

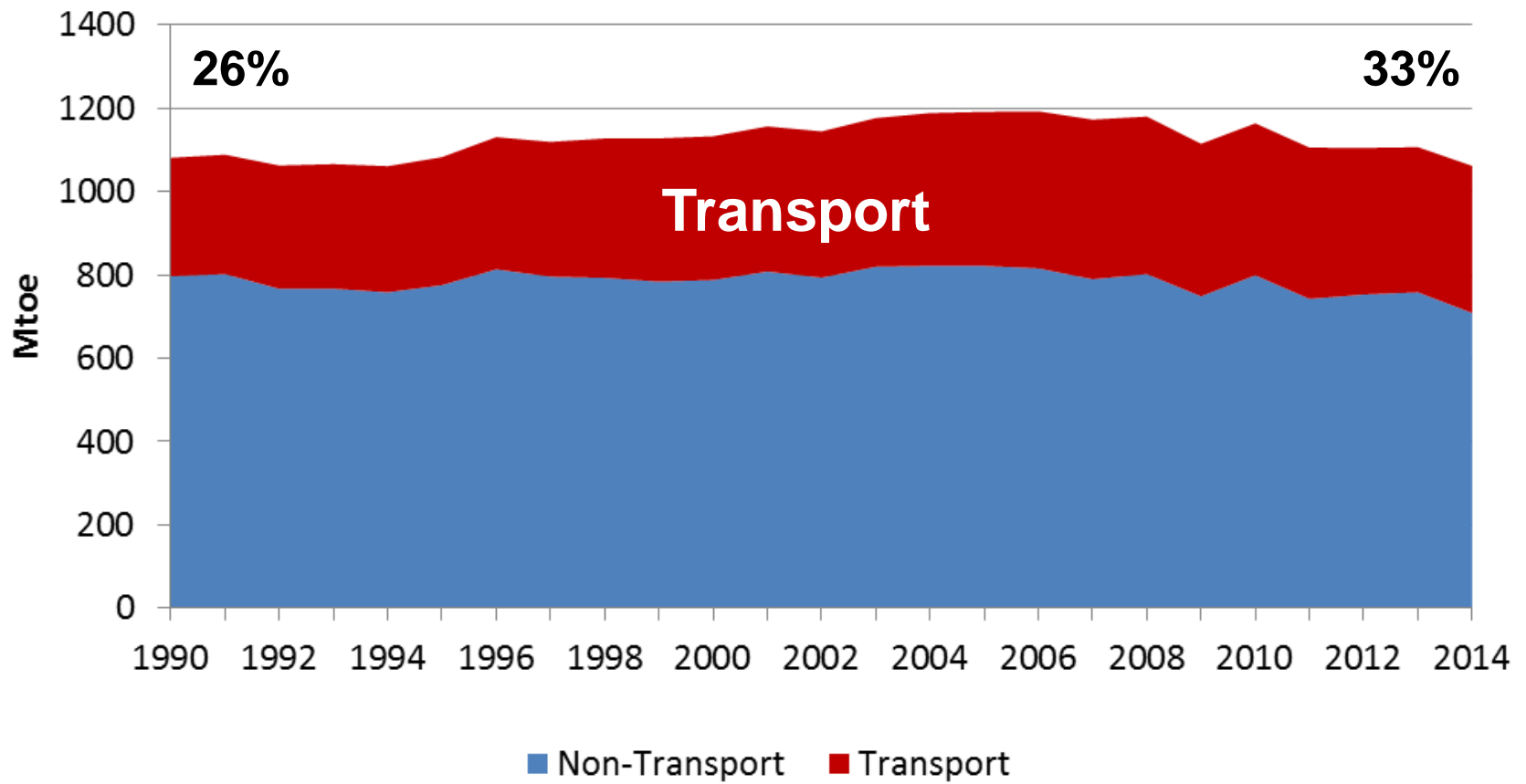
Challenges, possibilities and policies for reducing GHG emissions in transport

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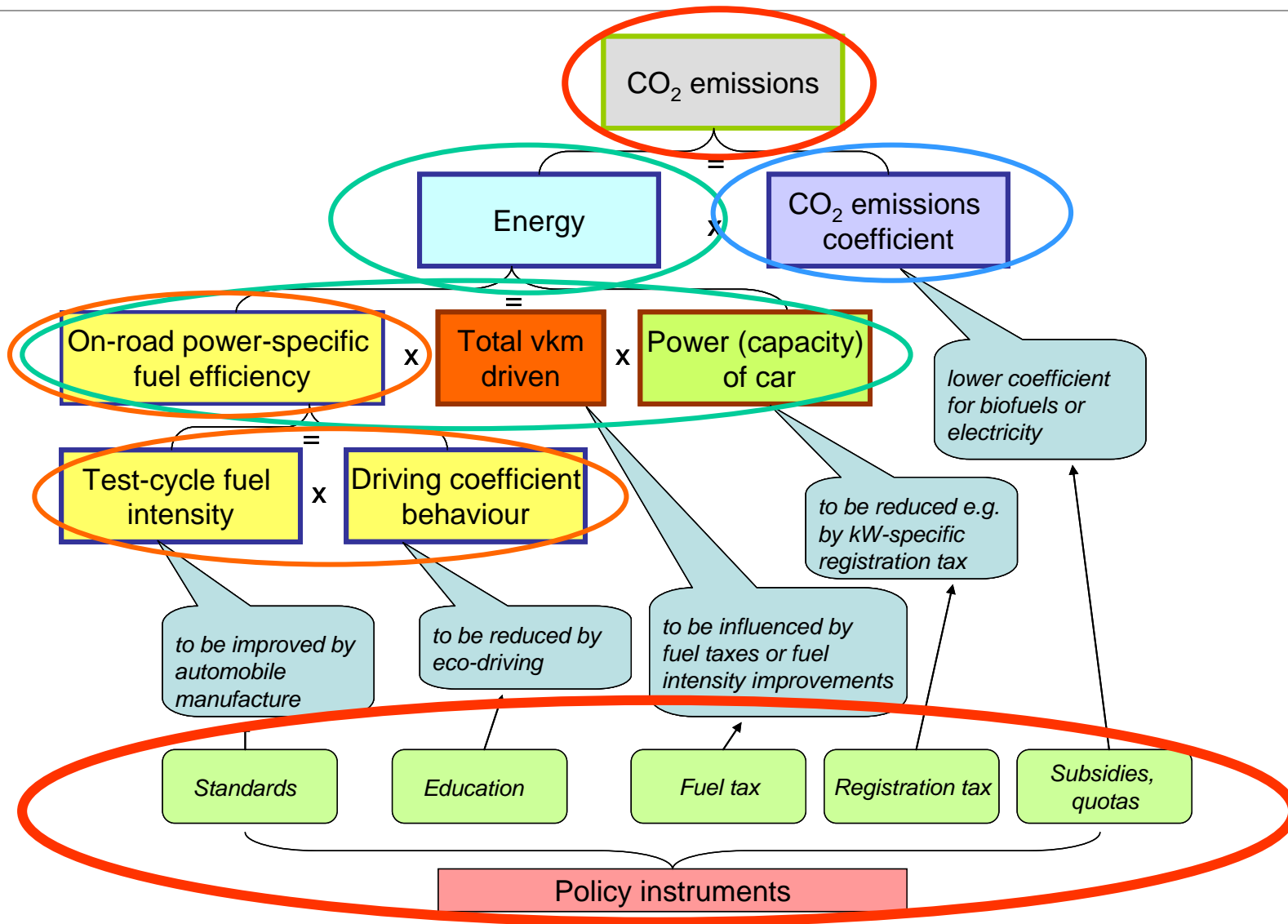
*CZ AT EEG, Prague,
8th November 2016*

- ✓ Introduction
- ✓ Policies
- ✓ Electric vehicles
 - Economic and environmental assessment
- ✓ Conclusions

EU-28: Final energy consumption



CO₂ emissions in passenger car transport



Impact factors on CO₂ emissions in the car passenger transport sector

2008

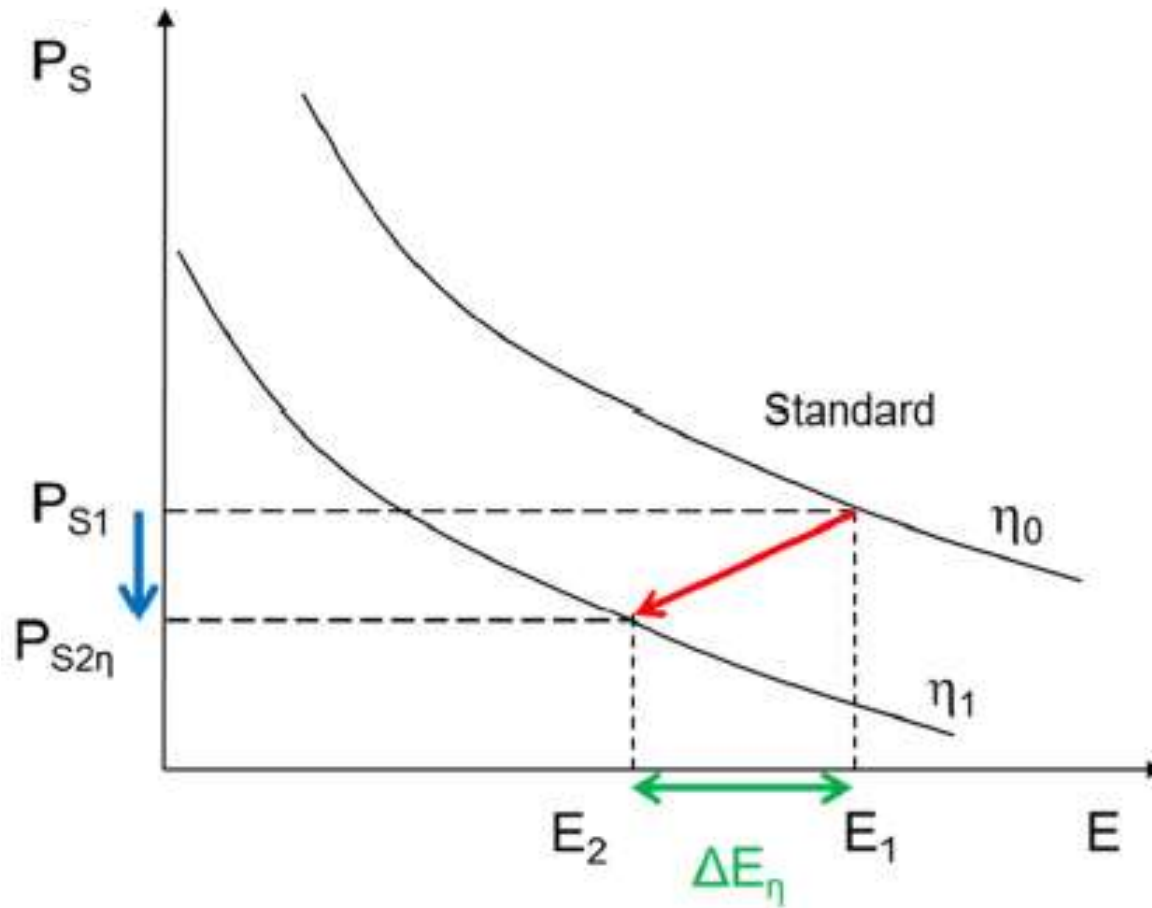
- The voluntary commitments undertaken by the European (ACEA), Japanese (JAMA) and Korean (KAMA) car manufacturer associations relate to average new car emission targets of **140 gCO₂ /km** by 2008 (ACEA target) or by 2009 (JAMA and KAMA target).

2015

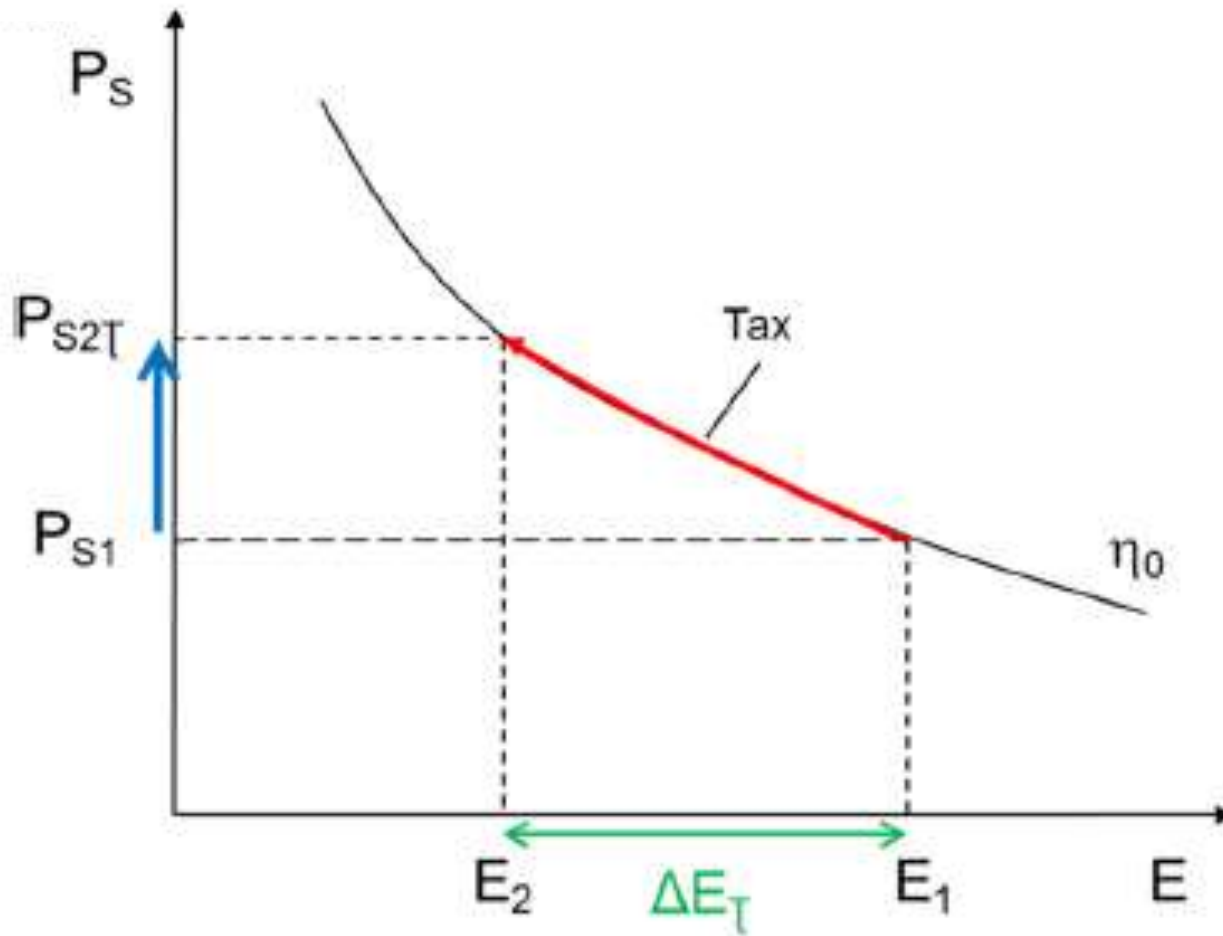
- The first mandatory CO₂ emissions standards for passenger cars in the EU – **130 g CO₂/km** by 2015

2020

- Mandatory target – **95 gCO₂/km** for 2020

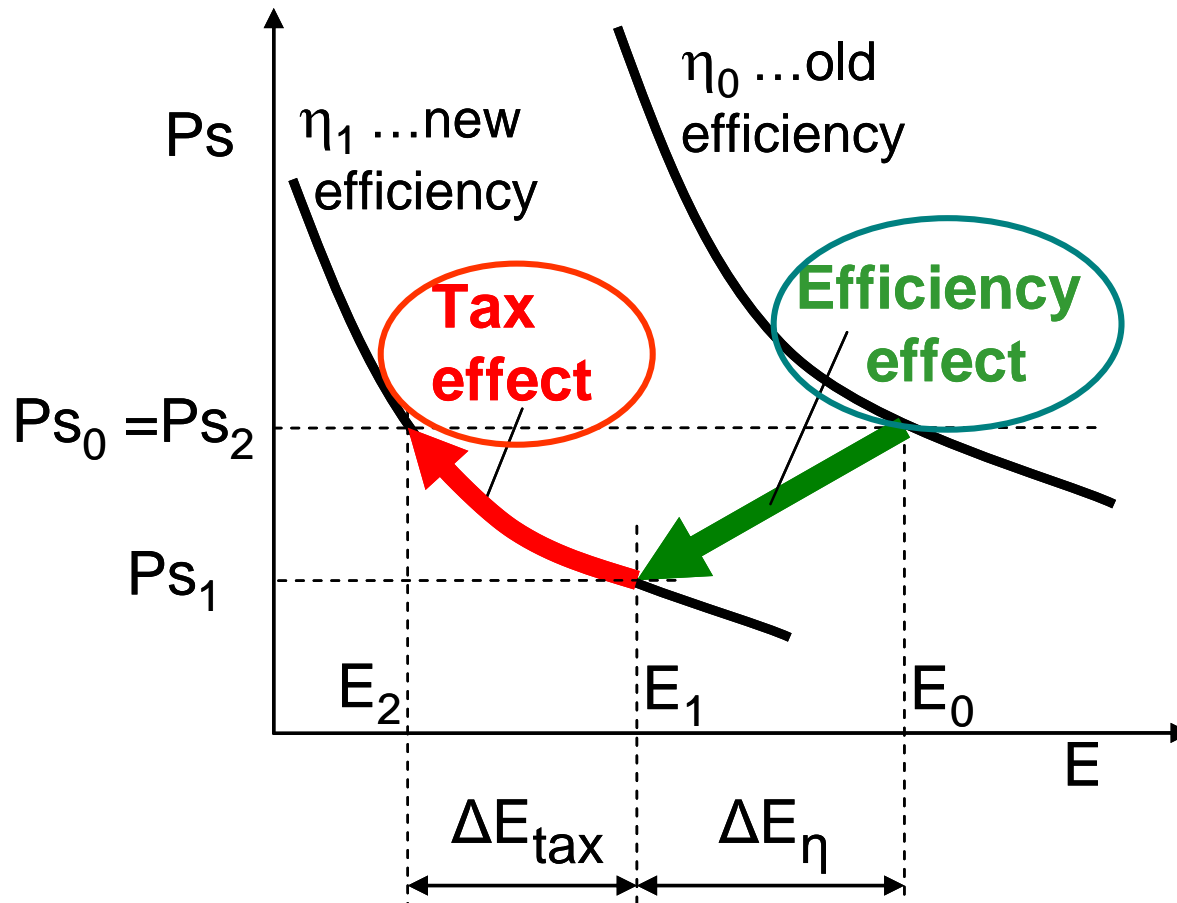


How a standard works

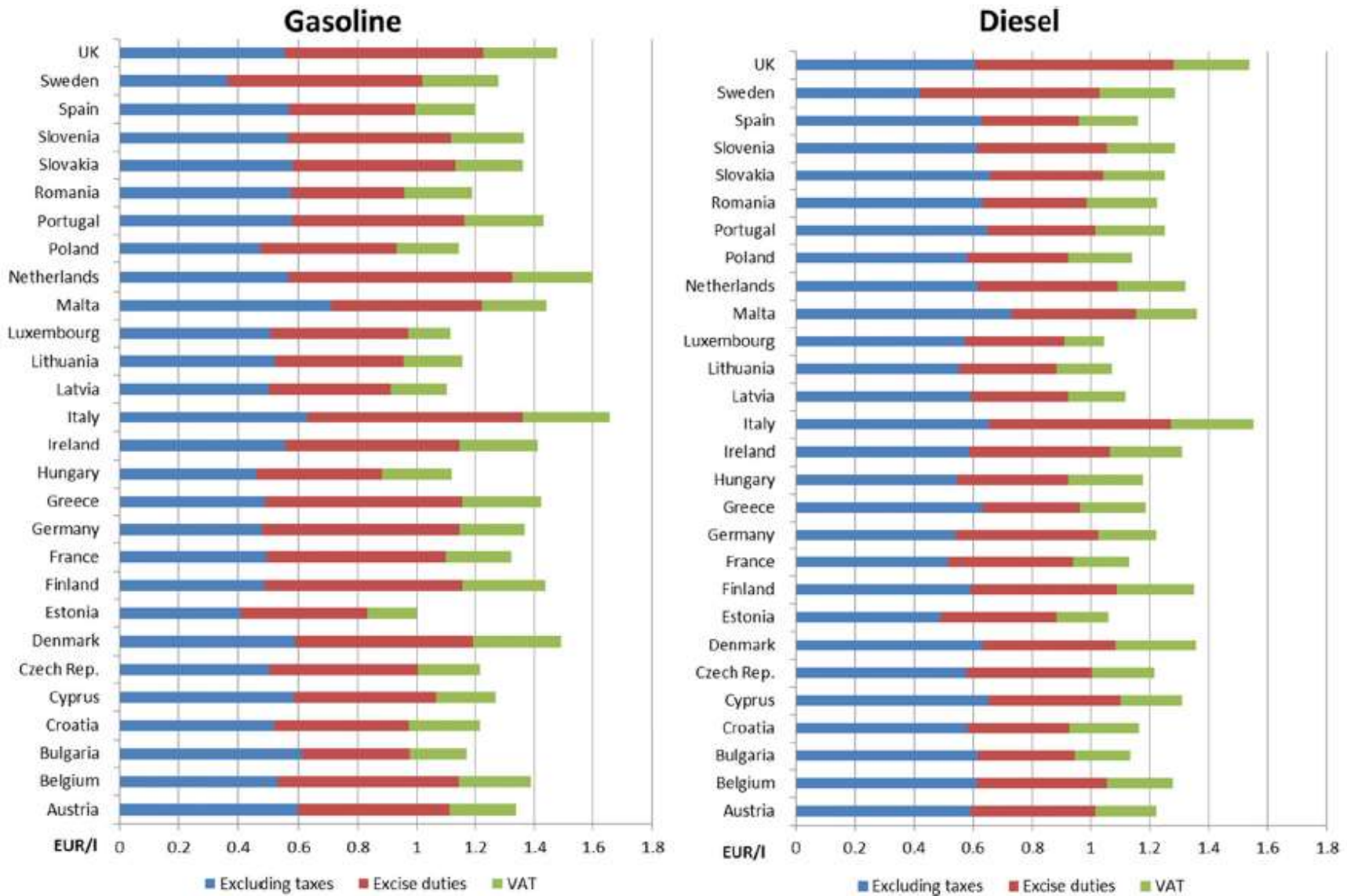


How a tax works

Standards & taxes



How taxes and standards interact and how they can be implemented in a combined optimal way for society

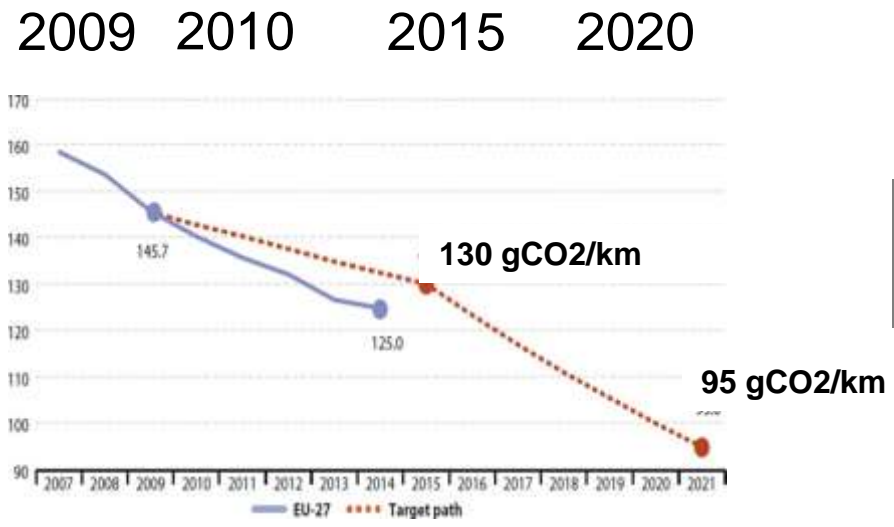
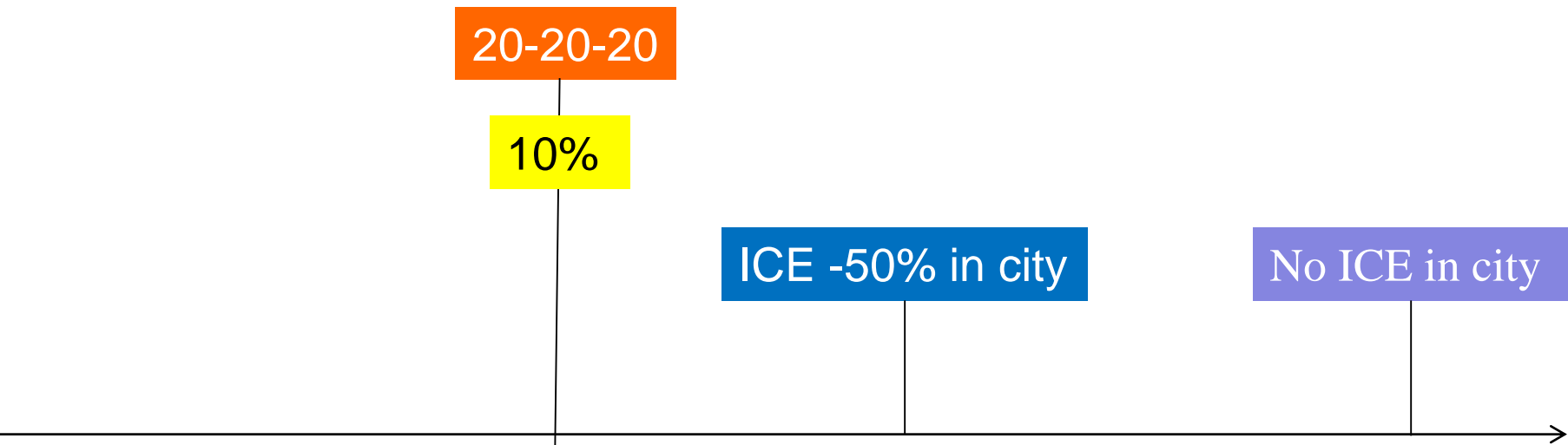


Registration tax based on:

CO ₂ emissions	Austria, Cyprus, Spain, France, Ireland, Lithuania, Malta
Car price + CO ₂ emissions	Finland, Hungary, Croatia, Netherlands, Slovenia
Cylinder capacity	Belgium, Greece, Hungary, Poland, Portugal, Romania
Kilowatt/weight/seats	Italy, Slovakia
None	Bulgaria, Czech Republic, Germany, Estonia, Luxembourg, Sweden, United Kingdom

Ownership tax based on:

Fuel consumption	Denmark
Weight	Lithuania, Denmark, Sweden
CO ₂ emissions	Cyprus, Germany, Italy, Croatia, Ireland, Luxemburg, Sweden, United Kingdom
Power (horsepower; kilowatt)	Spain; Austria, Bulgaria, Italy, Hungary
Cylinder capacity	Belgium, Malta, Romania, Slovenia, United Kingdom
None	Czech Republic, Estonia, France, Lithuania, Poland, Slovakia



20% GHG
(2008)

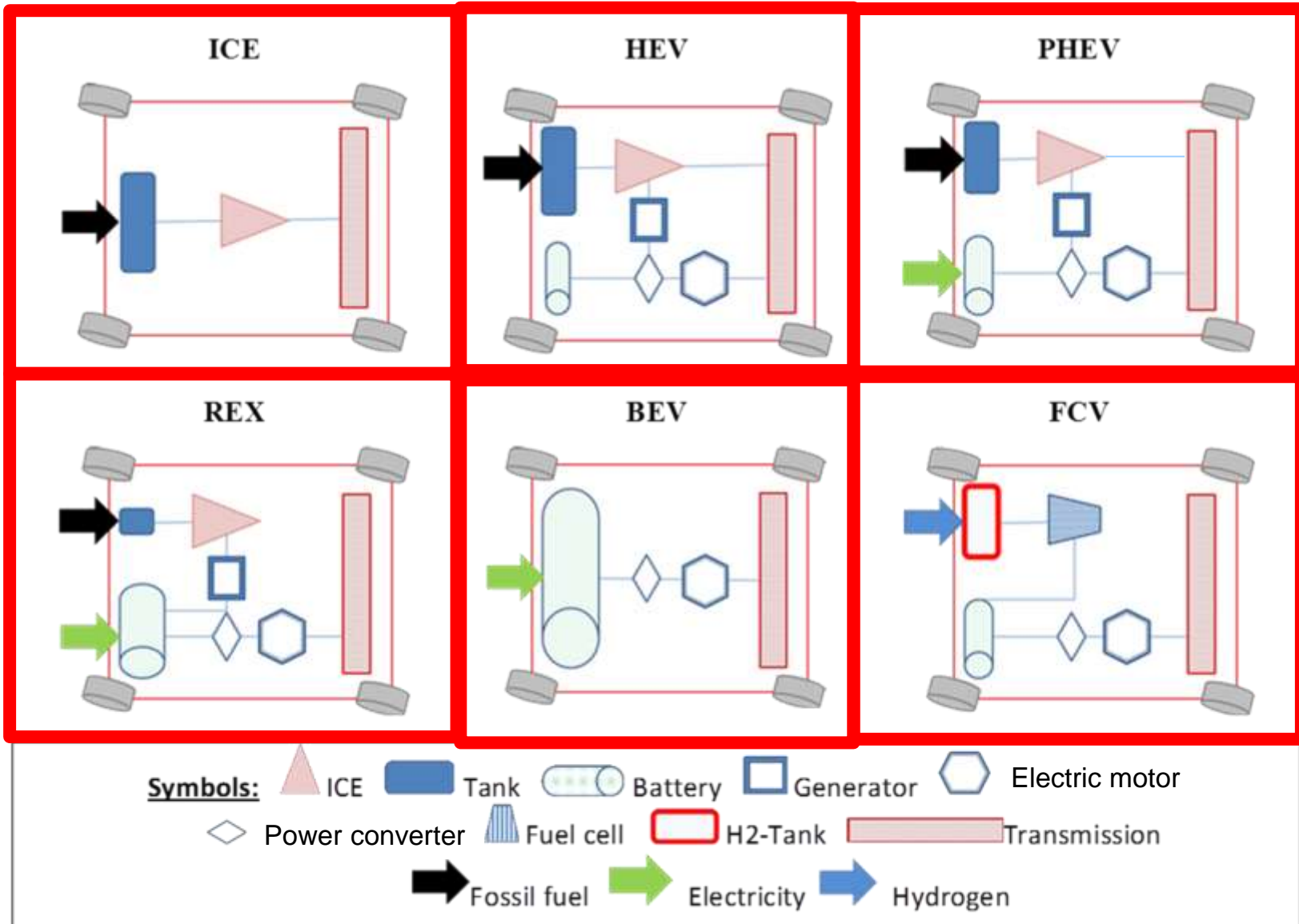
60% GHG
(1990)

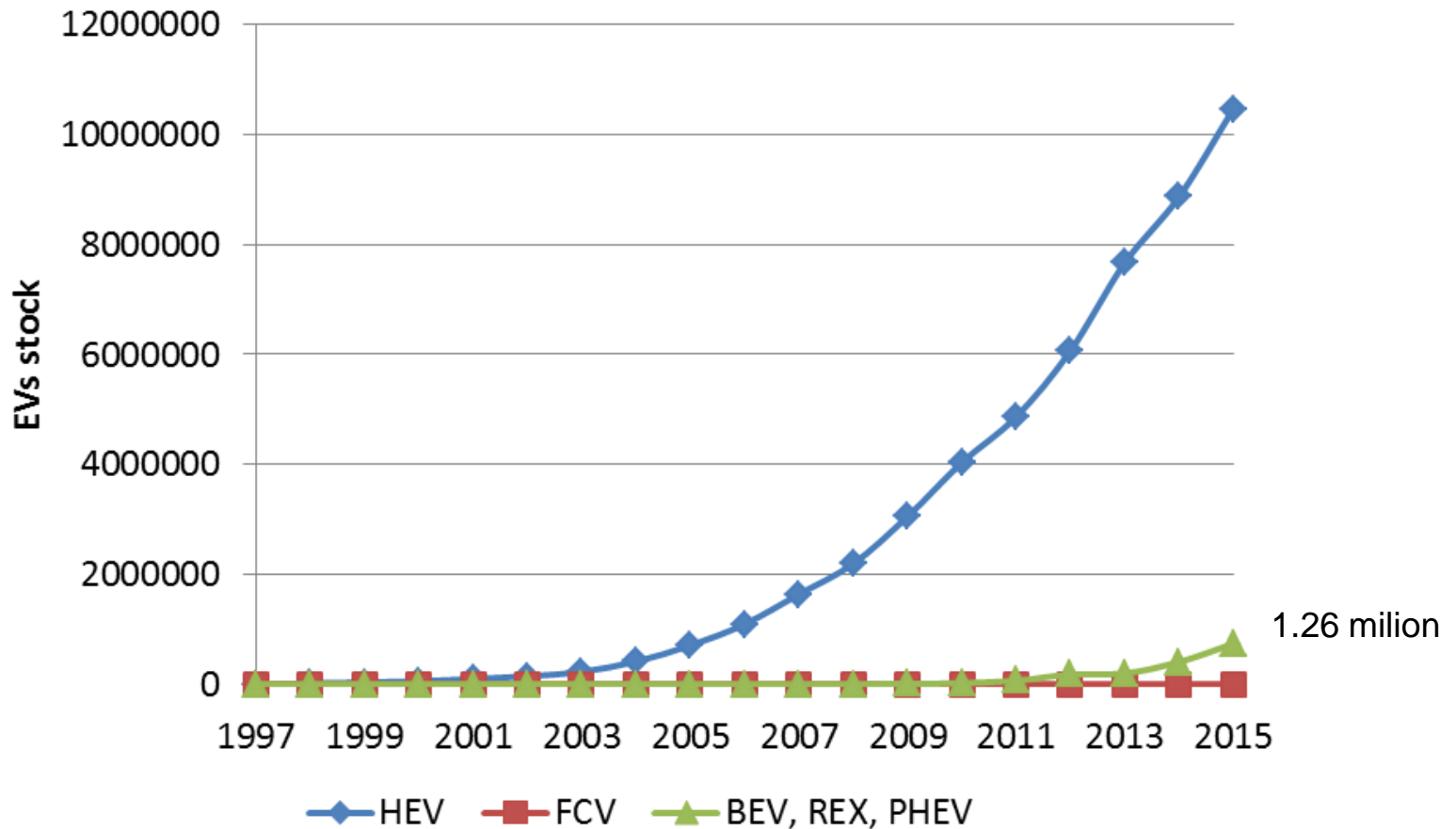
The White Paper on Transport Policy

Targets and average CO₂ emissions from new passenger cars in EU countries

Paris Declaration on Electro-Mobility and Climate Change & Call to Action:

- more than 100 million EVs
- 400 million two and three-wheelers





Development of the global stock of EVs

The costs per km driven C_{km} are calculated as:

$$C_{km} = \frac{IC \cdot \alpha}{skm} + P_f \cdot FI + \frac{C_{O\&M}}{skm} \quad [€/100 \text{ km driven}]$$

IC.....investment costs [€/car]

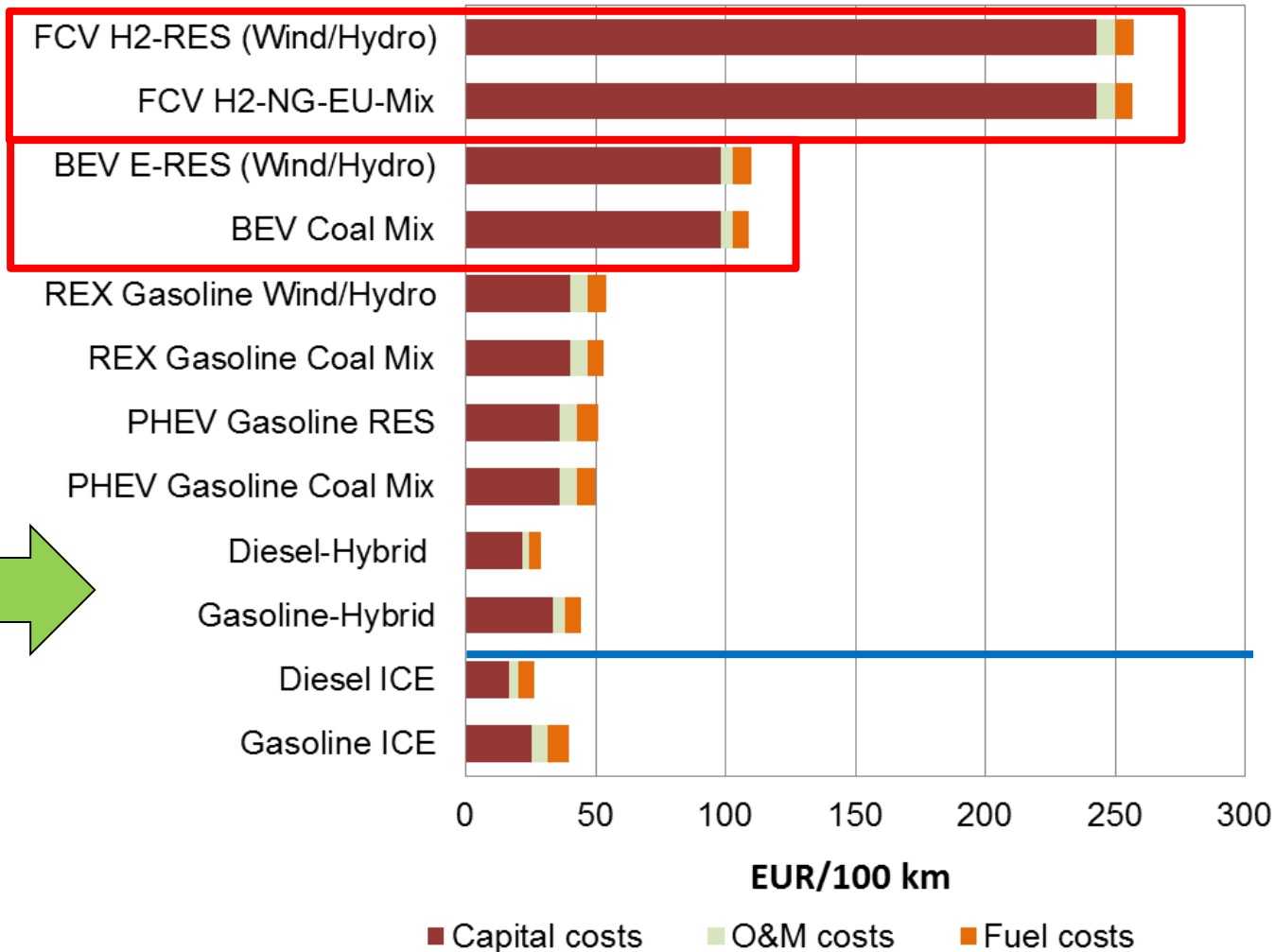
αcapital recovery factor

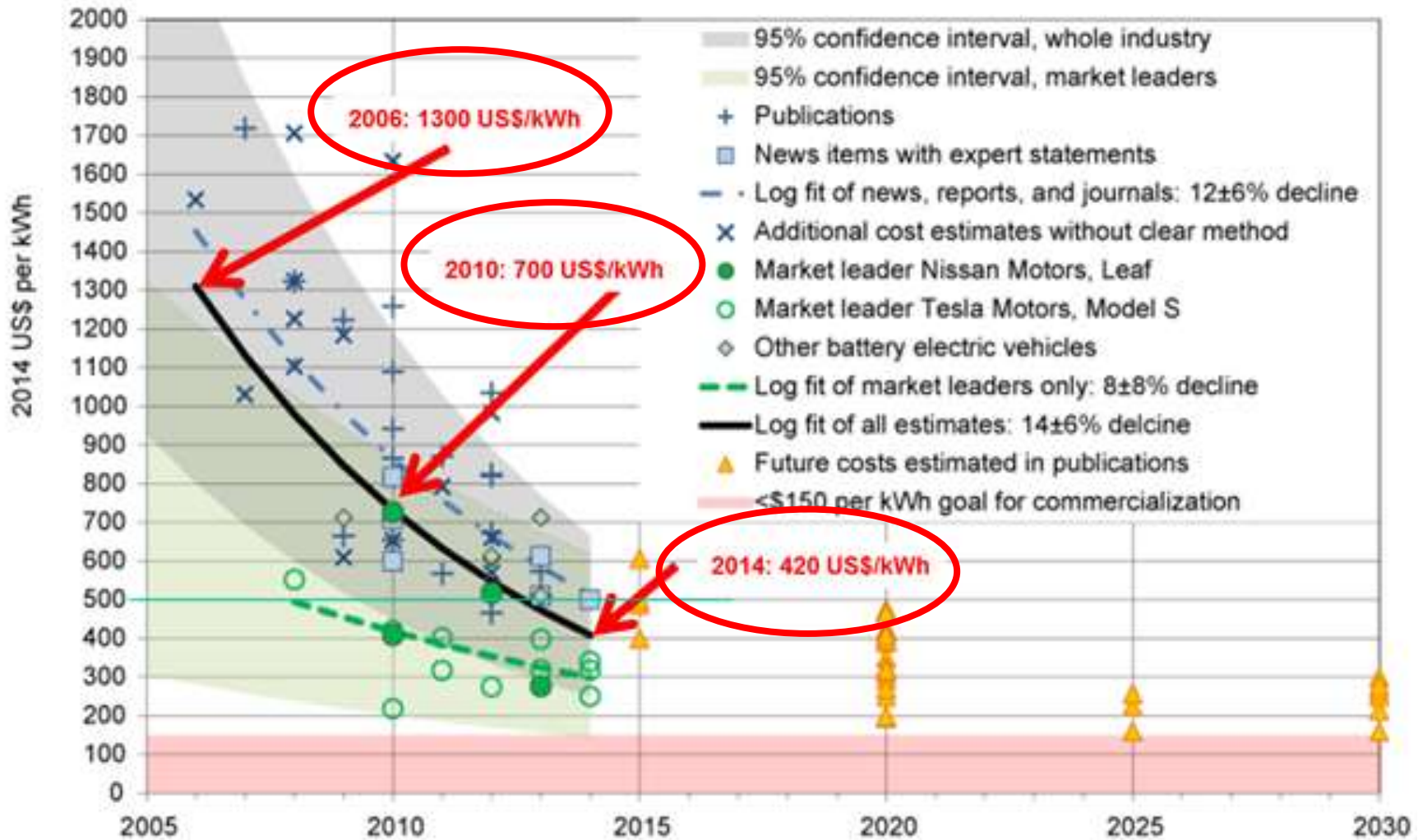
skm.....specific km driven per car per year [km/(car.yr)]

P_ffuel price incl. taxes [€/litre]

$C_{O\&M}$...operating and maintenance costs

FI.....fuel intensity [litre/100 km]



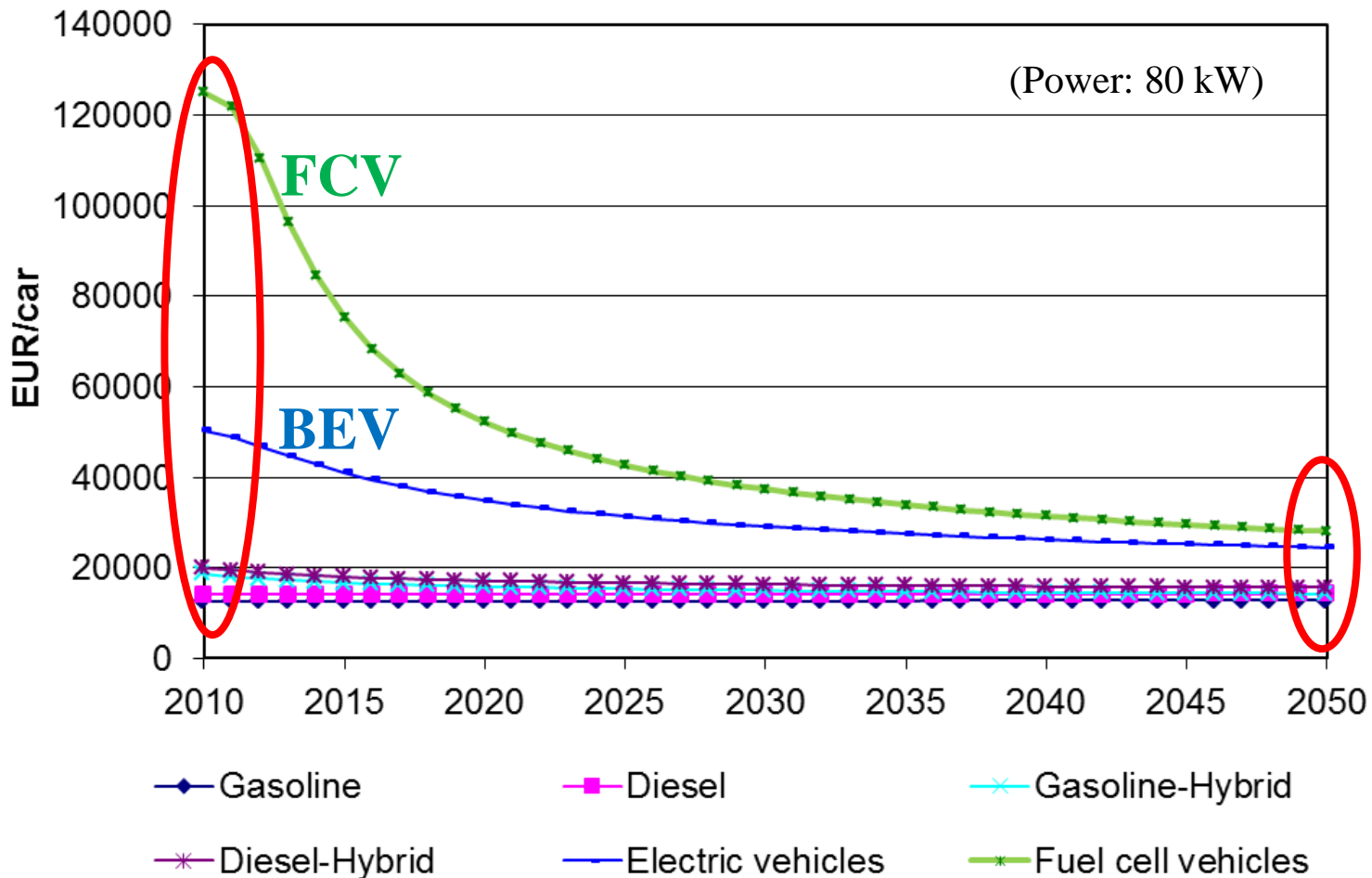


Scenario for development of investment costs

Technological learning:

$$C_t(x) = a \cdot x_t^{-b}$$

a.....specific costs of the first unit
 b.....learning rate
 xcumulative (unit) production

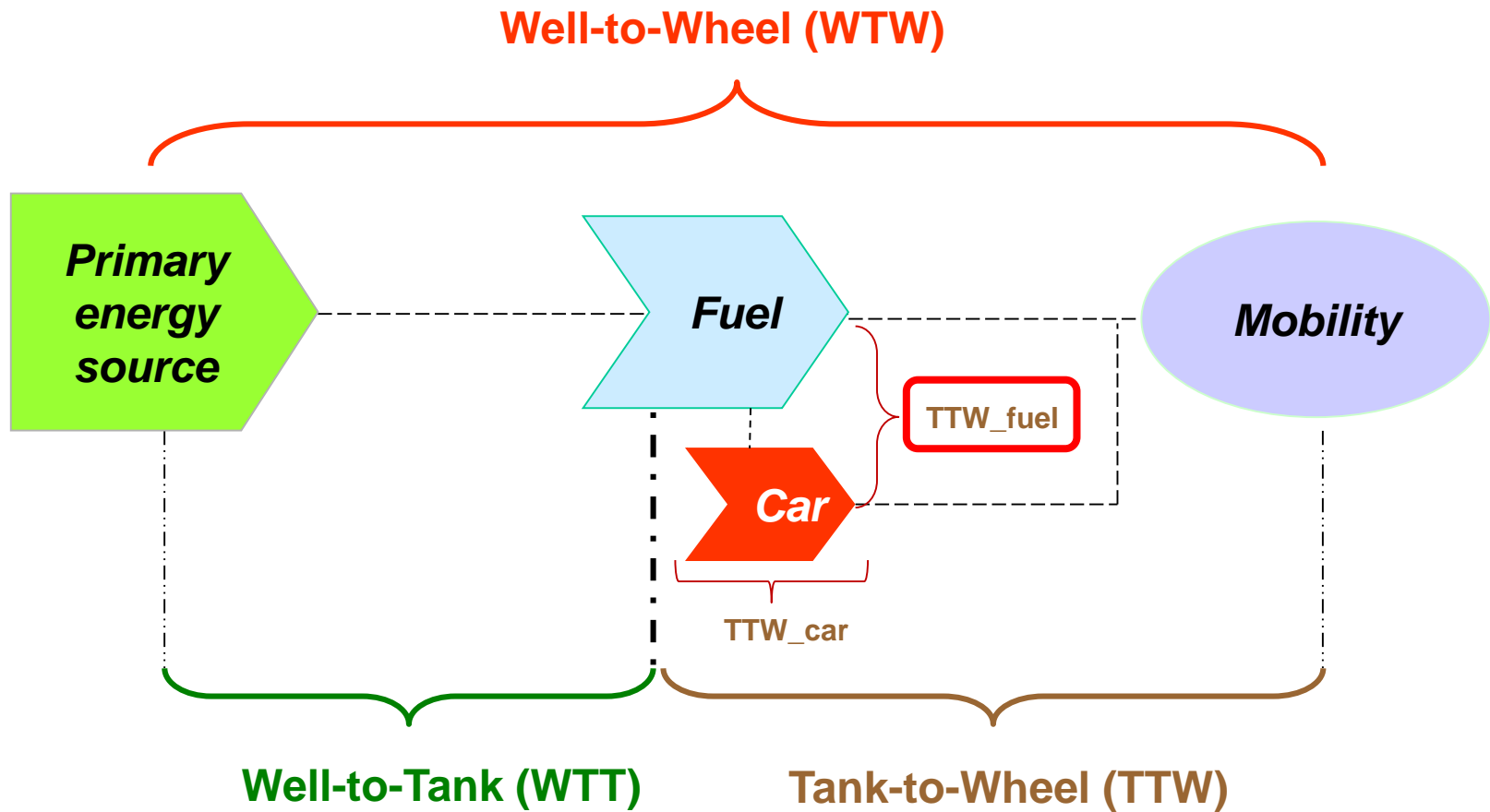


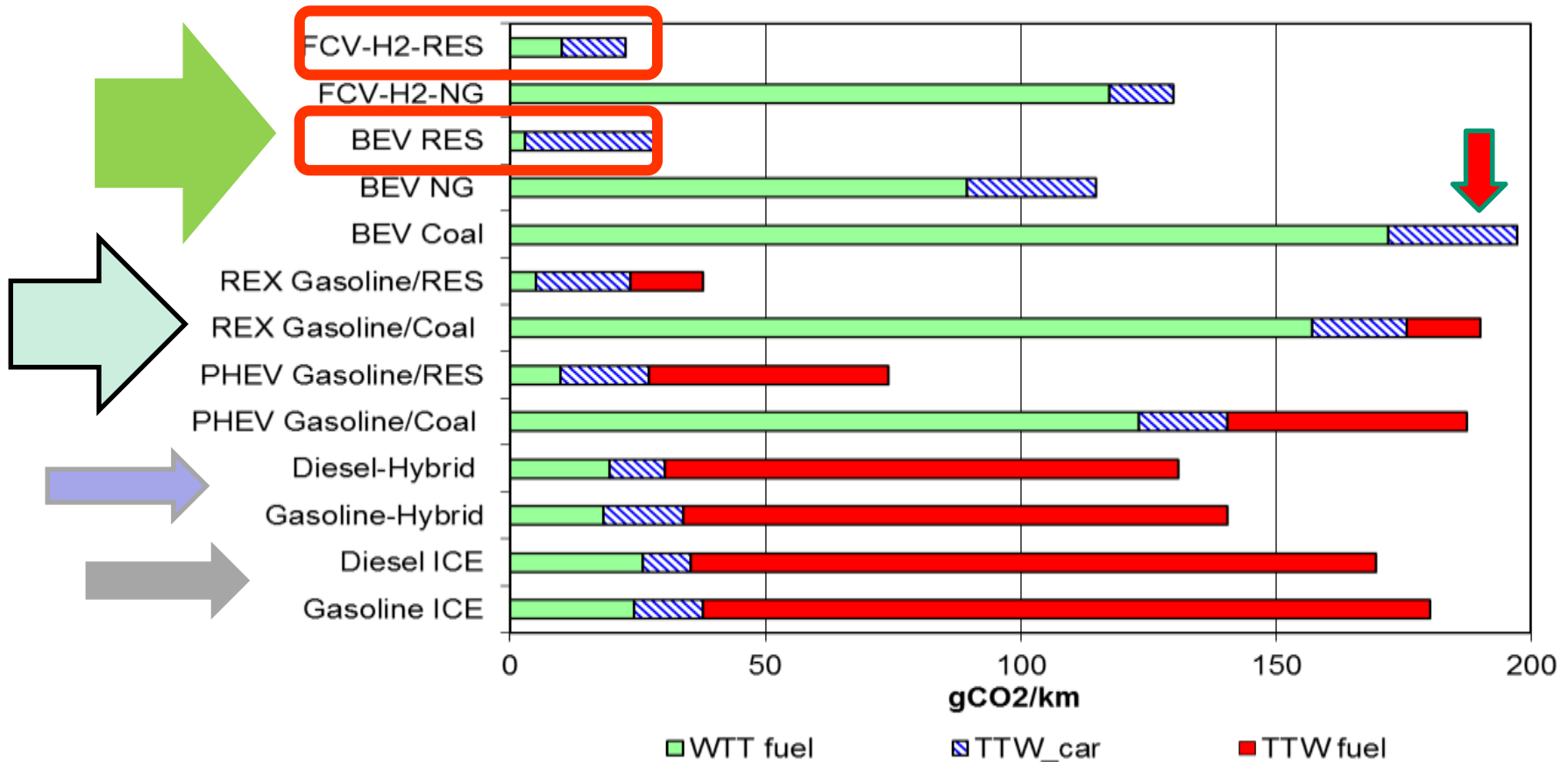
In Europe, the most commonly used monetary measures are subsidies and exemptions (or reductions) from:

- road taxes (e.g., in DE, DK, CZ)
- annual circulation tax (e.g., in DE, GR, NO, SE, UK)
- company car tax (e.g., in FR, UK)
- registration tax (e.g., in NO, BE, DE, FI, NL)
- fuel consumption tax (e.g., in AT)
- congestion charges (e.g., in NO, SE, UK)

The most important non-monetary measures are:

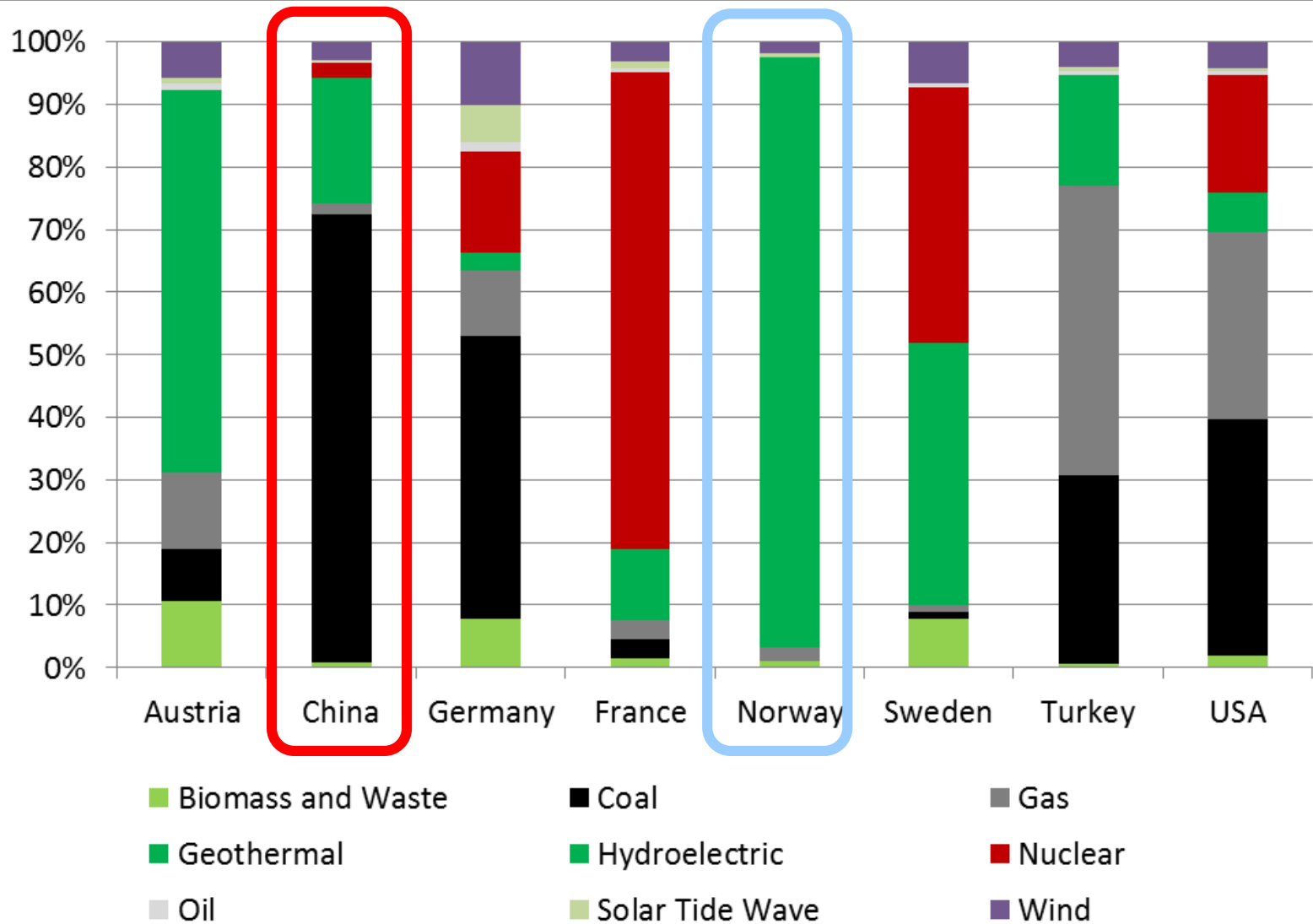
- free parking spaces,
- possibility for EVs drivers to use bus lanes,
- wide availability of charging stations,
- permission for EVs to enter city centers and zero emission zones.





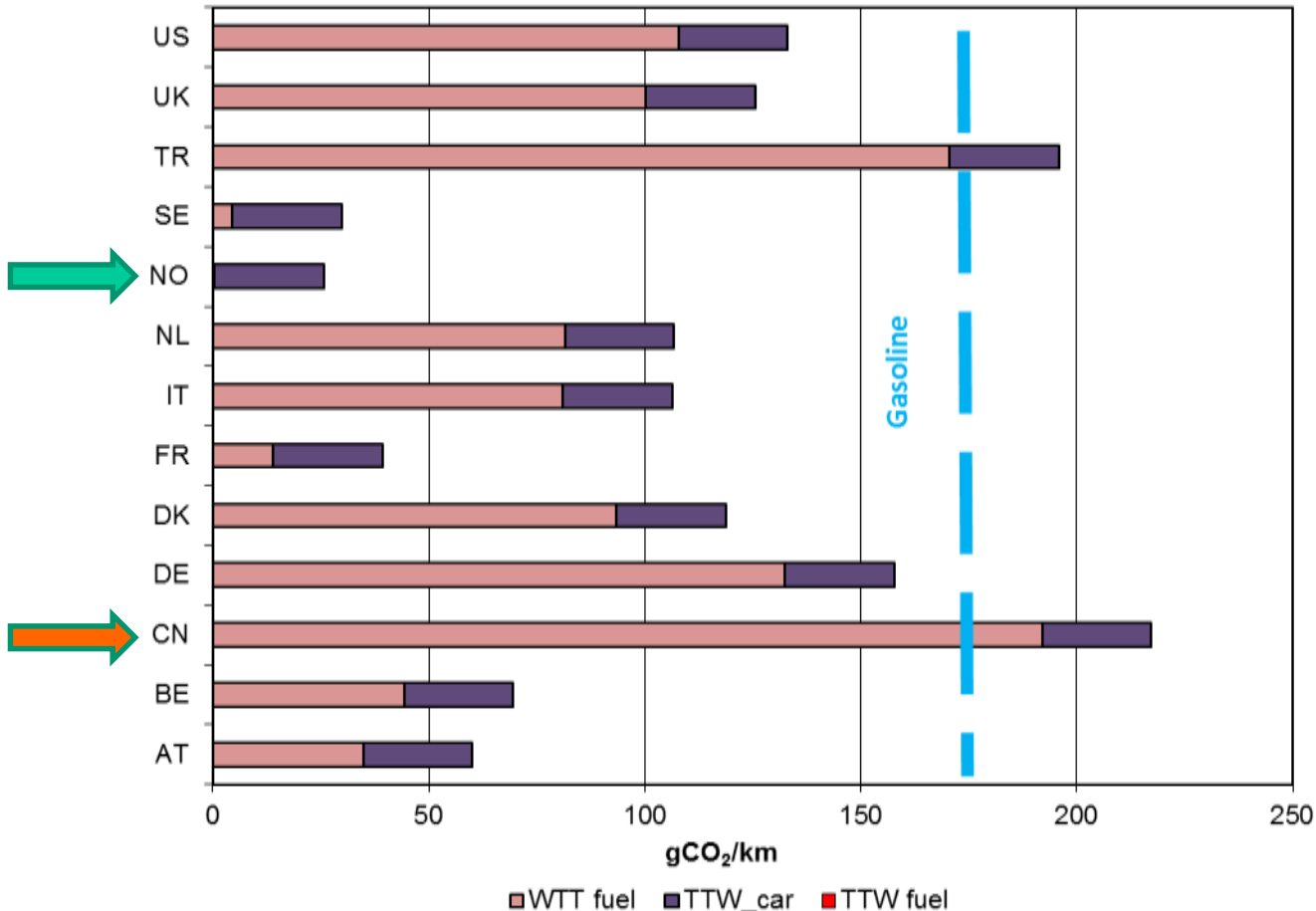
CO₂ emissions per km driven for various types of EV in comparison to conventional cars (power of car: 80kW)

Electricity mix (2014)

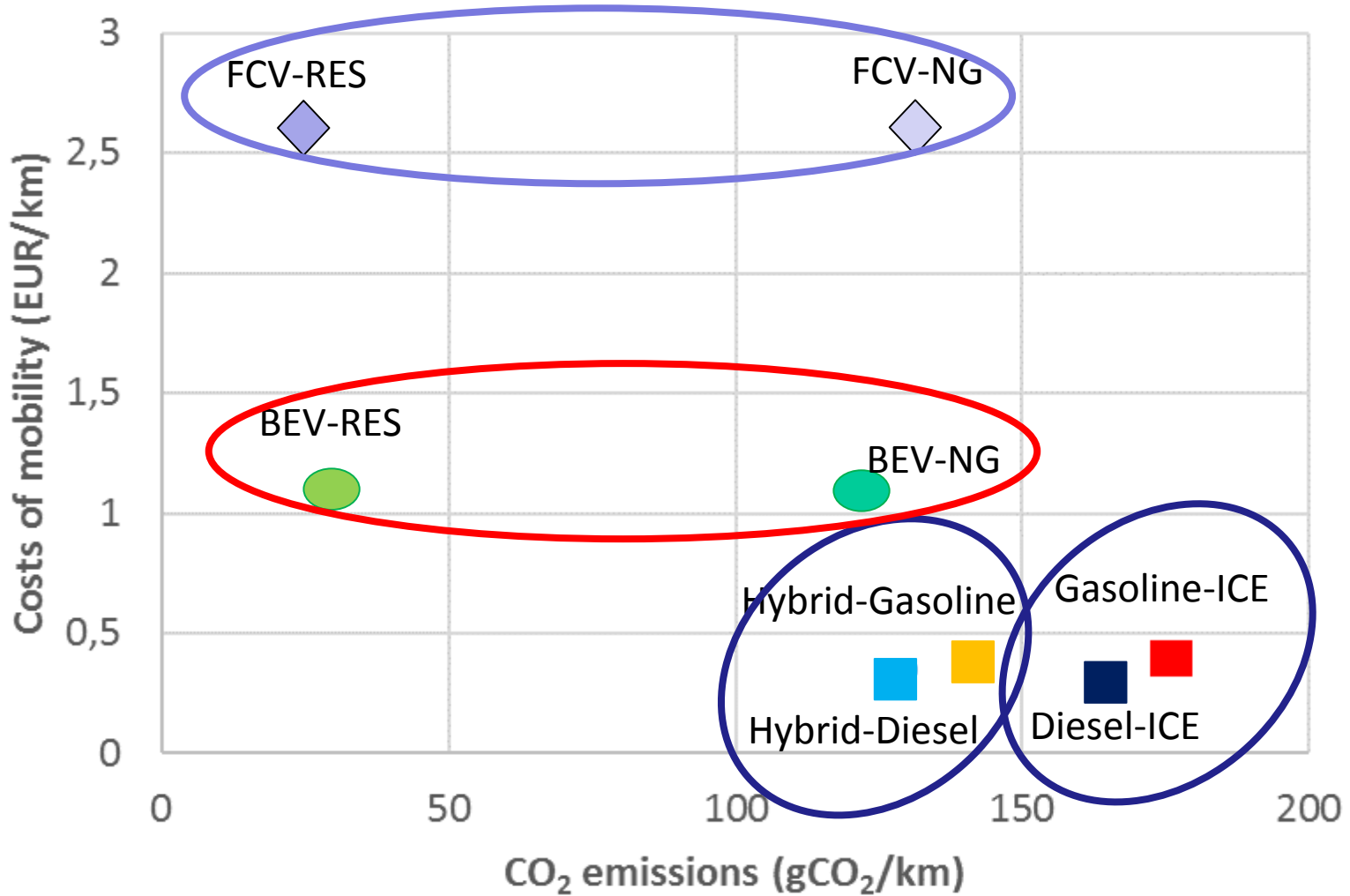


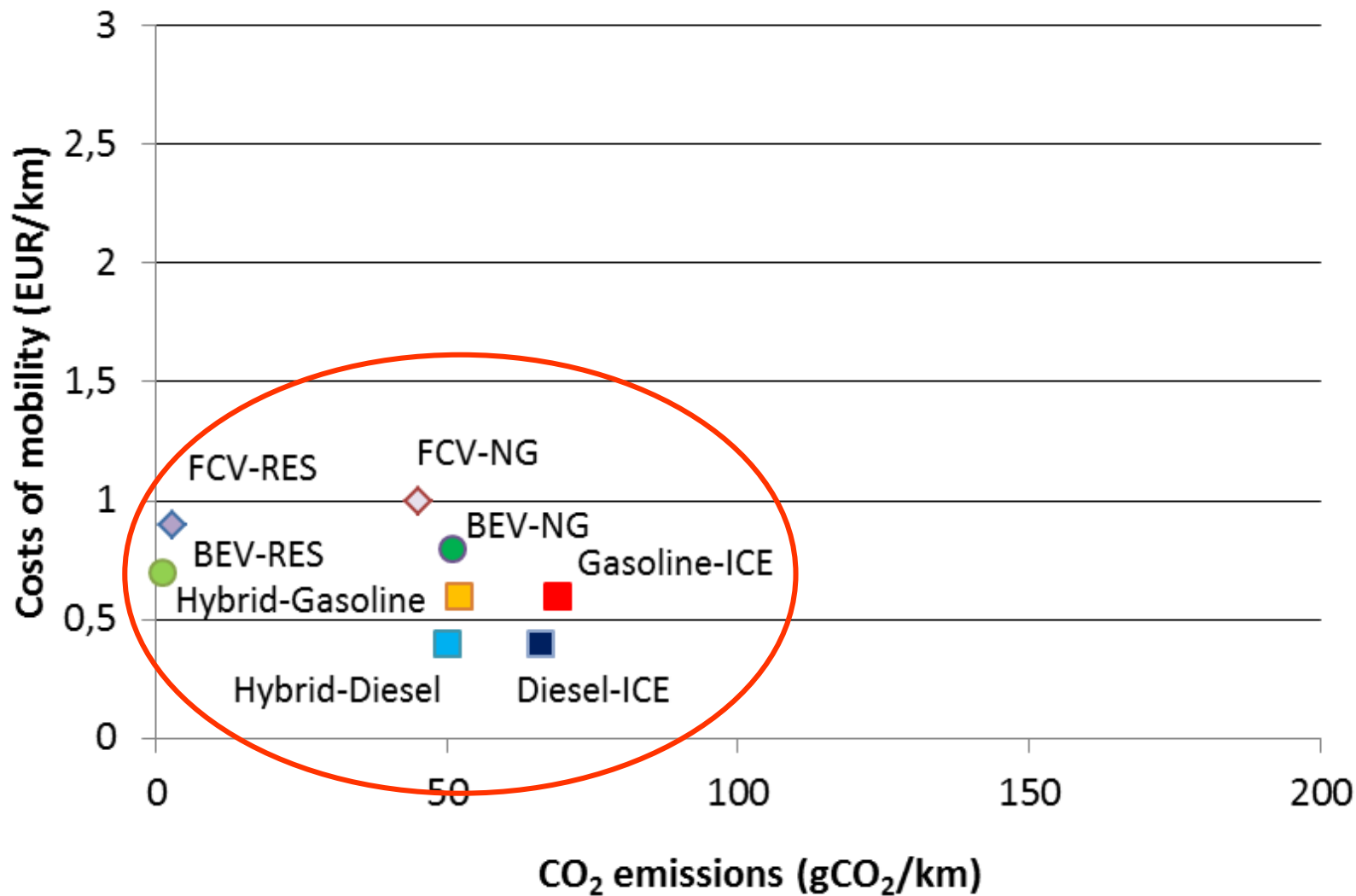
Electricity-specific factors

	Electricity-specific factors (gCO ₂ /kWh)
Austria	176.80
Belgium	224.77
China	974.62
Germany	672.22
Denmark	474.75
France	70.93
Italy	410.90
Netherlands	413.30
Norway	2.24
Sweden	23.03
Turkey	865.66
United States	574.09



CO₂ emissions per km driven for BEVs powered by grid electricity in different countries





- Policy instruments...harmonisations
- Electric vehicles ...cost reductions, improvement of battery characteristics as well as development of infrastructure
- New policy design....most of the policies implemented will be abolished with the increasing number of EVs
- The final goal is not just to increase number of EVs, the goal is to reduce GHG emissions and air pollution
- To harvest the full benefits of rechargeable EVs – electricity generated from renewable energy sources

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