



Projections on penetration of future technologies, including electrified vehicles

EMISIA WORKSHOP, Zurich, 2017-11-17

Background

- Road transport electrification is considered to significantly contribute towards EU environmental targets
 - Greenhouse gases
 - Urban air quality
 - Specific (non-binding) targets to decrease conventionally fuelled vehicles
- Large uncertainty in projecting their penetration to the market (revolutionary rather than evolutionary technology)
 - Market disruption effect difficult to predict with conservative engineering tools
- Still, it is interesting to predict the impact of different penetration scenarios

Scenario Formulation



Starting point

- A complete and consistent dataset of historical data with no gaps on a per country basis
 - Harmonized with official national statistical data so as to reflect real situation to the extent possible
- Historical trends in fleet turnover dynamics
 - Vehicle lifetime, activity drop with mileage, second hand registrations, age distribution in reference year, etc...
- Total activity projection agreed on a political level, e.g. PRIMES/GAINS baseline

Fleet dataset: historical years



- EMISIA actively maintains up-to-date datasets used in COPERT/SIBYL
- Up to 2010, data are based on FLEETS and TRACCS projects funded by EC
- Latest update in 9.2017 covering the period 2010-2016

Synthesis of primary information

- No single source provides all data at the level of detail required
- Gaps, incomplete times series, inconsistent information, no common vehicle classification
- Values from different sources seldom agree



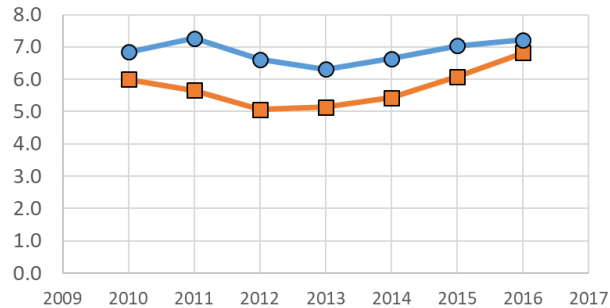
A processing methodology is required in order to create a complete and consistent dataset with no gaps, harmonized with official statistical data, by synthesizing information from the various sources

How do latest data look like?

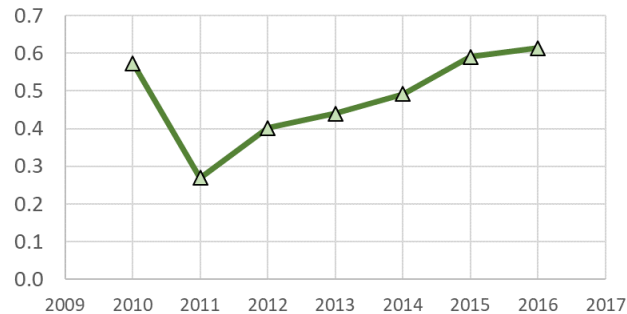


EU28 PC Registrations

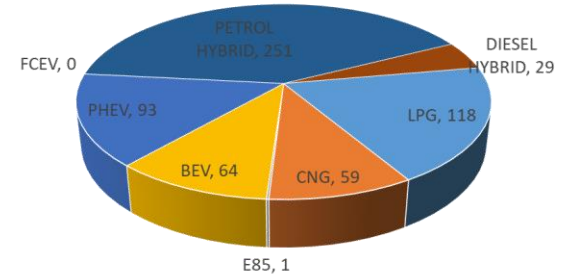
EU28 PCs New Registrations (Mveh) - Diesel and Petrol



EU28 PCs New Registrations (Mveh) - Other fuels



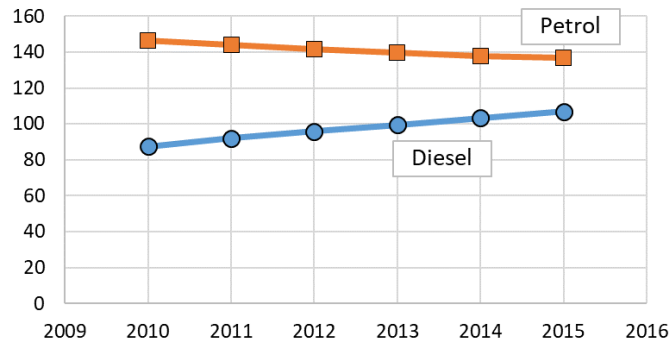
NEW REGISTRATIONS - 2016
(Values in thousands units)



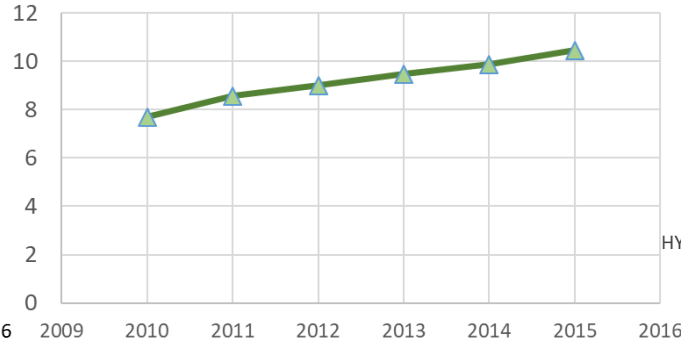
- Petrol cars sales continuously increase since 2012 (from 5m to 6.8m in 2016)
- Sales of diesel cars in EU28 show signs of saturation
- Percentage split in 2016:
 - 47% petrol
 - 49% diesel
 - 4% alternative fuels (LPG, CNG, BEV, PHEV, FCEV, Full Hybrids, EtOH)

EU28 PC Stock

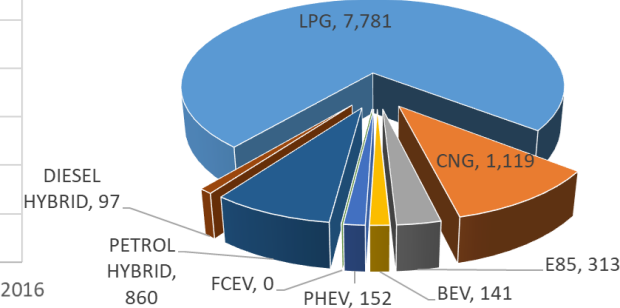
EU28 PCs - Diesel & Petrol (Mil. Vehicles)



EU28 PCs - Other Fuels



PARC - 2015
(Values in thousands units)



➤ Total stock marginally increases from 242 to 254 vehicles (2010 -> 2016)

➤ Percentage split in 2015:

54% petrol, 42% diesel, 4% alternative fuels (80% LPG, CNG, BEV, PHEV, Diesel Hybrid, EtOH)

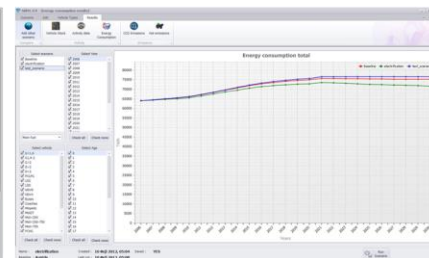
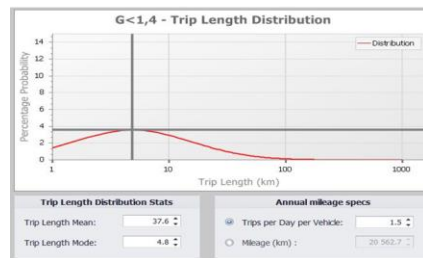
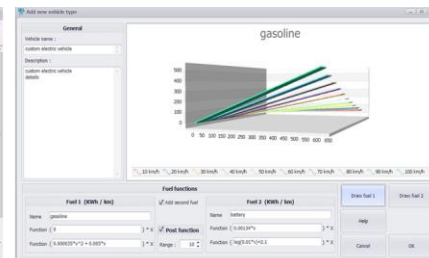
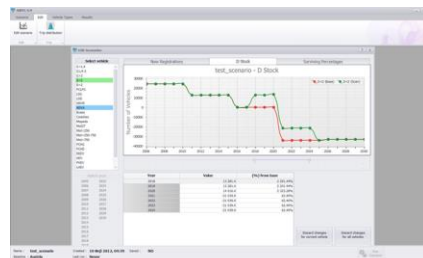
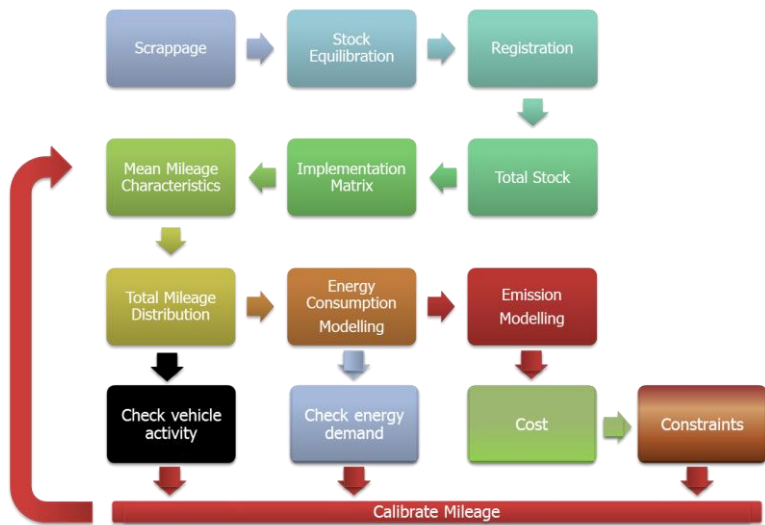
➤ LPG cars originating from petrol conversion not sales

➤ ~290 BEV+PEV in 2015. Market in 2016 stagnant at ~150k vehicles

➤ CNG becoming visible but market also stagnant

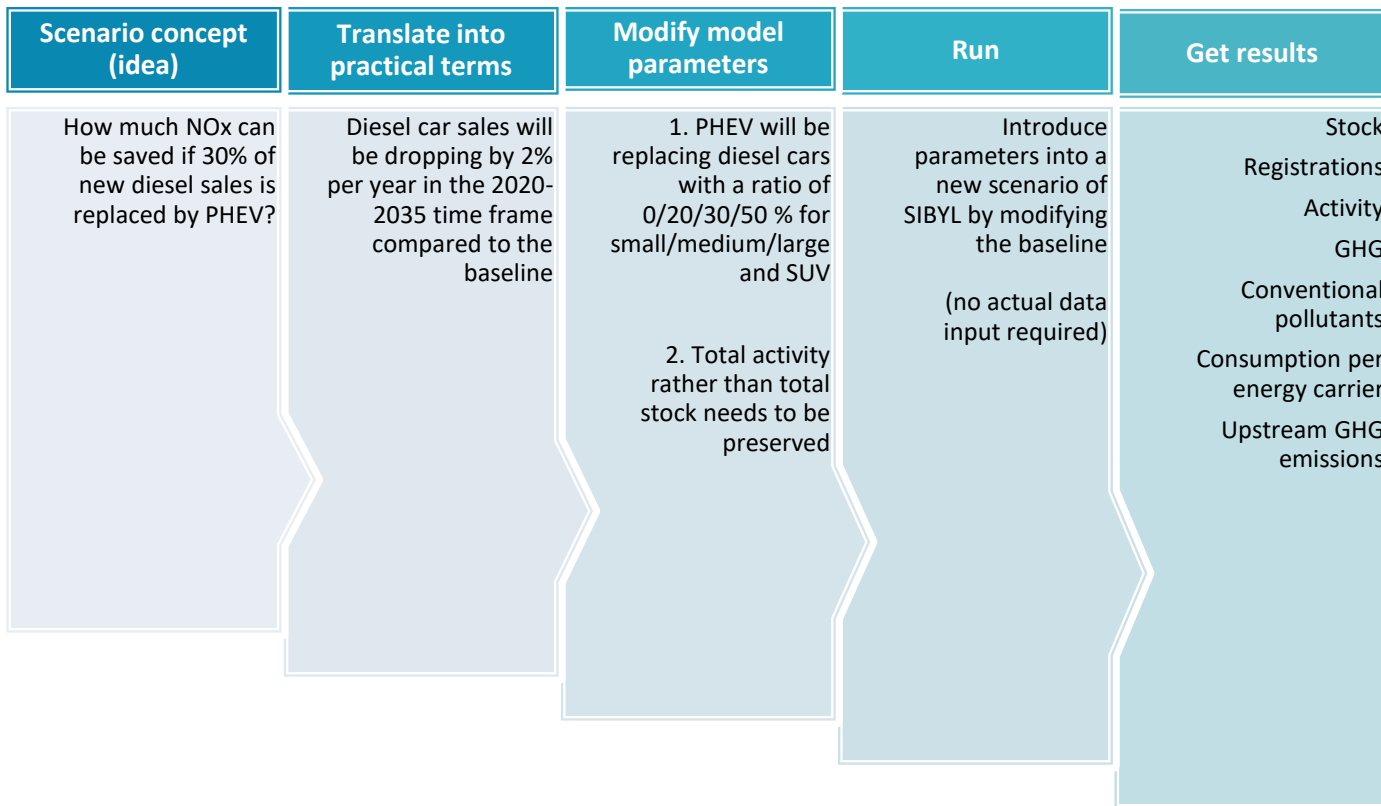
Scenario Execution





- Sibyl contains a consolidated baseline and provides an interface and method to develop relevant scenarios
- Baseline included in full detail, based on pre-processed information
- Energy and emission factors for conventional types based on COPERT

From an idea to practical results



A glimpse into a possible future



A possible development

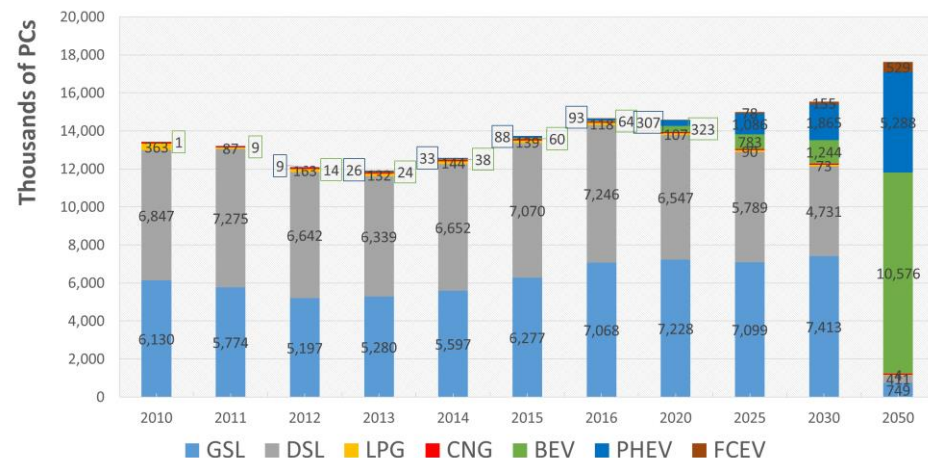
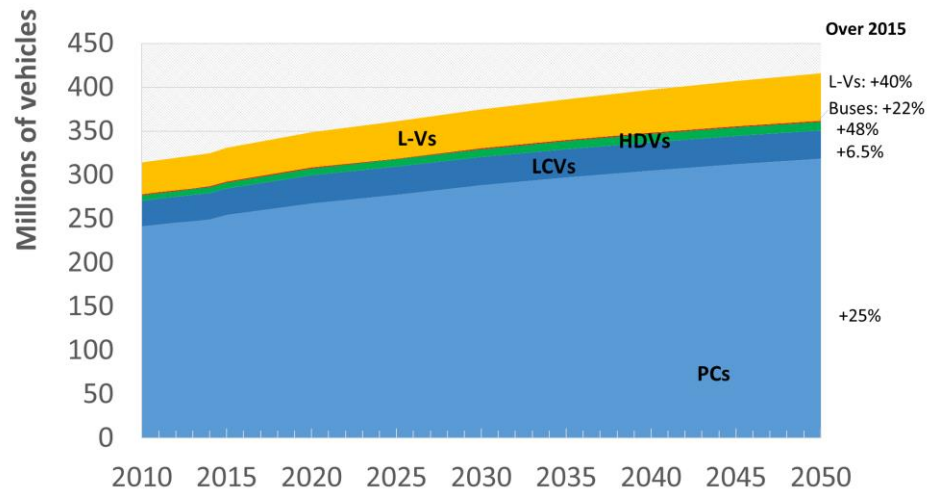
- PRIMES Reference Scenario (REF 2015f) total activity trends are used to drive total fleet stock projections per sector
 - Assumption that future vehicles will be driven as much as today's ones. True?...

- EVs increase their share but not in a booming fashion:

Year	New Registrations (Mil. Vehs)	BEV	PHEV	Source for BEV, PHEV targets
2020	14.5	2%	2%	Pasaoglu, Slightly decarbonized scenario for EU15
2030	15.5	8%	12%	Perseverant scenario by ERTRAC (pessimistic)
2050	17.6	60%	30%	ERTRAC CO2 Integrated Approach Partly Electrified scenario, White Paper

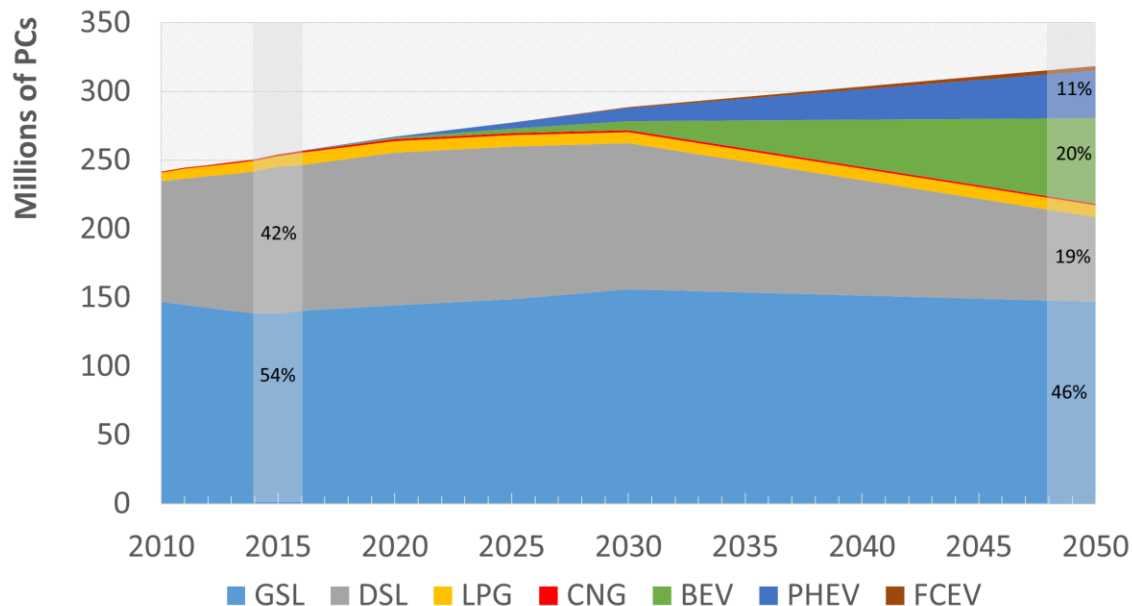
- FCEV 1% for 2030 and 3% for 2050, CNG fixed at 0.4%

Stock development and PC registrations



- Baseline scenario shows that total stock will constantly continue to grow to 2050. This is questionable
- Projected PCs sales structure follows input assumptions. 3m BEV+PHEV in 2030, increasing to >15m in 2050.

EU28 Passenger Cars Fleet Composition



- EVs seem to remain a small fraction in the medium-term future
- PC activity dominated by ICEs (~60%) to 2050

What would it take for a significant penetration of EVs in the parc?

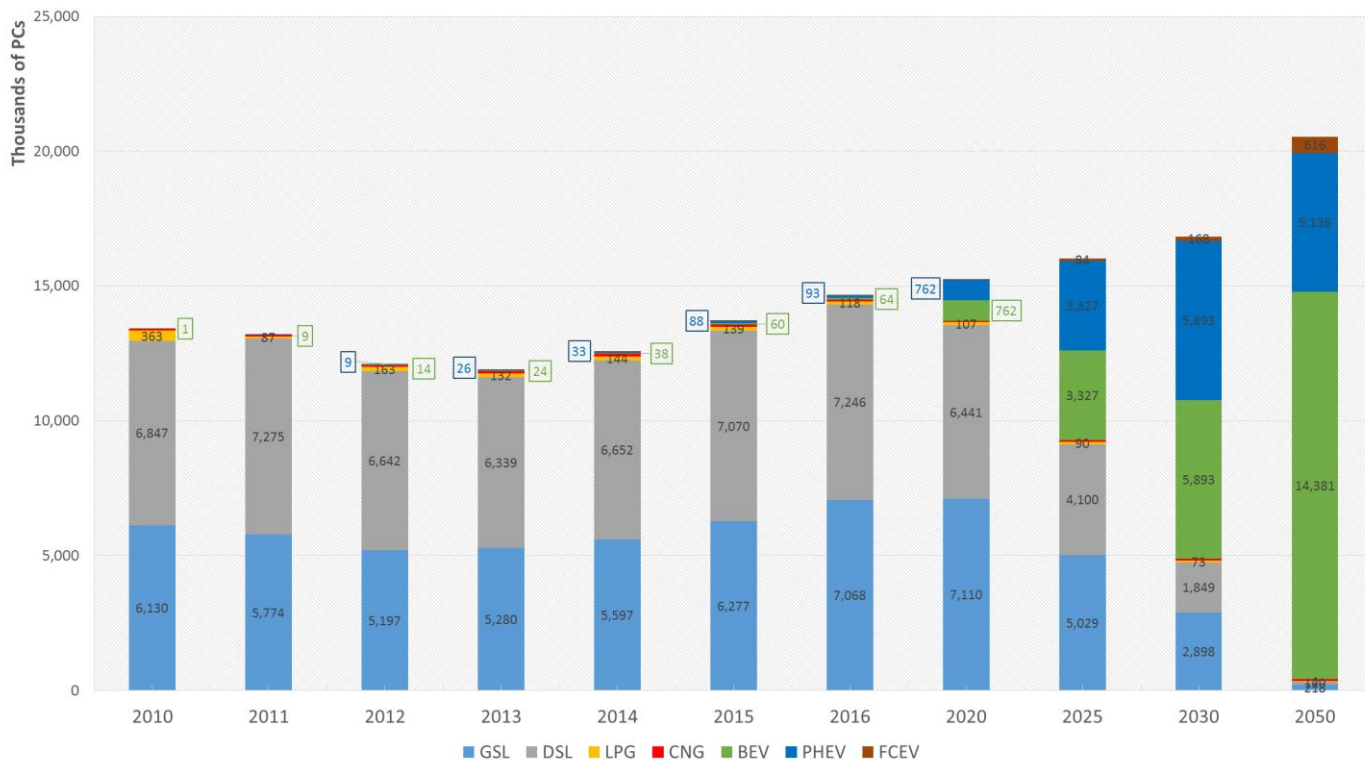
Aggressive scenario for EVs

Year	New Registrations (Mil. PCs)	BEV	PHEV	Was
2020	15.2	5%	5%	4%
2030	16.8	35%	35%	20%
2050	20.5	70%	25%	90%

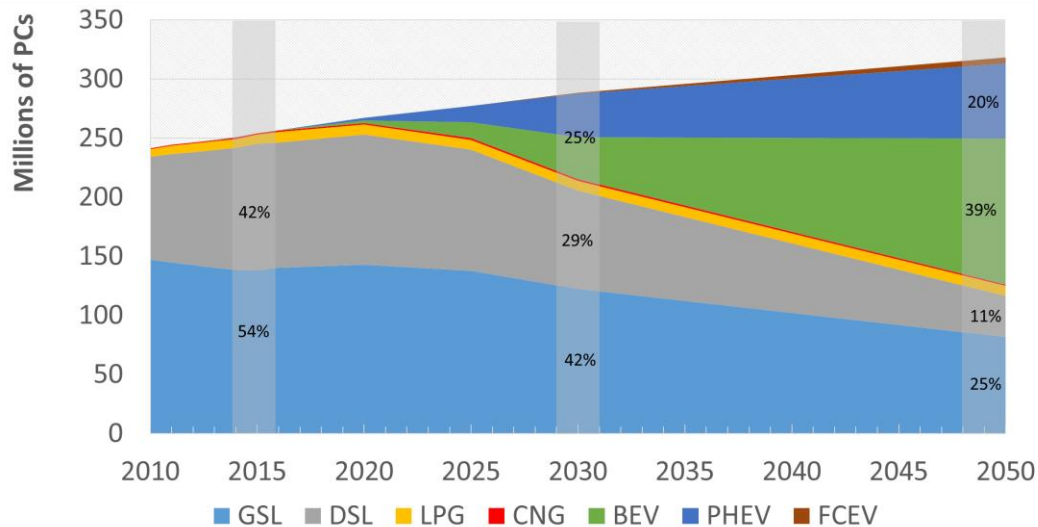


- Increased rate of total new registrations (1% per year increase over baseline)
- BEV/PHEV/FCEV lifetime increased (50% at 10 years for BEV/FCEV and 11 years for PHEVs)
- FCEV new registrations: 1% for 2030 and 3% for 2030
- CNG new registrations: 0.4% (fixed)

EU28 Passenger Cars NR Composition



EU28 Passenger Cars Fleet Composition



- Early and aggressive introduction of BEVs required to significantly penetrate the fleet (in a mechanistic scenario)
- Aspirational future CO₂ targets may also have to consider a scenario where total activity (~stock) decreases instead of increasing

Thank you for the attention!

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New Registrations

ACEA as the main source for total new registrations and diesel share

Gap-filling from other sources: Eurostat, EC Statistical Pocket Book, CO₂ monitoring database

Alternative fuels from combination of ACEA, EAFO, CO₂ monitoring database

Petrol = Total - diesel – Alternative fuels

Cross-checking between various sources

New registrations
2010-2016

Total stock

Eurostat as the main source for total stock and a first estimation of petrol/diesel share

Gap-filling from other sources: national statistics, EC Statistical Pocket Book, ANFAC Vehicle Parc, TRACCS, interpolation and estimates only if needed

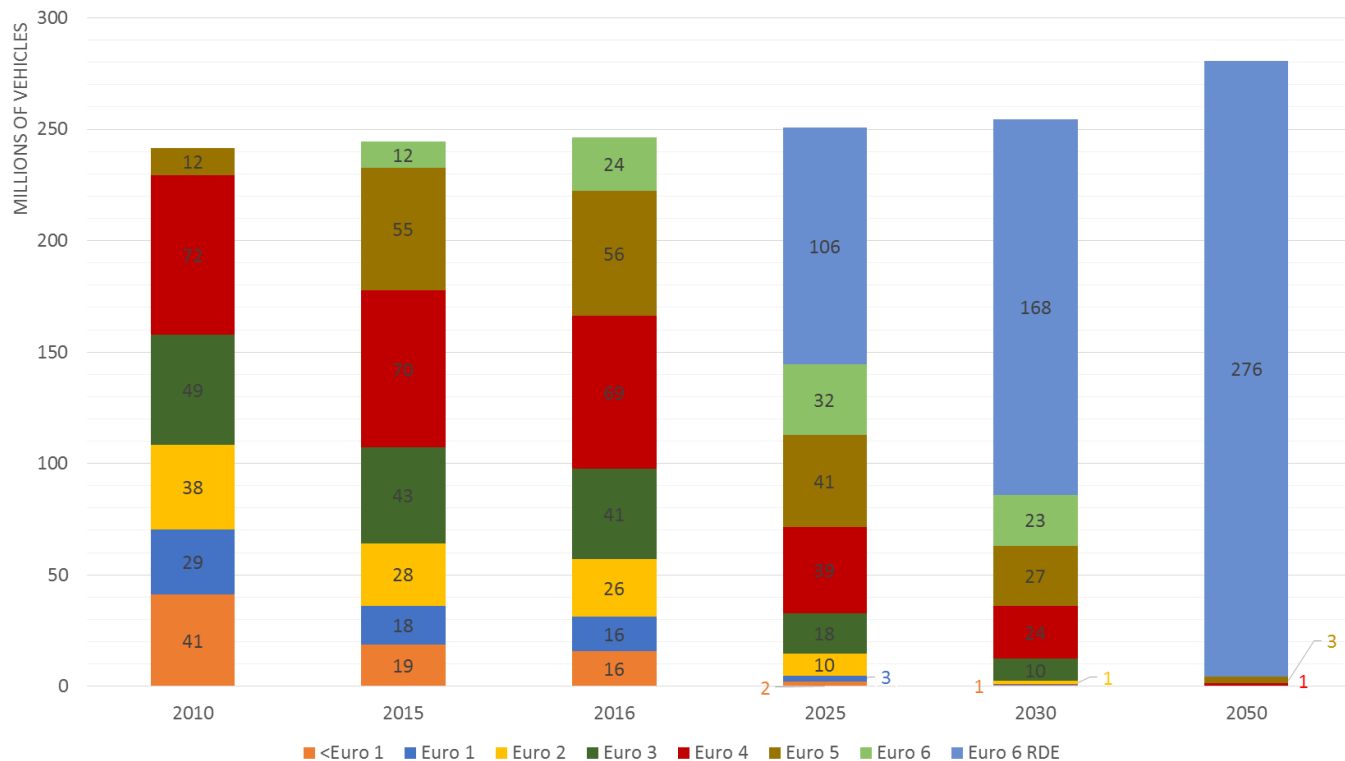
Alternative fuels from combination of Eurostat, EAFO, NGVA Europe, NGV Global, estimates based on new registrations for hybrids and pure electric

Micro-adjustments in first estimation of petrol/diesel so as to respect total stock value

Cross-checking between various sources

Stock of vehicles
2010-2015

EU28 Passenger Cars Technology Composition



Euro 6 RDE introduction is assumed, starting in 2017