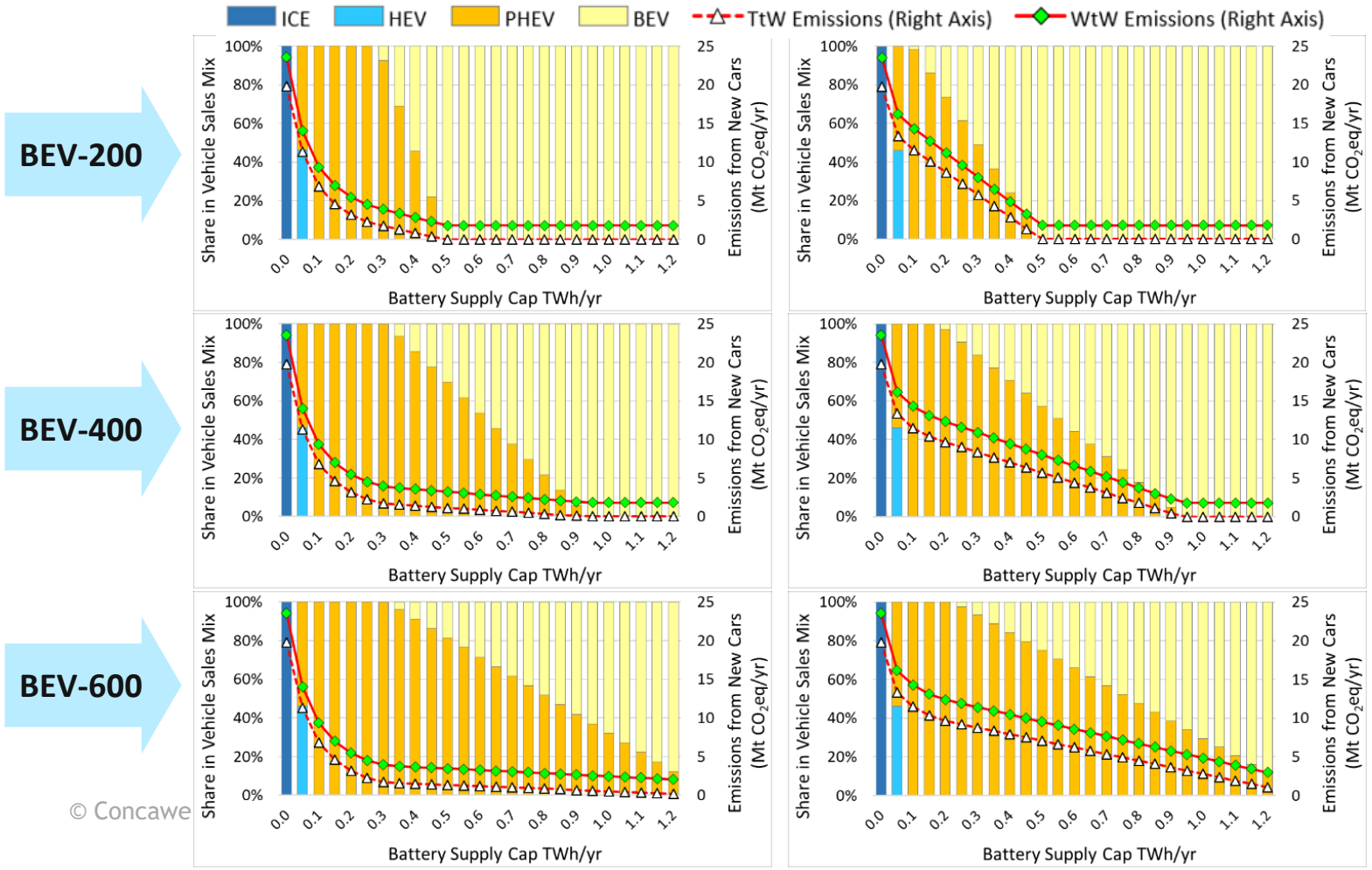
Objectives

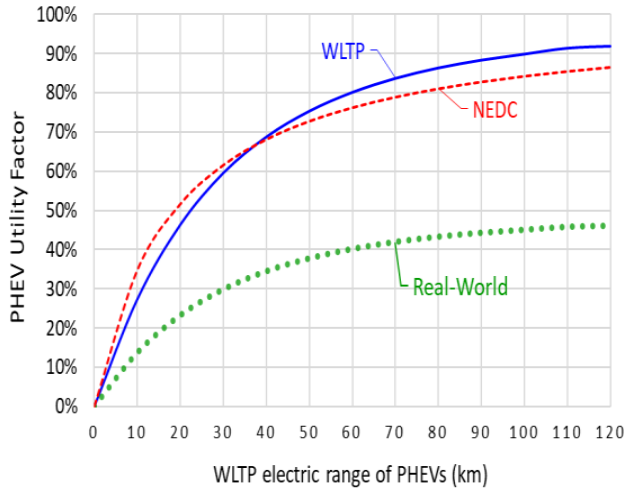
- **Concawe's assessment aims to investigate the following key questions:**
  - **How to make the best use of a certain level of battery production/supply towards a minimized GHG emissions of EU-wide newly registered cars towards 2030?**
    - ***Putting the question of « feasibility » at the core of the issue***
    - ***Shifting from a back-to-back comparison to a systemic approach***
    - ***Optimization under realistic conditions instead of "moonshot" plans resulting in suboptimal results when the initial assumptions are not realistic***
    - ***Starting the mitigation of transport-related GHG "now" without waiting for the full rollout of the gigafactories.***
  - **Is there a role for PHEVs? How much the Utility Factor could impact the results?**
  - **What would be the impact of using low-carbon fuels?**
  - **Open a debate with the road transport industry on**
    - ***Likelihood to live in a battery-constrained environment by 2030+?***
    - ***Impact of aspects not considered in this work (e.g. production costs, costumer acceptance) on the optimal vehicles sales mix?***

Simultaneous optimisation of sales mix & battery size of PHEV

Optimal vehicle sales mix

WLTP Utility Factor | **Real-World Utility Factor**

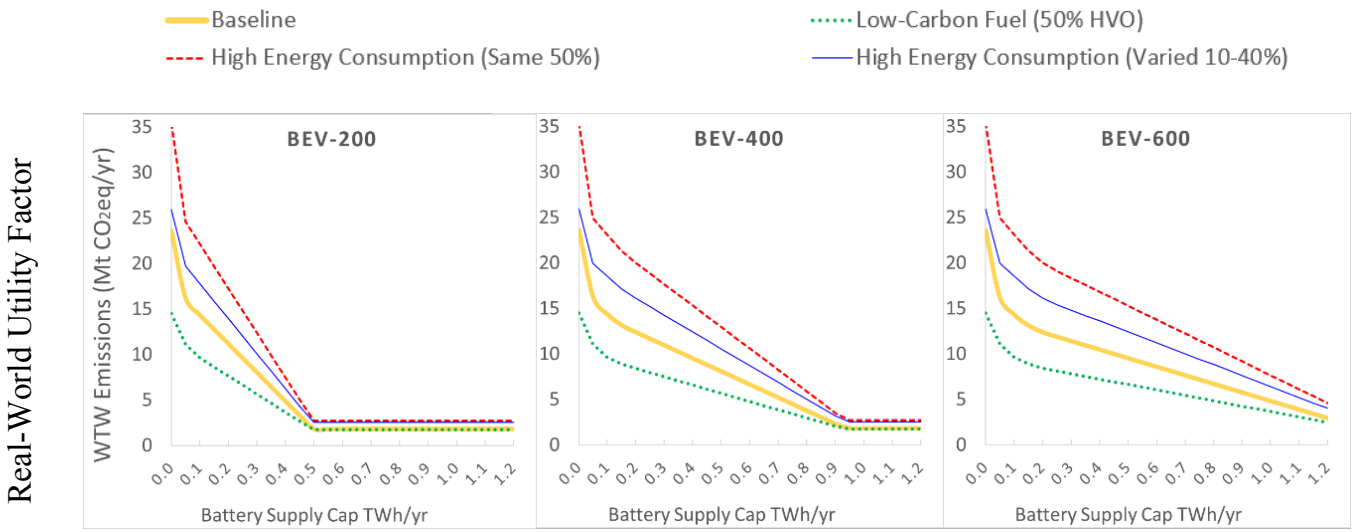




Concawe

Impact of Low Carbon Fuels

- **Introduction of low carbon fuels, up to 50% HVO**
  - *Does not change significantly the optimal vehicle sales mix*
  - *But significantly reduces the overall WtW emissions*



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Conclusions

- **There will still be a significant amount of liquid fuels used by 2030 and beyond, at least due to the presence of the legacy fleet**
- **A higher uptake of low-carbon fuels obviously leads to mitigating GHG emissions from liquid fuels consumption**
- **RED-T II target seems within reach with the planned uptake of renewable fuels production capacity**
- **Even in optimal high-electrification cases*, the new sales will still need liquid fuels**
  - *A higher uptake of low-carbon fuels does not modify the optimal electrification design of the vehicles, but significantly reduce their WtW CO2 emissions*

** And even more in non-optimal high-electrification cases*

Next steps

- **Update the fleet and fuel models to include the Fit-for-55 package proposal targets**
- **Challenges and question marks**
  - *Uptake of electrification, considering effects of Euro 7, recharging infrastructure, society behavior, …*
  - *Effects of ETS for road transport, aviation and maritime*
  - *Effects of renewables targets in aviation and low-carbon intensity targets in maritime*
  - *RED III implementation*
    - **Switching from energy target to GHG target**
    - **Removing most of the multipliers**
  - *Interlink between the different parts of the Fit-for-55 package*

HDV CO2 directive revision

- short update -

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ETIP Bioenergy WG3 meeting, 30 November 2021

Heavy Duty CO2 Directive
Reg No 595/2009 (2019/1242)

. 198/202 EN Official Journal of the European Union 25.7.2019

REGULATION (EU) 2019/1242 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 20 June 2019

setting CO_2 emission performance standards for new heavy-duty vehicles and amending Regulations (EC) No 595/2009 and (EU) 2018/956 of the European Parliament and of the Council and Council Directive 96/53/EC

(Text with EEA relevance)

Fuels in the HDV CO2 directive

The present HDV CO2 directive calls for 15% CO2 reduction in 2025 and 30% reduction in 2030 (from July 2019 to June 2020 baseline)

Problems with this directive from a renewable fuels' perspective:

- the only 'metric' used for legal purposes is 'g CO2 /ton km' (VECTO simulation)
- makes no difference between fossil carbon and renewable carbon in the fuel
- longer term: the energy efficiency aspect (VECTO = **V**ehicle **E**nergy **C**onsumption calculation **TO**ol) can basically be lost when there is no carbon in the fuel, or the carbon/energy ratio differs drastically from known hydrocarbon fuel systems
- energy carriers without a carbon content (electricity, hydrogen, NH3) will always be "zero CO2" regardless of their origin
- to ensure a level playing field between energy carriers: well-to-wheels approach is necessary!

Article 15 in the directive calls for the Commission to make a review by 31 December 2022

- 'Synthetic and advanced alternative liquid and gaseous renewable fuels, including e-fuels' is mentioned in the review guideline in Article 15
- In January 2021 DG Clima contracted Ricardo - together with partners Öko-Institute, TU Graz and Transport and Environmental Policy Institute (TEPR) - to provide the 'needed technical support'

Review of Regulation (EU) 2019/1242

Art 15 - Reg 2019/1242

Review proposal for 2022

- Assessment based on cost-efficient CO_2 reduction technical potential

Other concerned policies pending of revision

- TEN-T
- Eurovignette
- Fuel Quality Directive

CO_2 emission targets review

- Overall ambition assessment for 2025, 2030
- Possible targets for 2035 and 2040

Review of existing targets

2025 & 2030

New binding targets

- 2025 and beyond (depending on HDV categories)

ZEV / LEV

- Key role for 2030
- Deployment assessment and potential

Incentives

- Evaluation of current incentive mechanism
- Assessment to stimulate ZEV/LEV market uptake

Bio- and e-fuels

- Including hydrogen
- Assessment of ccontributions to decarb.
- CO_2 credits for manufacturers?
- Life-cycle assessment of CO_2 emissions?

VECTO

- Assessment to ensure tool updating
- More certificated HDV categories

CO_2 Standards scope extension

- Smaller trucks' categories
- City buses and coaches
- Trailers and semi-trailers
- Vocational vehicles
- EMS concept
- Pooling

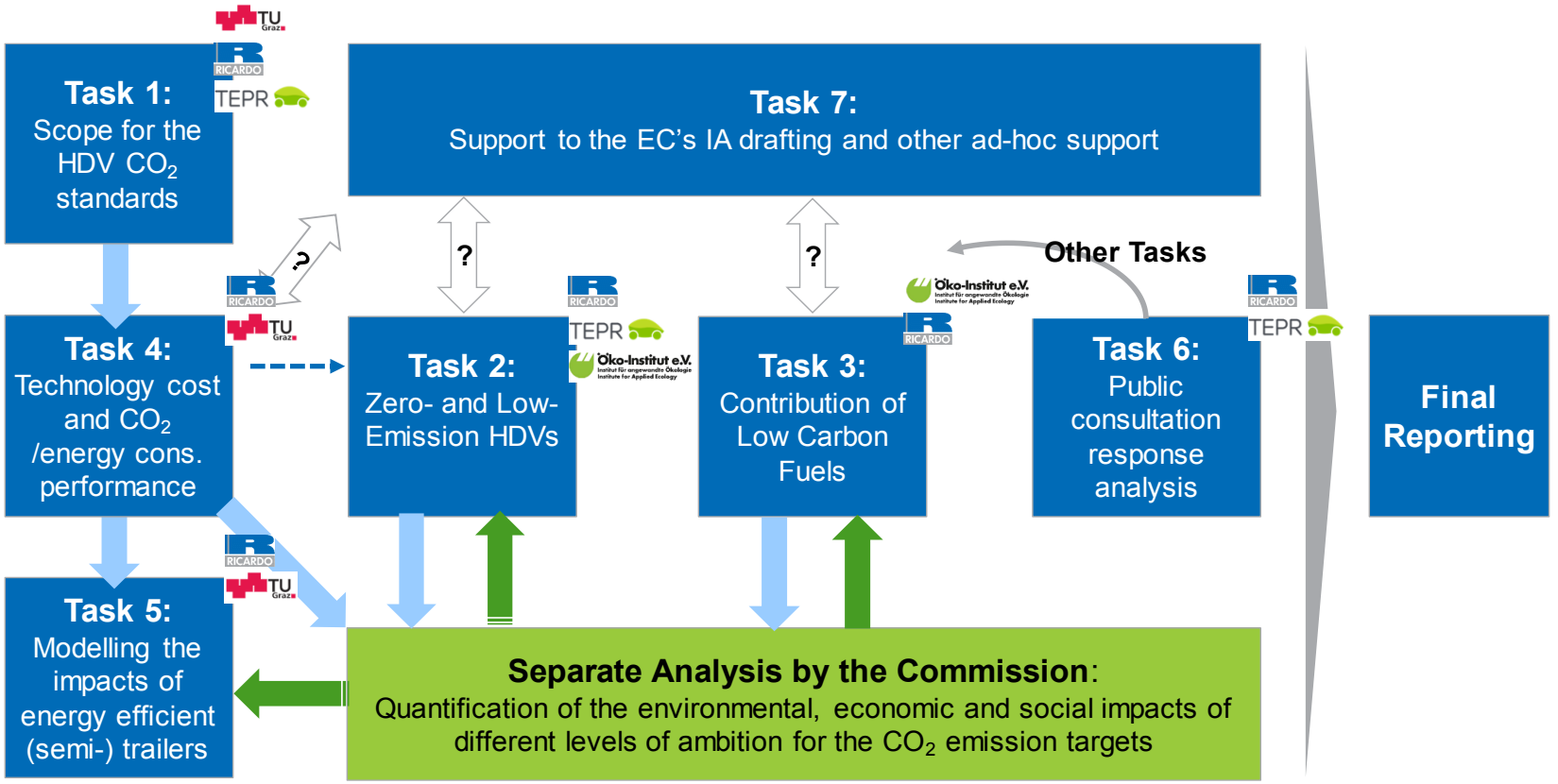
Refueling infrastructure

- Assessment within revised AFID (Alternative Fuels Infrastructure Directive)

European Commission

The Ricardo study: General project overview

- The overall work programme has 7 tasks
  - Some indirect dependencies through relation to Separate Analysis



Terms of Reference for the HDV CO2 directive review study ("the Ricardo study")

Task 3: Contribution from low-carbon fuels (bio- synth- and renewable fuels)

The contractor shall analyse the option of the inclusion of the potential contributions to CO2 emissions reductions from the use of synthetic and renewable alternative liquid and gaseous renewable fuels, including hydrogen and other e-fuels, for compliance with the HDV CO2 Standards Regulation as set out in Article 15(2)g. In this respect, the contractor shall consider possible regulatory scenarios as, for example (not exhaustive):

- Weight tailpipe CO2 emissions calculated for compliance with the carbon footprint of fuels used (e.g. based on assumptions about future fuel mixes consistent with the upcoming Climate Target Plan);

- Provide CO2 credits for reducing the carbon footprint of fuels (e.g. sustainable production of bio- and synthetic fuels), which can be used by vehicle manufacturers for compliance with HDV CO2 Regulation requirements.

The contractor shall then assess the effects of these scenarios for achieving the overall GHG reduction targets of the EU, based on the upcoming Climate Target Plan, in a 2030 and 2050 perspective. In particular, the contractor should take into account the availability at EU and global level of bio-, synthetic and renewable alternative liquid and gaseous renewable fuels, which will have to be sustainably and safely produced in a decarbonised economy, as well as cross-sectoral effects and impacts on vehicle technology developments. The analysis should also include the assessment of economic impacts, including administrative burdens as well as issues related to the implementation and responsibilities of the various regulated entities in order to ensure a robust compliance and enforcement system.

The progress of the DG Clima/ Ricardo HDV CO2 review

Ricardo's work - progress and outlook

- March 2021 (ca) - kick-off
- April 19 - email to 'concerned parties': *"As part of this project, the study team will undertake a targeted consultation of key stakeholders to gather insights and additional data on the relevant technical areas"*
- *This f*irst consultation was carried out in August/September: focus on future deployment of zero and low emission vehicles in HDV fleets (ZLEV); technology and cost projections for xEVs
- Key respondents in this first consultation: Heavy duty vehicle industry (ACEA, individual truck & bus manufacturers…), automotive suppliers (CLEPA, AECC, individual supplier companies….), some related industries and special interests (Hydrogen, T&E)
- …..supposedly, there will be a stakeholder consultation also on fuels/energy and related issues (Task 3)
- …..public consultation at some point in time
- …..”deadline” for the DG Clima legislative proposals: 31 December 2022
- …..Ricardo's reports could be expected a few months before end of 2022.