EU Fleet Consumption Regulation undermines Climate Protection

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Introduction to Büro Ö-quadrat

- Boutique consulting office founded in 1999 in Freiburg, Germany
- Ö-quadrat ($Ö^2$) = ökonomische' (economic) + 'ökologische' (ecological) concepts

Information Media

spargeräte

Energy-Efficient Home Appliances Database

LED NAVI

LED Lamps Search APP

Tools / Methods

PV-Battery Tool

Tool for PV-Battery Systems Analysis

Stromspartool

Tool for Household Energy Audit

Pilot Implementation

Doppelte Dividende

PV & Energy Efficiency

Solar Home Systems

Renewable Electricity for Families in Rural Rwanda

Partners

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Öko-Institut e.V. Institut für angewandte Ökologie Institute for Applied Ecology

DBU Deutsche Bundesstiftung Umwelt

dena Deutsche Energie-Agentur

Wuppertal Institut

etc.

Location of Freiburg

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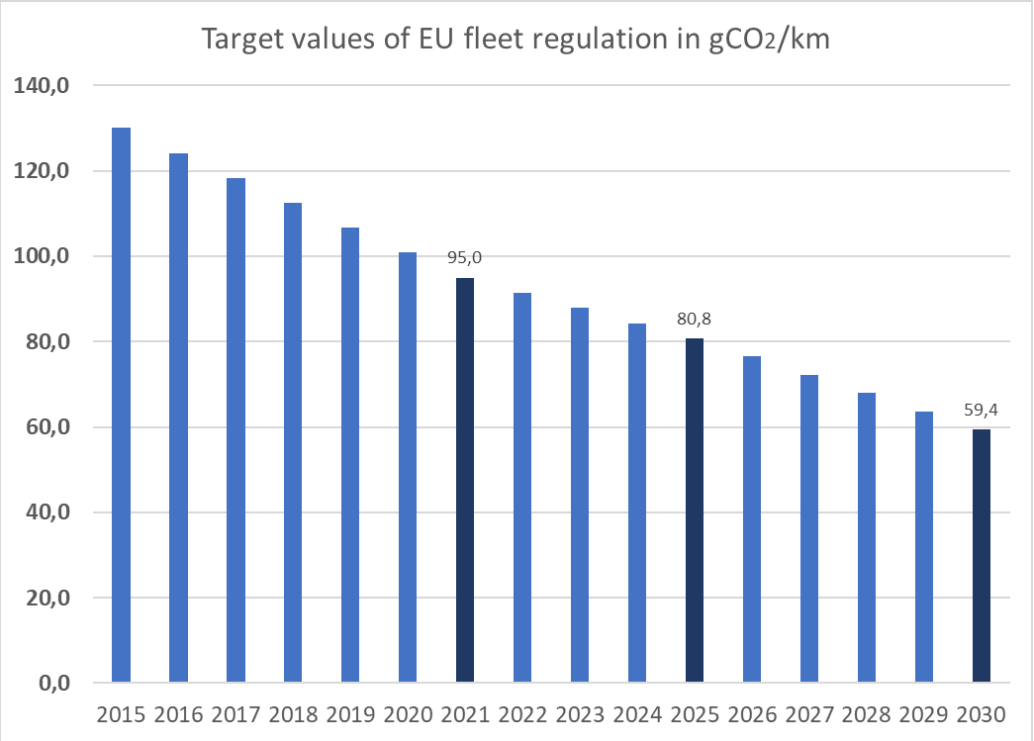
Overview

- EU car fleet consumption control – how does it work?
- Regulation with big loopholes – why?
- Comparison of CO_2 emissions between electric and conventional cars
- Merit order effect and the German renewable energy politics
- Scenario analysis: Large difference between results on paper and reality
- Implications: High compensation payments for German non-ETS sector
- Conclusion and recommendations

EU fleet consumption control (EU REGULATION No 333/2014)

- EU legislation sets **mandatory emission reduction targets for new cars** as a core strategy to improve the fuel economy of cars sold in Europe

- Target for passenger cars:
  - 2015: 130 gCO_2/km
  - 2021: 95 gCO_2/km
  - 2030: 59 gCO_2/km
    (37.5% ⬇ compared to 2021 target)



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EU fleet consumption control (EU REGULATION No 333/2014)

- Average fleet consumption of a car manufacturer is regulated
- Average target value of all European car makers in 2021 is 95 gCO_2/km
- For German car makers:
  - Volkswagen VW: 96 gCO_2/km
  - BMW: 101, Daimler: 103 gCO_2/km
- Car manufacturers who exceed the target have to pay a penalty of €95/gCO_2 for excess emissions for each car registered

Manufacturer group	Average mass (kg) 2017	CO_2 target (g/km) 2021
Toyota	1,359	94
PSA	1,273	91
Renault-Nissan	1,310	93
Average	**1,390**	**95**
FCA	1,259	91
Ford	1,393	95
BMW	1,570	101
Hyundai	1,348	94
Volkswagen	1,420	96
Daimler	1,607	103

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EU fleet consumption control: Zero-Emission Cars and “Super Credits”

- **Zero Emission Cars**

  Incentives for car makers to produce vehicles with “extremely low emissions”:
  - Battery-electric vehicles (BEVs)
  - Fuel cell vehicles (FCVs)
  - Plug-in hybrid electric vehicles (PHEVs)

  with emissions **below 50 gCO_2/km** are counted as “zero emission cars”

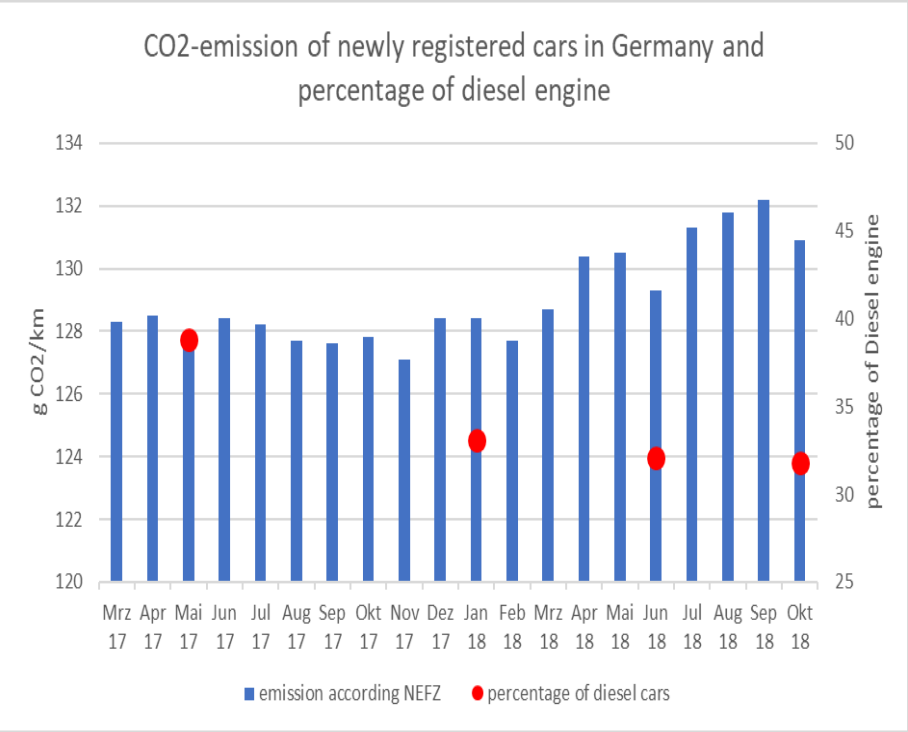
- **Super Credits**

  In 2020 - 2023, zero-emission cars will be counted with an additional weighting factor:

Year	2020	2021	2022	2023 onwards
Weighting factor	**2**	**1.67**	**1.33**	**1**

Latest development of fleet consumption in Germany

- 2010 to 2017: reduction of fleet consumption from 152 gCO_2/km to 128 gCO_2
- Growth of 3.3 gCO_2/km in Oct 2018 compared to Oct 2017 (including BEVs and PHEVs)
- Share of diesel cars has been declining
- Higher demand for SUVs, off-road vehicles and sports cars



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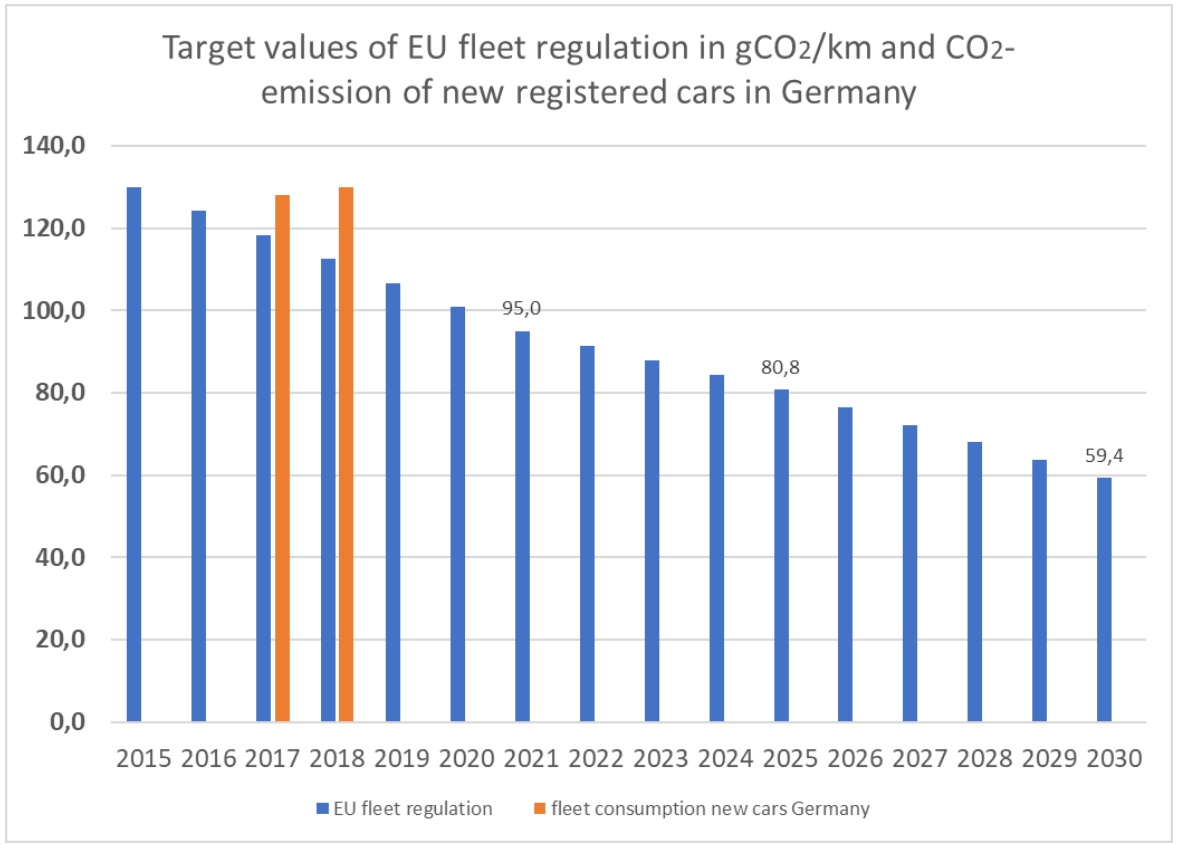
EU fleet consumption control: targets and status of German cars



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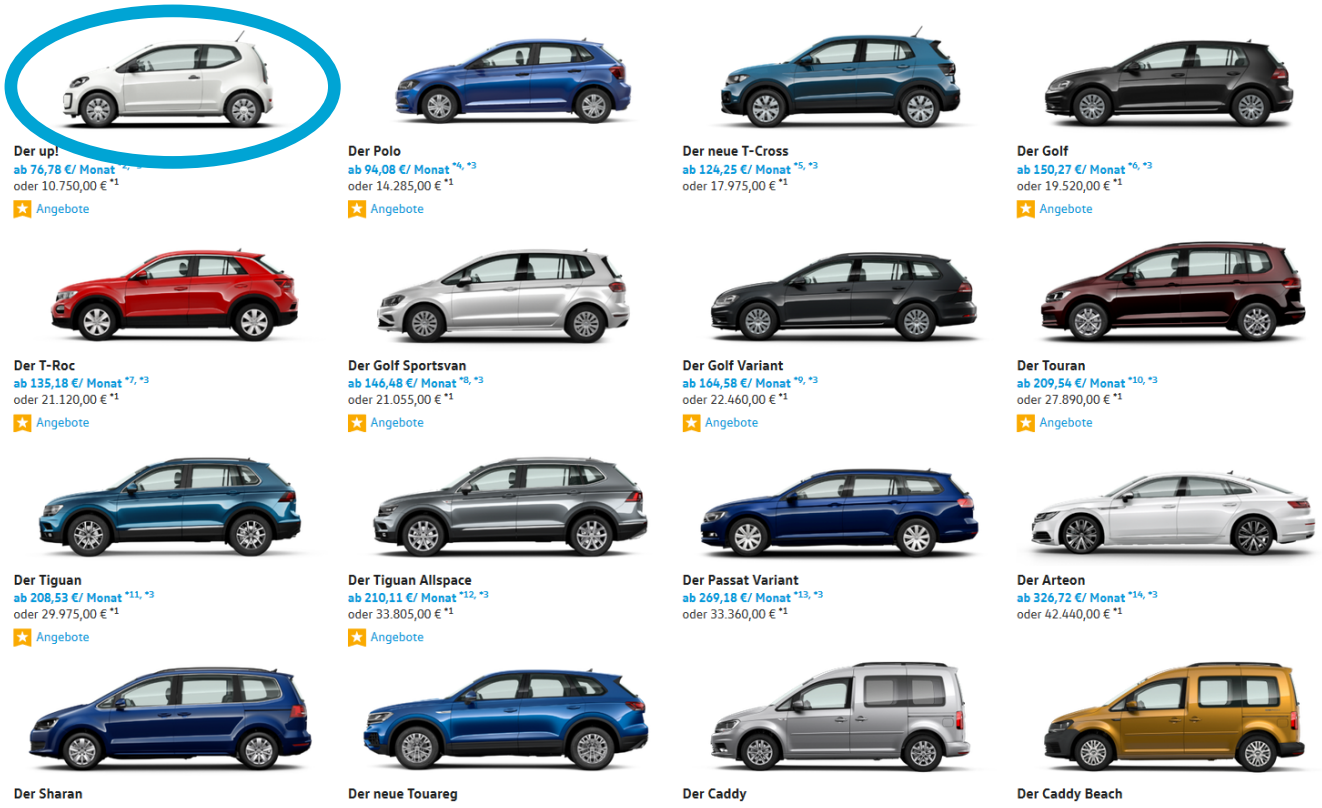
Volkswagen VW: Only the „up!“ is reaching the target of 95 gCO_2/km (2021)



95 gCO2/km is equivalent to a consumption of 3.6 liter diesel or 4.1 liter gasoline per 100 km Source: VW 5/2019

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Plug-in Hybrid (PHEV) – the best from two worlds?

- **Hybrid – Two power systems**
  - Gasoline / Diesel + Electric motor
- **Mild Hybrid**
  - Small battery charged through regenerative breaking or generator
  - Electric range: few kilometers

- **Plug-in Hybrid**
  - Battery can be charged from electric plug
  - Electric range: ~ 50 km
  - Advantages: range of a gasoline/diesel car, efficient and clean for city trips
  - Disadvantages: heavier, more expensive, inefficient for long-distance travel

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Example of Plug-in Hybrid: Mercedes E 300 de

Performance Data	
Power: diesel	143 kW
Power: electric	90 kW
Diesel consumption	1.6 litre/100 km
Electricity consumption	17.9 kWh/100 km
CO_2 emission	41 g/km
Maximum speed	250 km/h
Battery capacity	13.5 kWh
Driving range	54 km

Zero Emission Car !

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How the Plug-in-Hybrid is washed clean

- **Step 1**: Drive the test procedure (WLTP) with full battery until the battery is depleted. For Mercedes 300de, the range is 54 km and CO_2 emission from the electricity used is not counted
- **Step 2:** Drive the test procedure with diesel (or gasoline) engine over 25 km. For Mercedes 300de, the measured consumption is 1.3 litre of diesel
- **Step 3:** Total fossil fuel consumption of the car is calculated for a distance of 100 km

  ⇨ Diesel consumption = 1.3 litre / (54 km +25 km) * 100 km = 1.6 litre / 100 km
- **Step 4:** Based on the diesel consumption, CO_2 emissions are calculated

  ⇨ 1.6 litre diesel / 100 km * 2.64 $kgCO_2$ / litre diesel = 4.2 $kgCO_2$ / 100 km = 42 gCO_2 / km
- **Result:** Emissions **< 50 gCO_2 / km** threshold ⇨ **Zero-emission car**

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Effectiv emissions of PHEV Mercedes E 300de

- NEDC: 130 gCO_2 / km
- Real emission - Conventional drive

  ⇨ 7.9 litre diesel / 100 km

  = 7.9 * 2.64 = **186 gCO_2 / km**

  (Source: Spritmonitor for E 300d)
- Real emission - Electric drive:

  ⇨ 25 kWh / 100 km

  = 25 kWh* **843 gCO_2 / kWh** = **216 gCO_2 / km**

- **Result: CO_2 emissions of E 300de is similar to the non-hybrid model E 300d but calculated as zero emission car in the fleet consumption**

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EU fleet consumption regulation – from the perspective of car manufacturers

E 300 d Limousine Gesamtpreis € 52,824	**E 300 de Limousine** Gesamtpreis € 55,638 Source: Mercedes 5/2019
CO_2 emission = 130 g (NEDC) ⇨ Penalty: 28 g * 95 €/g = €2,660	CO_2 emission = 0 g ⇨ Bonus: 102g * 95€/g = €9,690 (without super credit) **Difference: €12,350**

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EU fleet consumption regulation – from the perspective of car manufacturers

- With BEVs and PHEVs, the manufacturer can avoid efficiency measures by their conventional cars

  ⇨ Cars get bigger and more powerful

- For every PHEV or BEV produced, car manufacturers can compensate the emissions of two or three big SUVs on paper

The new Peugeot 3008 Hybrid4 will be the strongest series model in the company‘s history (200 PS conventional plus 110 PS electric)

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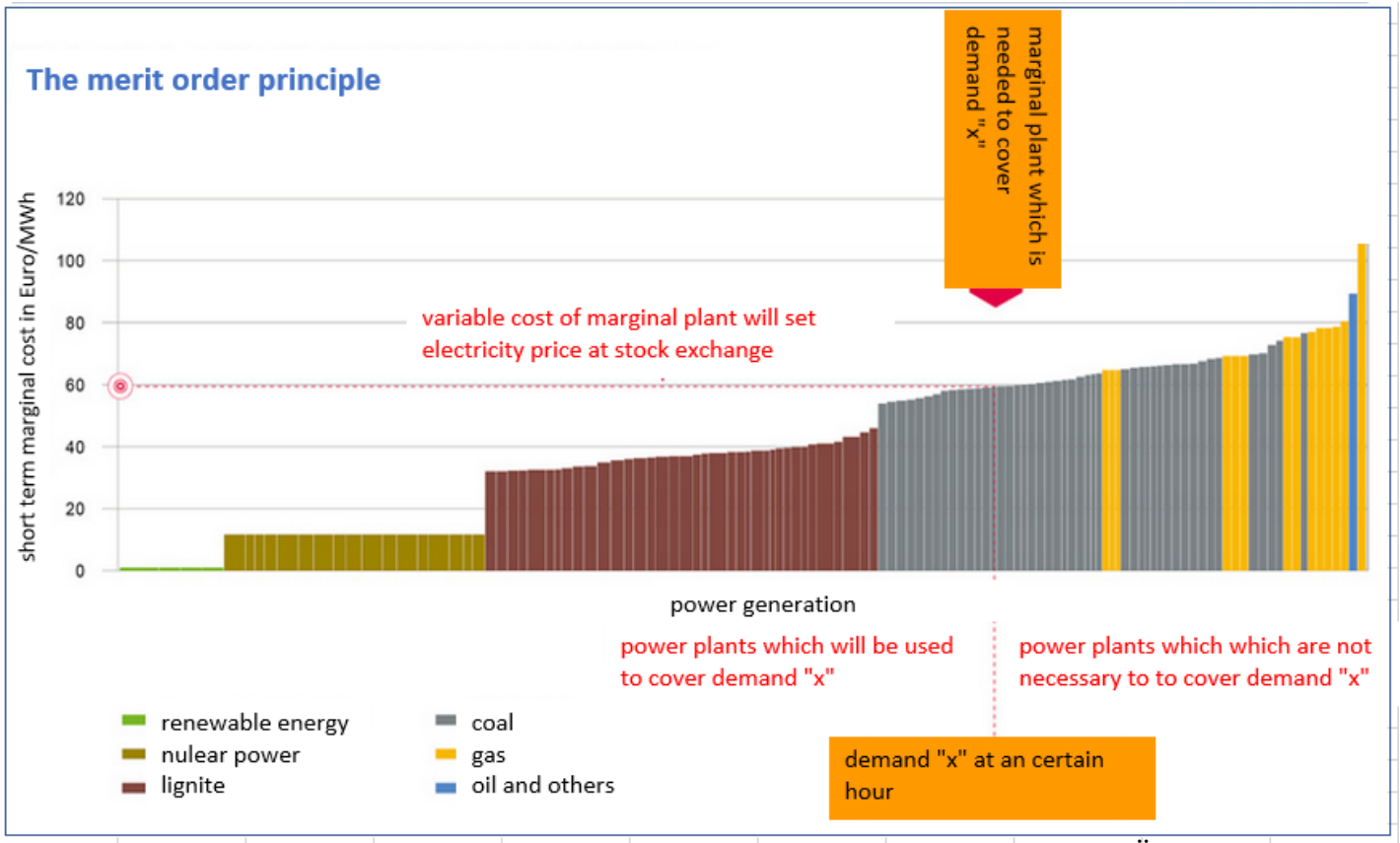
CO_2 Emission related to BEV and PHEV

- We calculated the emissions of electric cars with an electricity mix based on fossil fuels

Why?

- Additional demand will be supplied by conventional power plants (merit-order principle)
- In Germany, EEG (2014,2019) gives the regulative framework (corridor) for the development of wind and solar power until 2030. Growth is limited through public tenders.
- German government has decided to push sector coupling (E-mobility, heat pump, synthetic fuel) in recent years, which leads to additional electricity demand
- Renewable energy law was not adopted to the additional demand and there is no sign that it will be in future
- Consequence: Until 2030 and beyond, the CO_2 emissions from electric cars are determined by power plants using fossil fuels

The merit order principle – additional electricity demand is covered by marginal plants



Source: Öko-Institute 2011

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Emissions from fossil fuel power plants

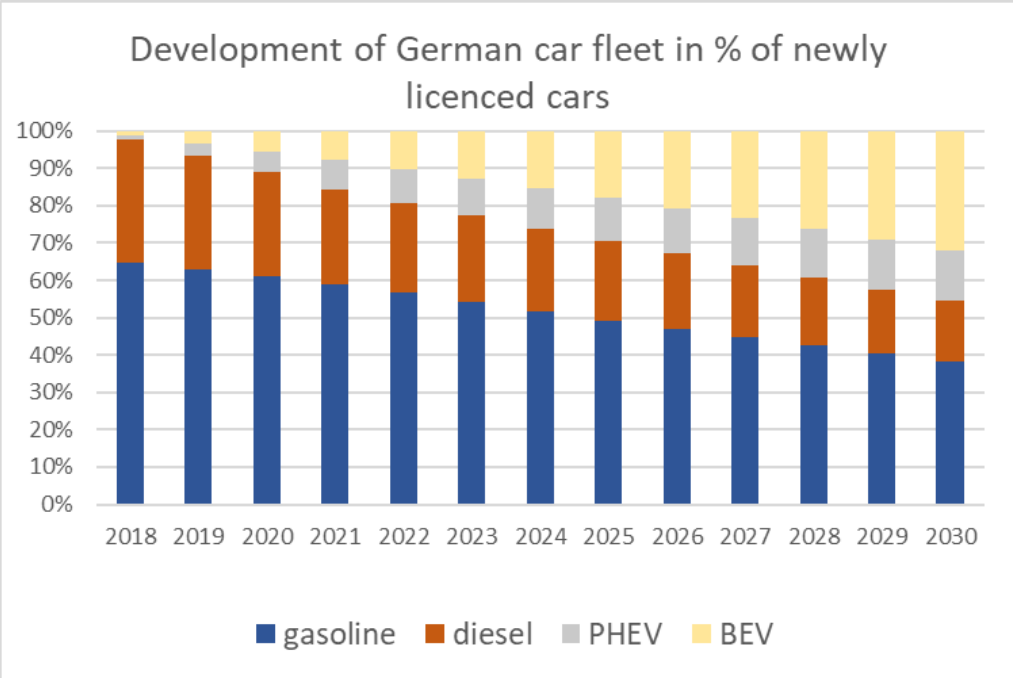
Fuel	CO_2 emission from fuel (g/kWh)	Electricity generation Efficiency	CO_2 emission of electricity (g CO_2/kWh)	Scenario A	Scenario B	Emission factor Scenario A (g CO_2/kWh)	Emission factor Scenario B (g CO_2/kWh)
Lignite	407	35%	1151	40%	33.3%	460	384
Coal	337	39%	863	40%	33.3%	345	288
Gas	201	51%	391	20%	33.3%	78	130
						884	**802**

Source: Umweltbundesamt 2018 and Büro Ö-quadrat

Analysis - Scenario OE2: Impact of EU fleet consumption regulation

Assumptions

- German car makers reach the EU fleet consumption targets in 2030
- Share of PHEVs in electric cars (PHEVs+BEVs):
  - 2018 - 2021: increases to 50%
  - 2021 - 2025: drops linearly to 40%
  - 2025 - 2030, drops linearly to 30%
- Share of diesel cars in conventional cars:
  - 2018 - 2021: drops linearly to 30%
  - 2021 - 2030: remains at 30%



2018:
Share of PHEVs in electric cars (PHEVs+BEVs) = 40%
Share of diesel cars in conventional cars = 33.8%

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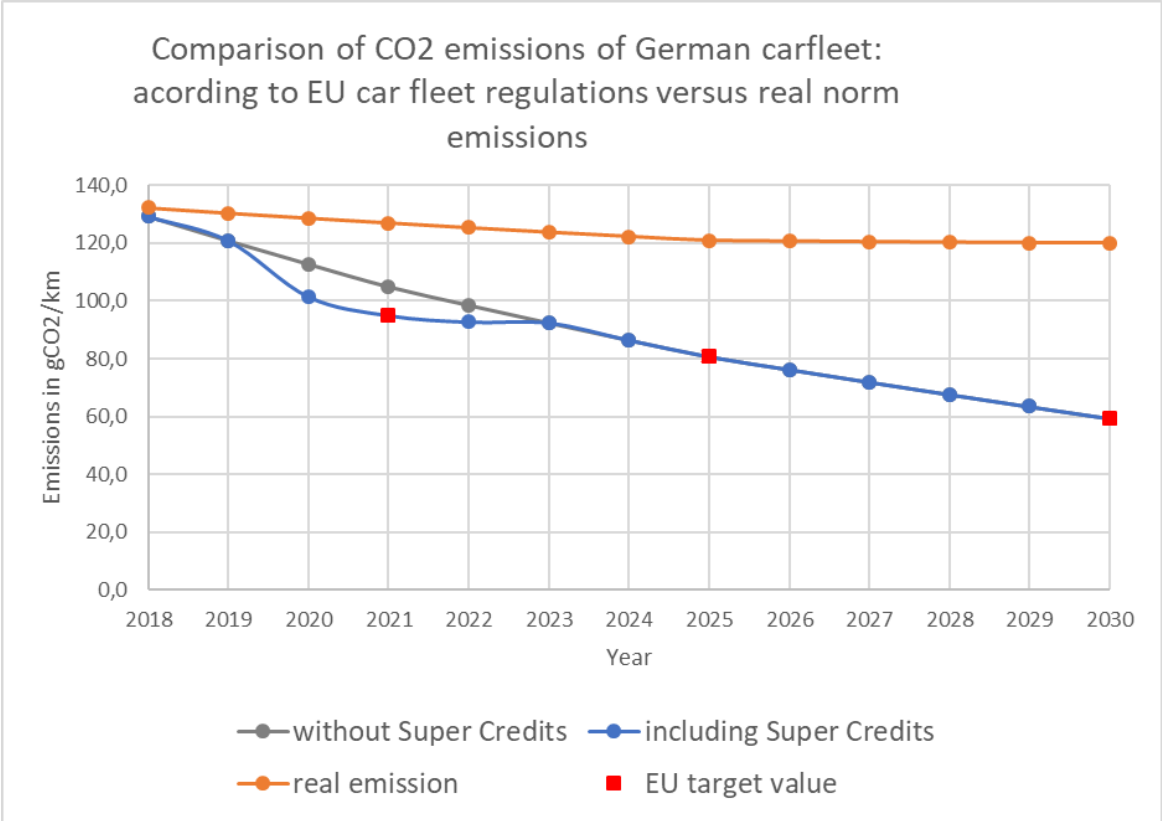
Analysis - Scenario OE2: Impact of EU fleet consumption regulation

- German car market will reach a CO_2 reduction of 54% in 2030 relative to 2018 (on paper!)
- In reality, the average CO_2 emission of the new car fleet will only be reduced by less than 10% until 2030.



Based on electricity consumption measured under NECD and an emission factor of 843 gCO_2/kWh (average of Scenario A and B)

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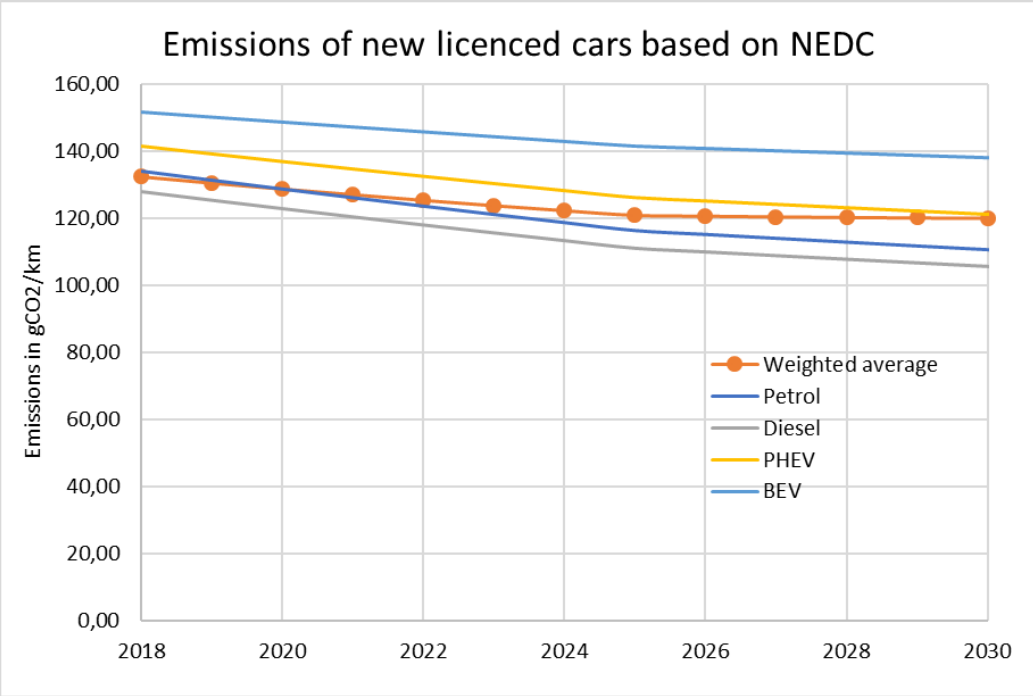
Analysis - Scenario OE2: Impact of EU fleet consumption regulation

- Growing number of vehicles might counteract the CO_2 reduction



Based on electricity consumption measured under NECD and an emission factor of 843 gCO_2/kWh (average of Scenario A and B)

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Analysis - Scenario OE2: Impact of EU fleet consumption regulation

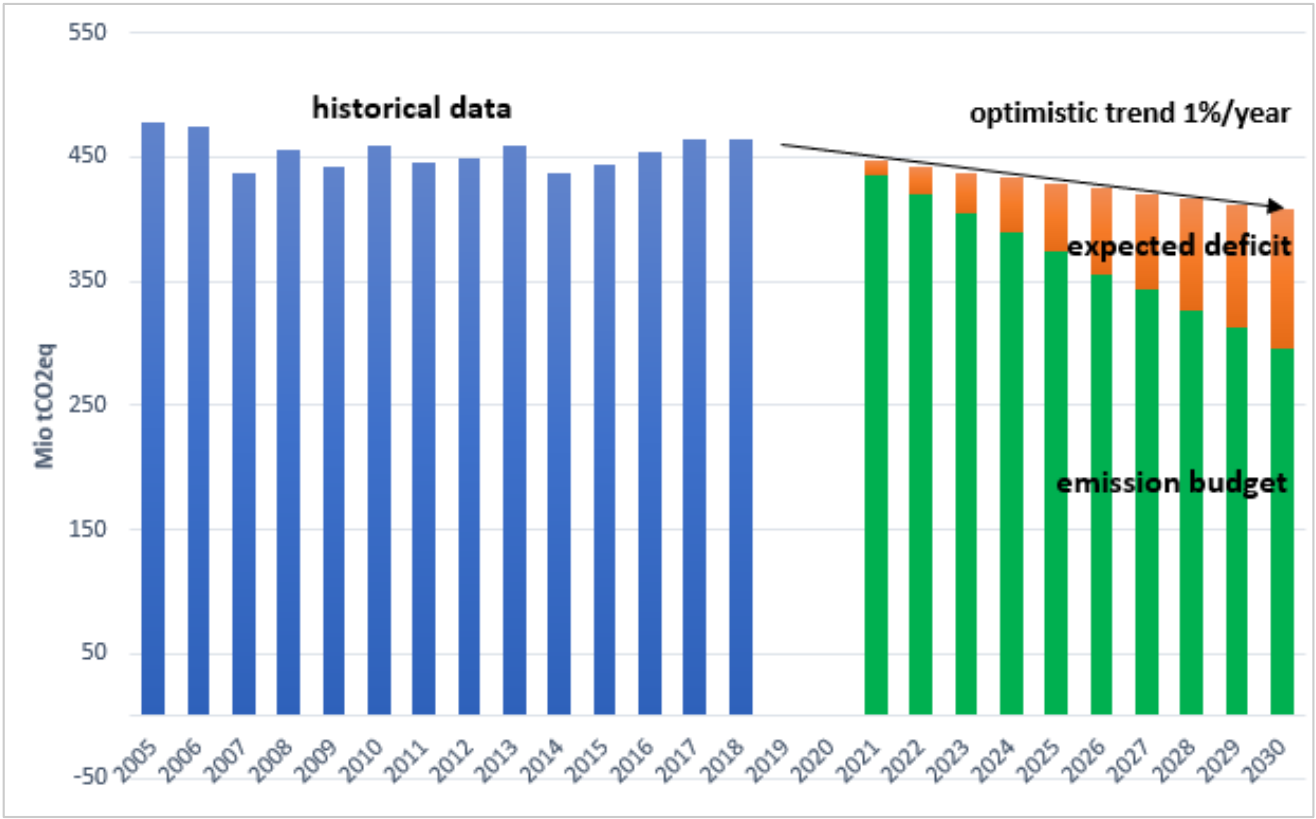
- Efficiency of new diesel and gasoline cars:
  - 2018 - 2025: rises by 2% per year
  - 2026 – 2030: rises by 1% per year
  - same for the fossil fraction of PHEVs
- Efficiency of electric cars:
  - 2018 - 2025: rises by 1% per year
  - 2026 – 2030: rises by 0.5% per year
  - same for the electricity consumption of PHEVs
- 2018 consumption and emission of cars:
  - Diesel 128 gCO_2/km
  - Gasoline 134 gCO_2/km
  - PHEV 130 gCO_2/km and 20 kWh/100km
  - BEV 18 kWh/100km
- Consumer preferences for heavier and more powerful cars e.g. SUVs are omitted

Social cost of PHEV for tax payers

- Within the Paris agreement, Germany has to fulfil mandatory CO_2 emission targets for transport, agriculture and building sectors (Non-ETS sector)
- Germany will fail to fulfil these obligations from 2020 to 2030 and will have to purchase CO_2 allowances from other EU countries
- Fleet regulation method is one of the main factor for the failing
- Scenario OE2: 3.8 million “zero-emission PHEVs” will be sold until 2030. Each car will emit about 1.8 tons of CO_2 per year driving with the combustion engine
- Cost for CO_2 allowances: €2140/car and €8.1 billion for the total number of PHEVs that will be brought into market until 2030
- Emissions from BEVs are not included here because they are considered in the ETS sector

Assumptions: Average distance with fossil mode is 9800 km per year (70% of 14000 km) with real CO_2 emissions of 182g/km, average lifetime of cars is 12 years and the cost of CO_2 allowance is €100/tonCO_2

CO2eq emissions in the German Non-ETS sector: Historical data and expected deficit compared to emission budget in Paris Agreement



Source: agora 2018

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Social cost of PHEV for tax payers

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Conclusion and Rcommendation (I)

- The EU fleet consumption regulation is far from reaching the necessary emission reduction in the transport sector in Germany
- The 54% reduction target in the average CO_2 emission from new cars until 2030 sound ambitious but there are big loopholes in the system
- Real CO_2 emissions will only decrease by about 10%
- The regulation will allow car manufacturers to continue selling heavy and environmentally unfriendly cars
- CO_2 reduction will come too late and and long time after 2030
- High financial costs for the German tax payers: 1. Government is subsidizing individual motorization. 2. Government has to buy CO2-allowances

Conclusion and recommendation (II)

- PHEVs should be included in the fleet consumption calculation with their real emissions
- Super credits should be avoided as they distort the emission calculations
- Introduction of BEVs should be accompanied by acceleration in renewable energy installations
- EU fleet regulation has to be accompanied by a climate friendly transport policy that aims to reduce vehicle-kilometers travelled, by motivating people to use lower emission transport mode, giving disincentives for bigger cars, boosting investment into bicycle and pedestrian infrastructure and includes the social cost into the price system…..
- Last but not least, we need better information and educational campaigns
- Communication related to the EU fleet regulation and the notion of “zero emission” electric cars are good examples of disinformation

We need e-mobility - but are e-mobility and efficiency regulation the solution for the transport problems?

Problem: land use

Without E-mobility

With E-mobility

Dr. Martin Pehnt www.ifeu.de

Thank you for your attention!

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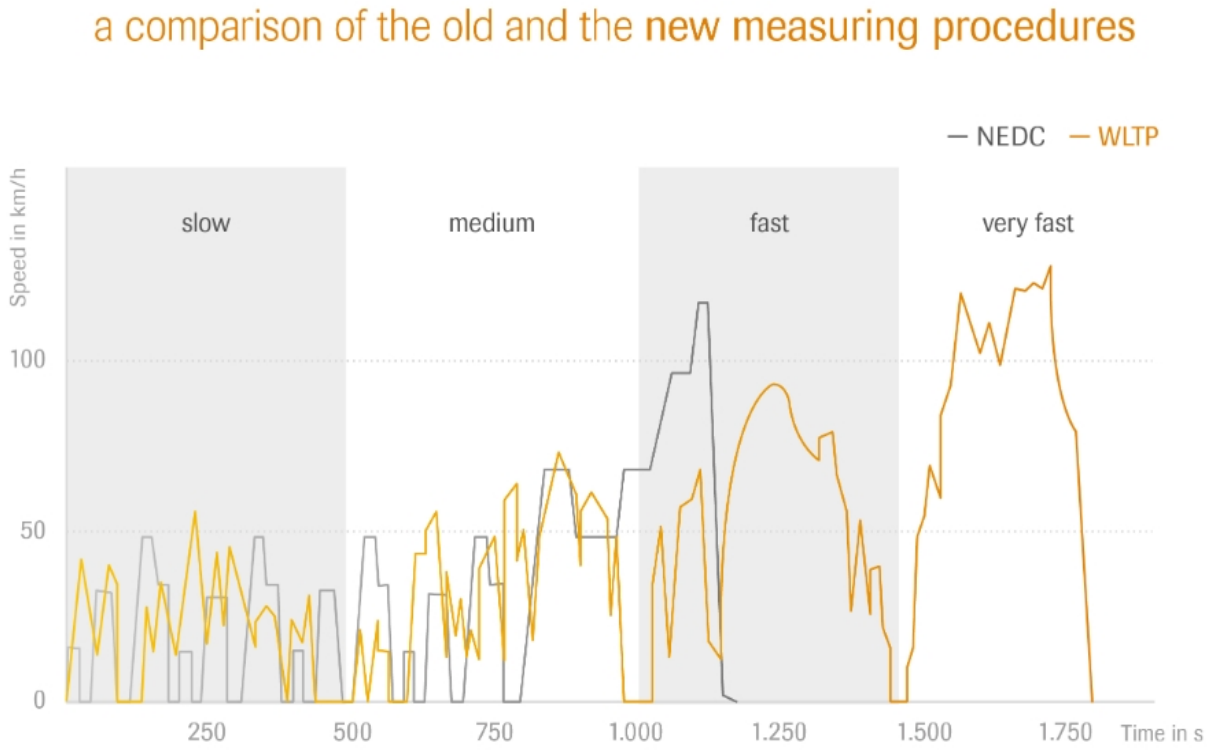
Since 1.9.2018:
WLTP (Worldwide harmonized Light Vehicle Test Procedure instead of NEDC (New European Driving Cycle)

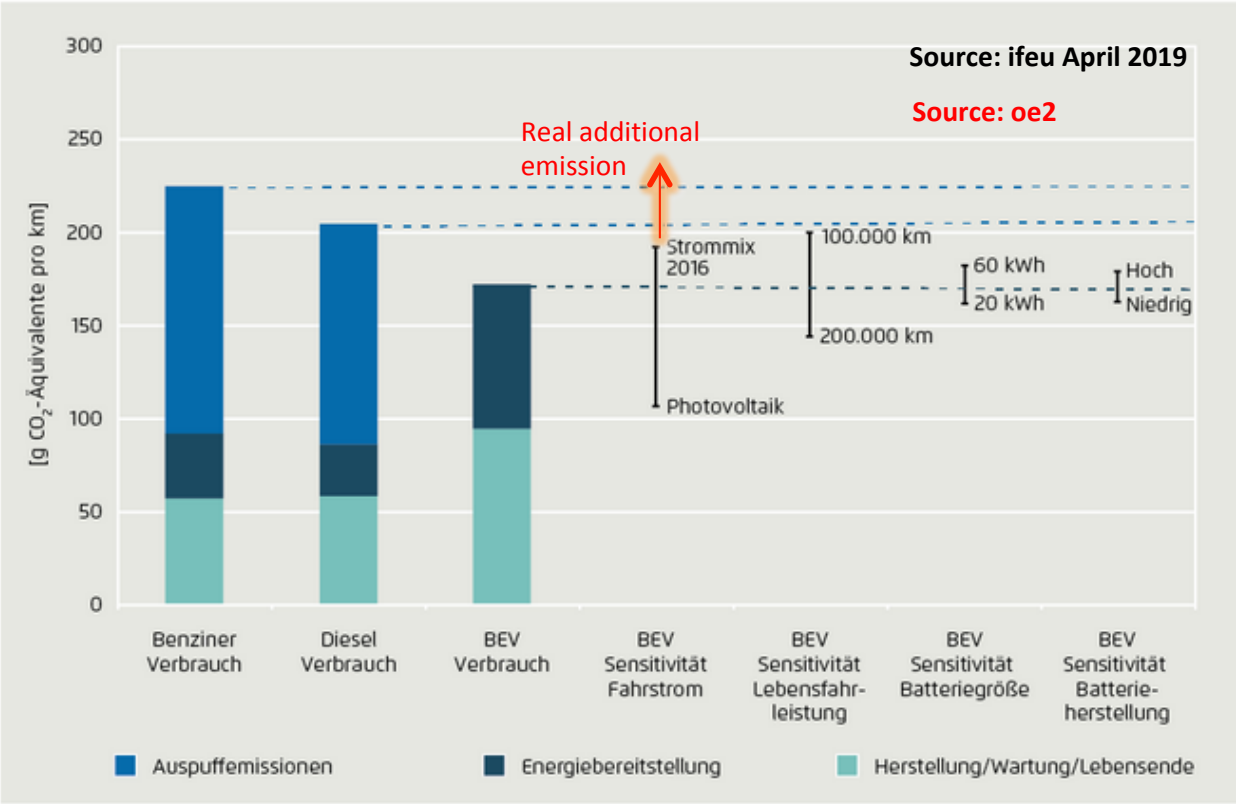
Differences:

- cycle time
- cycle distance
- average speed
- acceleration
- proportion of standstill
- test-procedure

Impact:
Expected change: about 20% higher consumption in WLTP-modus



CO_2-Emissions from BEV and conventional cars



Eigene Darstellung durch ifeu
Anmerkungen: „Sensitivität Batterie Hoch" als Fertigung mit 100 kWh_{el} pro kWh Batterie in China; „Sensitivität Batterie Niedrig" als Fertigung mit 50 kWh_{el} pro kWh Batterie im Mix der heutigen Fertigungsländer.
Lebensfahrleistung 150.000 km; Elektroauto mit 35 kWh Batterie und 16 kWh/100km Stromverbrauch (ohne Ladeverluste), Strommix nach Basisszenario in Kapitel 4.2.2; Benzinverbrauch 5,9 l/100 km und Dieselverbrauch 4,7 l/100 km.

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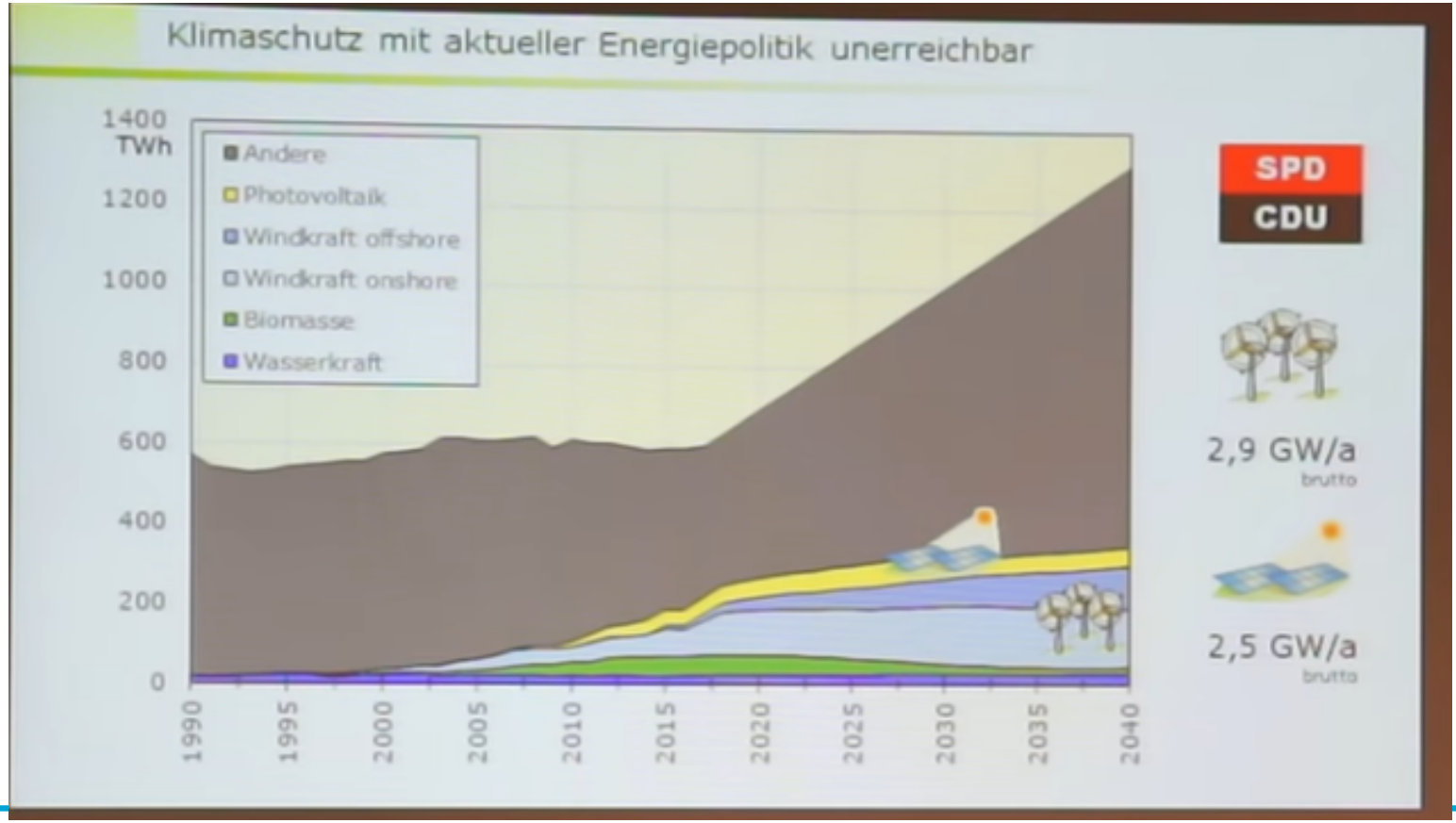
Why marginal plant and not the future mix?



Why marginal plant and not the future mix?

- Renewable Energy Law gives the corridor for the development of wind and solar power.
- In recent years, the government has decided to push Sektoren-Kopplung (E-mobility, heat pump, fuel) which leads to additional demand
- The renewable energy law was not adopted and there is no sign, that it will be in future.
- Consequence: Additional demand will be produced by conventional power plants.

- (Necessary per-year-expansion to reach the 65-percentage-target in 2030:→Onshore Wind: 4 Gigawatt→Offshore Wind: 0,8 Gigawatt till 2025, 1,7 Gigawatt from 2026→Solar: 4 Gigawatt till 2021, 5 Gigawatt from 2022)

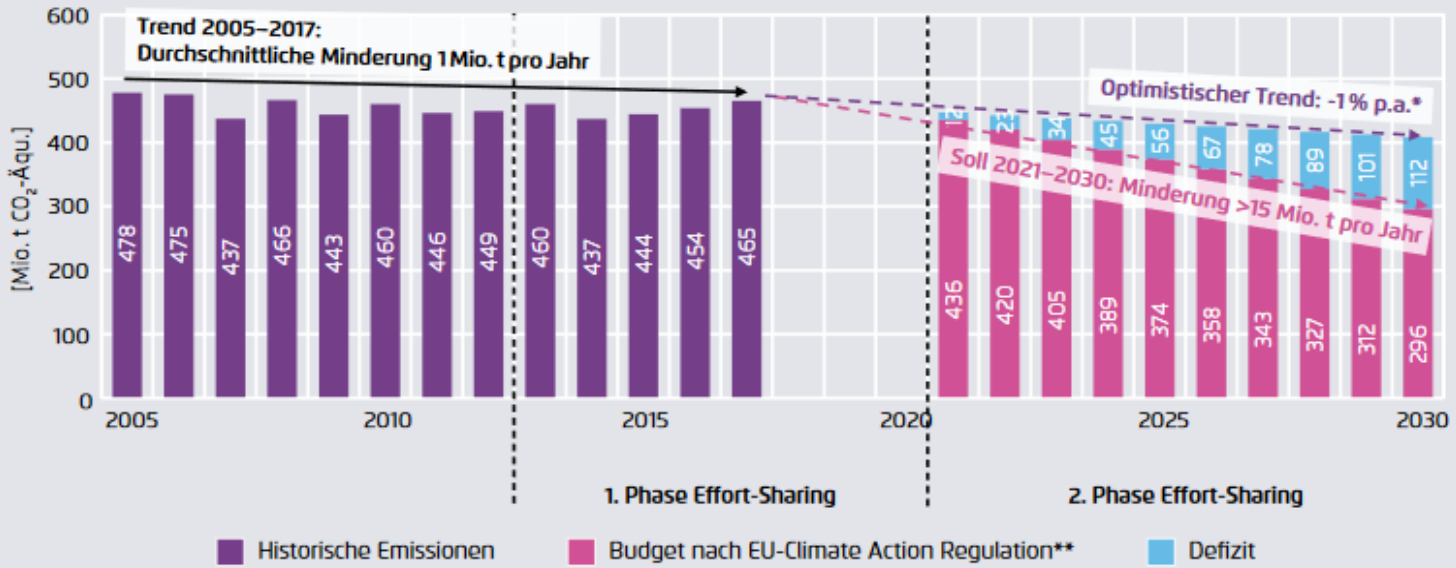
Neues Messverfahren für Spritverbrauch (und CO2-Emisionen)

- Seit 1. September 2018 müssen die Fahrzeuge ein neues Messverfahren zur Bestimmung der Verbrauchswerte (Benzin, Diesel Strom, Erdgas) durchlaufen: WLTP
- Ziel: realistischere Verbrauchswerte
- Norm-Verbrauchswerte werden in Zukunft um etwa 20% ansteigen.
- Kfz-Steuer steigt an, da Fahrzeuge nach **WLTP** bewertet werden
- Maßgebend für Flottenverbrauchsregelung ist jedoch noch der **NEFZ**
- Wegen neuem Messverfahren sind viele Plug-in-Hybride aus Prämienkatalog rausgefallen
- Bei VW (und einigen anderen Herstellern) kann man derzeit keinen Plug-in-Hybrid kaufen

Erwartetes Defizit im Nicht-ETS-Bereich

Nicht-ETS-Bereich in Deutschland: Historische Emissionen, jährliche Emissionsbudgets und das zu erwartende Klimaschutz-Defizit in den nicht vom Emissionshandel erfassten Sektoren für die Phase 2021–2030

Abbildung Z1



* Annahme: Emissionsminderung ab 2018 um 1 Prozent pro Jahr

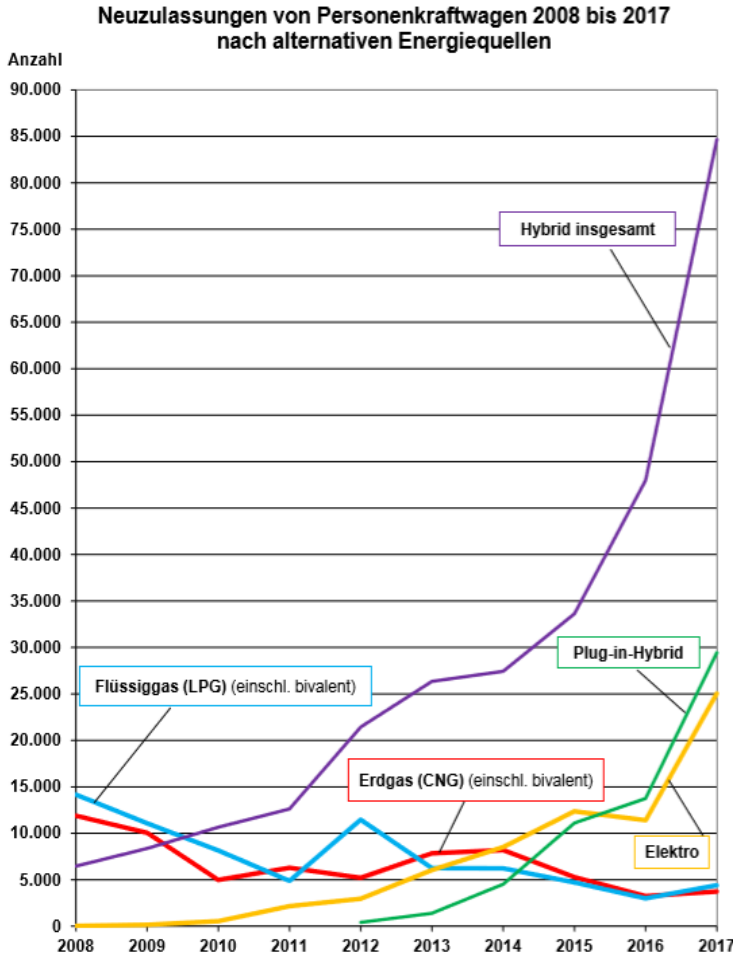
** Annahme für Startwertberechnung: 461 Mio. t $CO_{2Äq}$ in 2018.

Quelle: Agora

EEA (2017a); BMU (2018); Basisjahremissionen 2005 gemäß EEA (2017a). Nicht-ETS-Emissionen 2017 abgeschätzt aus Gesamtemissionen (BMU 2018) abzüglich stationären ETS-Emissionen (EEA 2018b) und nationalen Flugverkehrsemissionen (EEA 2018a).

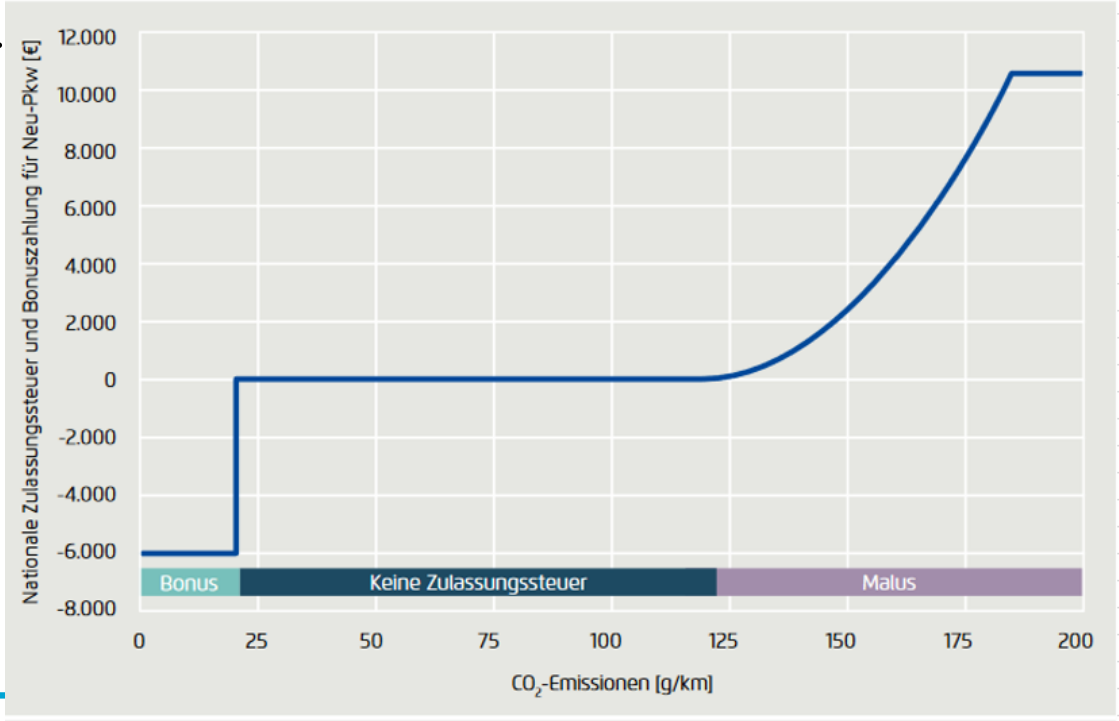
Absatz von Elektrofahrzeuge und Plug-in-Hybride noch schleppend

- Bislang geringe Mengen an E-Fahrzeugen
- 30.000 Plug-in-Hybride in 2017 entsprechen 0,9 Prozent der Neuzulassungen
- Plug-in-Hybride sind von der neuen Messverfahren (WLTP) betroffen.
- Da die elektrische Reichweite bei höheren Geschwindigkeiten sinkt, steigt der Benzinverbrauch auf über 50 gCO_2/km → keine Prämie
- Mehrere Hybride erhalten keine Förderung mehr
- Plug-in-Hybride von VW derzeit nicht bestellbar.



Recommendation on supplementary measures

- French feebate system: From 2018 onwords the registration tax for new vehicles in France is based on the CO_2 emissions of the car.



▪Folie 37

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Verbindliche EU-Klimaziele

- Deutschland ist innerhalb der EU verbindliche Ziele zur CO2-Reduktion eingegangen:
  A) Emissionshandelssystem im Industrie- und Energiesektor (ETS)
  B) EU-Effort-Sharing für die Bereiche Verkehr, Landwirtschaft, Gebäude (Nicht-ETS-Bereich)
- Verfehlt Deutschland seine Emissionsbudgets für den Nicht-ETS-Bereich, so muss es ab dem Jahr 2021 überschüssige Emissionen durch Kauf von Zertifikaten in anderen Ländern ausgleichen…..
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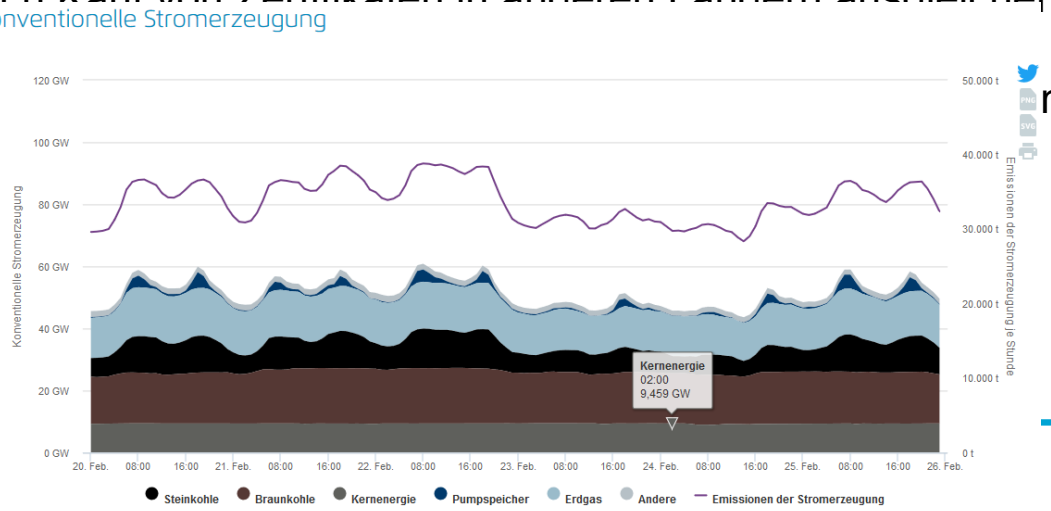

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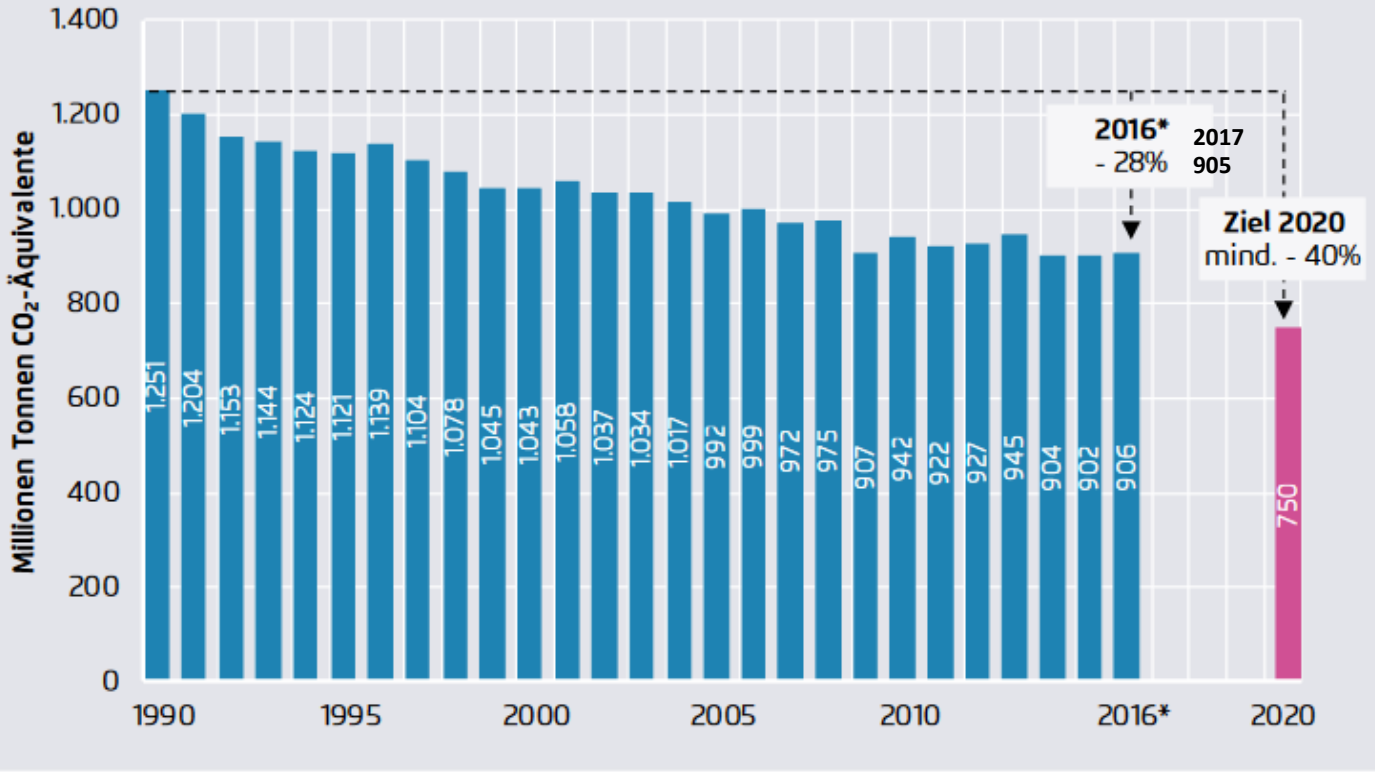
Deutschland wird Klimaziele nicht erreichen

Abbildung 1: Entwicklung der Treibhausgasemissionen in Deutschland 1990 – 2016



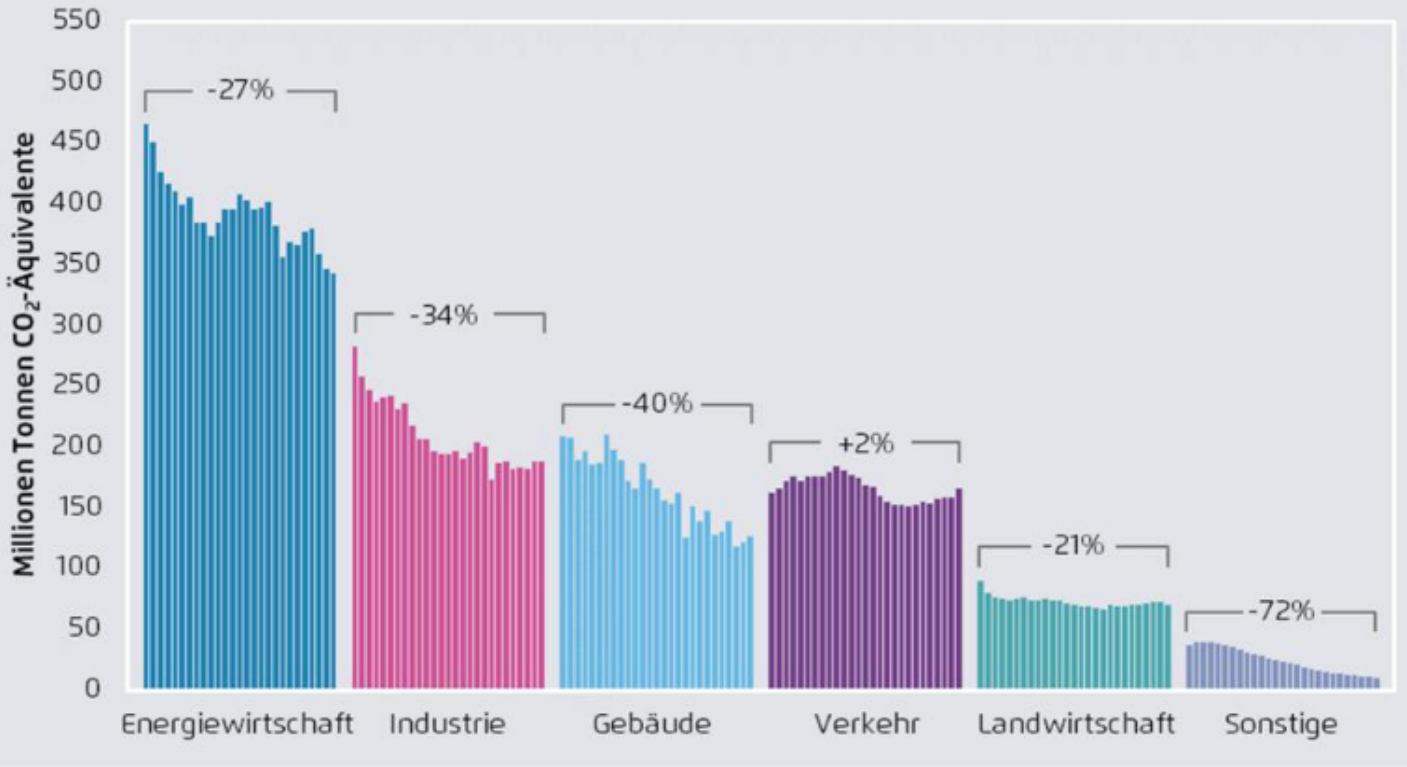
Umweltbundesamt (2017)

Quelle: Agora

*vorläufig

CO2-Emissionen im Verkehrssektor ungebremst

Abbildung 2: Entwicklung der Treibhausgasemissionen in Deutschland nach Sektoren 1990 – 2016



Umweltbundesamt (2017)

Quelle: Agora

*Zahlen für 2016 vorläufig

EU fleet consumption control

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a)

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b)