



ENERGY TRANSITION IN TRANSPORTATION.
100 % BIOMETHANE AT GERMAN CNG STATIONS
FEASIBLE TODAY.

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13. Tagung Gasfahrzeuge | Stuttgart | 22 October 2019

A photograph of a dirt path winding through a field of tall, golden-brown grass. A small rainbow is visible on the path in the distance. The image is partially obscured by a semi-transparent teal banner at the bottom.

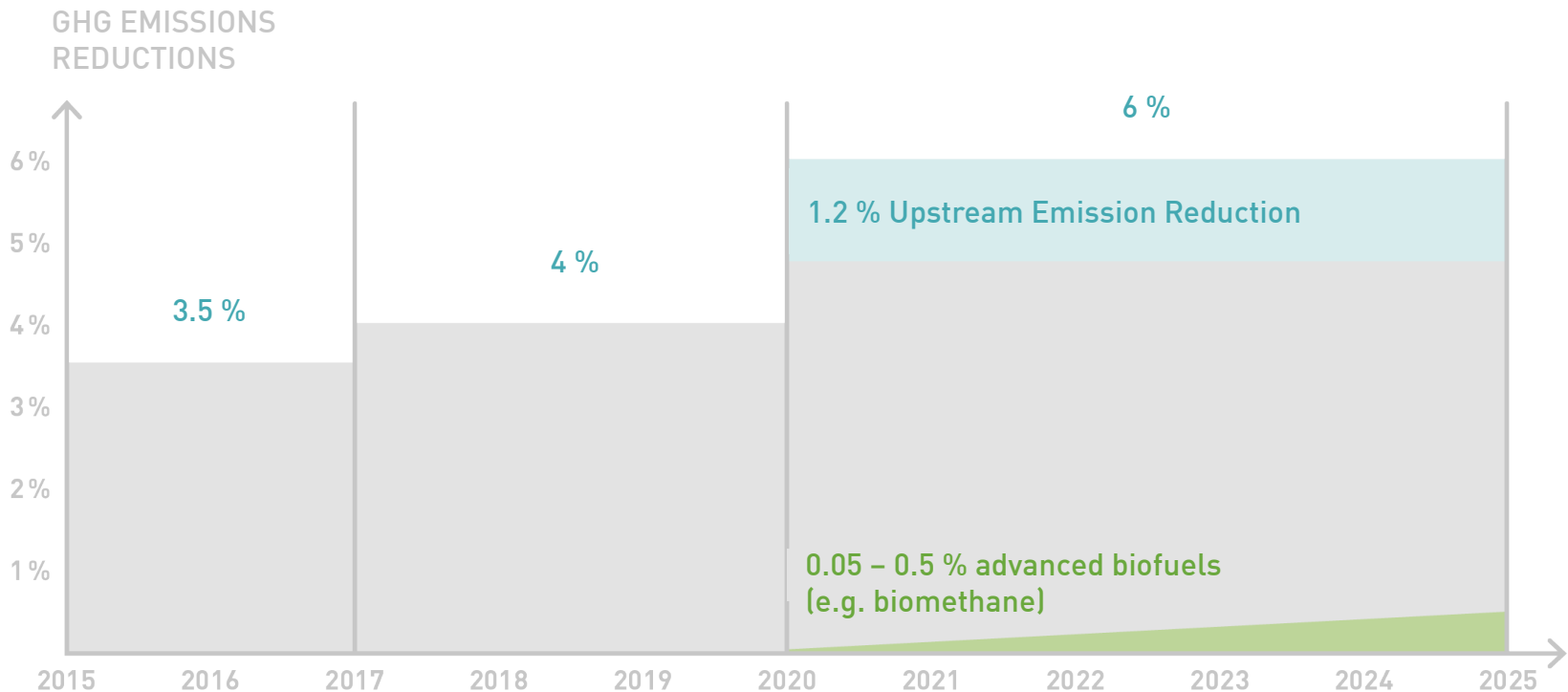
BIOMETHANE & NATURAL GAS FOR THE BIOFUEL QUOTA

BIOFUEL & GHG EMISSIONS REDUCTION QUOTA - HISTORICAL DEVELOPMENT



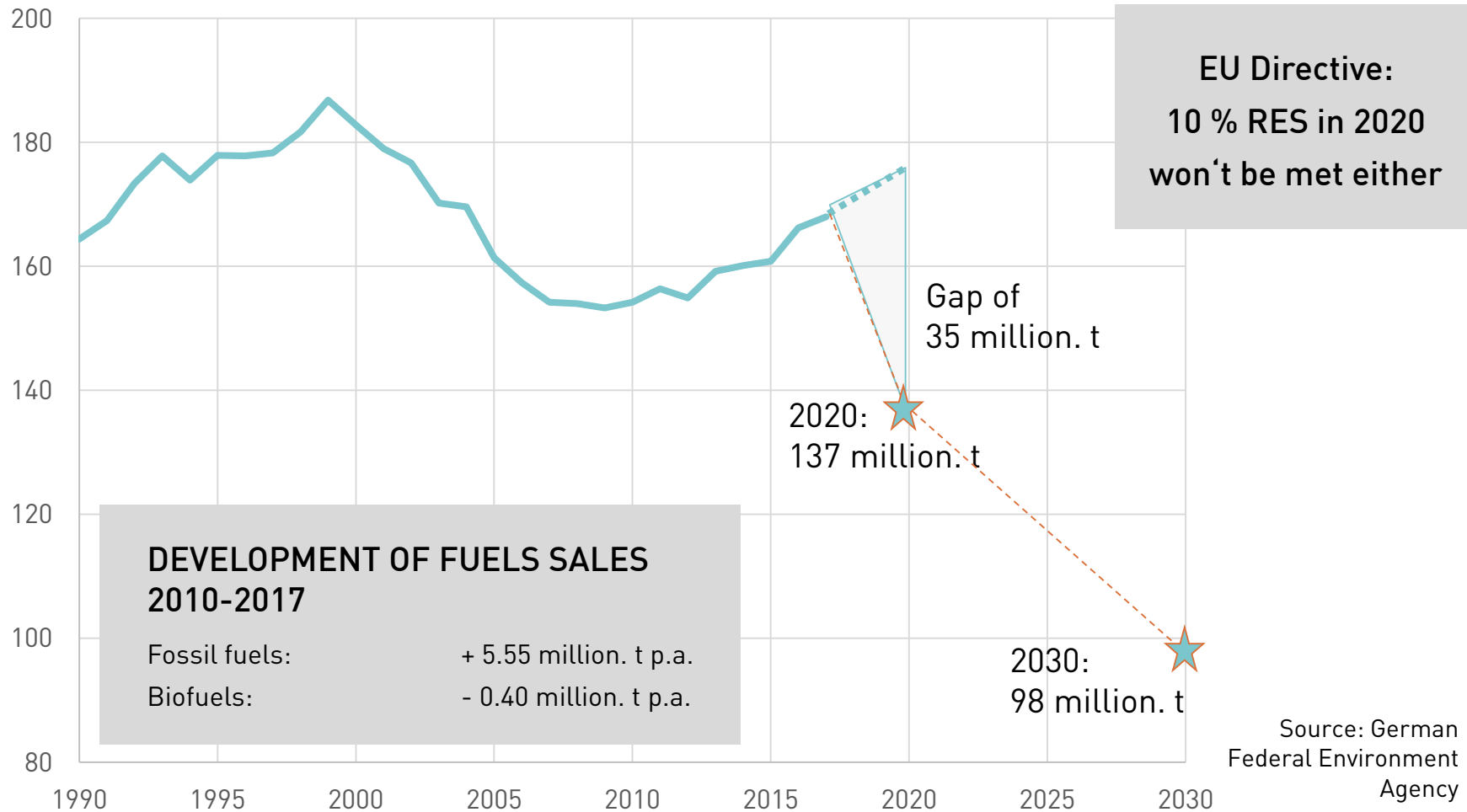
UNTIL 2006	<p>TAX EXEMPTION OR TAX REDUCTION</p> <ul style="list-style-type: none">■ Tax exemption for biodiesel ended 2006■ Tax reduction for biodiesel ended 2012
2007 – 2011	<p>SIMPLE ENERGY RELATED QUOTA</p> <ul style="list-style-type: none">■ Started at ~3 % and was capped at 6.25 % in 2010 (original target: 10 %)■ Since 2011: Quota fulfillment with biomethane possible
2012 – 2014	<p>SIMPLE & DOUBLE ENERGY RELATED QUOTA</p> <ul style="list-style-type: none">■ Double counting for waste based fuels
SINCE 2015	<p>GREENHOUSE GAS EMISSION REDUCTION QUOTA</p> <ul style="list-style-type: none">■ Started at 3.5 % - currently at 4 %■ Since 2018, quota can be generated by using natural gas

FUTURE GHG QUOTA DEVELOPMENT ACCORDING TO GERMAN 38. BIMSCHV



- Emissions calculated with current reference values: ~ 225 million. t CO_{2eq} p.a.
- Quota of 6 % is equivalent to reducing ~ 13.5 million t CO_{2eq}
- 0.5 % advanced biofuels in 2025 are equivalent to ~ 3.5 TWh p.a.

REALITY 2019: LESS BIOFUELS + MORE DEMAND = MISSING THE 2020 TARGET



QUOTA FULFILLMENT WITH BIOMETHANE & NATURAL GAS SINCE 2018



AMENDMENT: ADJUSTED REFERENCE VALUES FOR QUOTA FULFILLMENT

- Fossil reference value for diesel / petrol increased from 83.8 to 94.1 g CO_{2eq} / MJ
- Introducing a reference value for natural gas: 69.3 g CO_{2eq} / MJ



NATURAL GAS GENERATES GHG QUOTA SINCE 2018

- 21.0 g / MJ or 68.8 t / GWh
- Revenue of up to 12 €/MWh possible for a CNG station



BIOMETHANE AT THE PRICE OF CNG ONLY PARTLY POSSIBLE SINCE 2018

- Use of biomethane declining > alternative points of use more profitable
- CNG stations must pass on parts of alternative areas of application more profitable

QUOTA FULFILLMENT WITH BIOMETHANE & NATURAL GAS STARTING 2020



AMENDMENT: RAISING THE QUOTA FROM 4.0 % TO 6.0 %

- Increase in demand of up to 50 %
- Higher GHG quota unfortunately also leads to a higher fictitious quota



NATURAL GAS STARTING IN 2020

- Quota generation declines
 - 19.2 rather than 21.0 g / MJ or
 - 62.7 rather than 68.8 t / GWh
- Expected additional revenue for CNG filling stations of over 10€/MWh



TURNING POINT FOR BIOMETHANE?

- Affordable blending options using biodiesel / ethanol are capped
- No premium for advanced biofuels within sight

A photograph of a dirt path winding through a field of tall, golden-brown grass. A small rainbow is visible on the path in the distance. The scene is captured in warm, golden light, likely during sunrise or sunset.

BIOMETHANE WOULD BE A SIMPLE OPTION
TO DECARBONIZE THE TRANSPORT SECTOR

BIOMETHANE THE GREEN ALLROUNDER



VERSATILE INPUT MATERIAL

from manure to waste and to
energy crops.



FLEXIBLE

through various fields
of application.

STORABLE

in the existing gas grid.

EFFICIENT TRANSPORTATION

via the existing gas grid.

FRAUNHOFER ET AL.: BIOMETHANE IS THE MOST ECO-FRIENDLY FUEL



- Biomethane has the lowest GHG emissions compared to other engine technologies (when made from waste or residues)
- Biomethane from manure can achieve negative emissions
- Compared to e-mobility
 - Higher emissions through vehicle & battery production
 - With 100 % renewable energy: emissions almost equal
 - Current German energy mix: drastically higher emissions

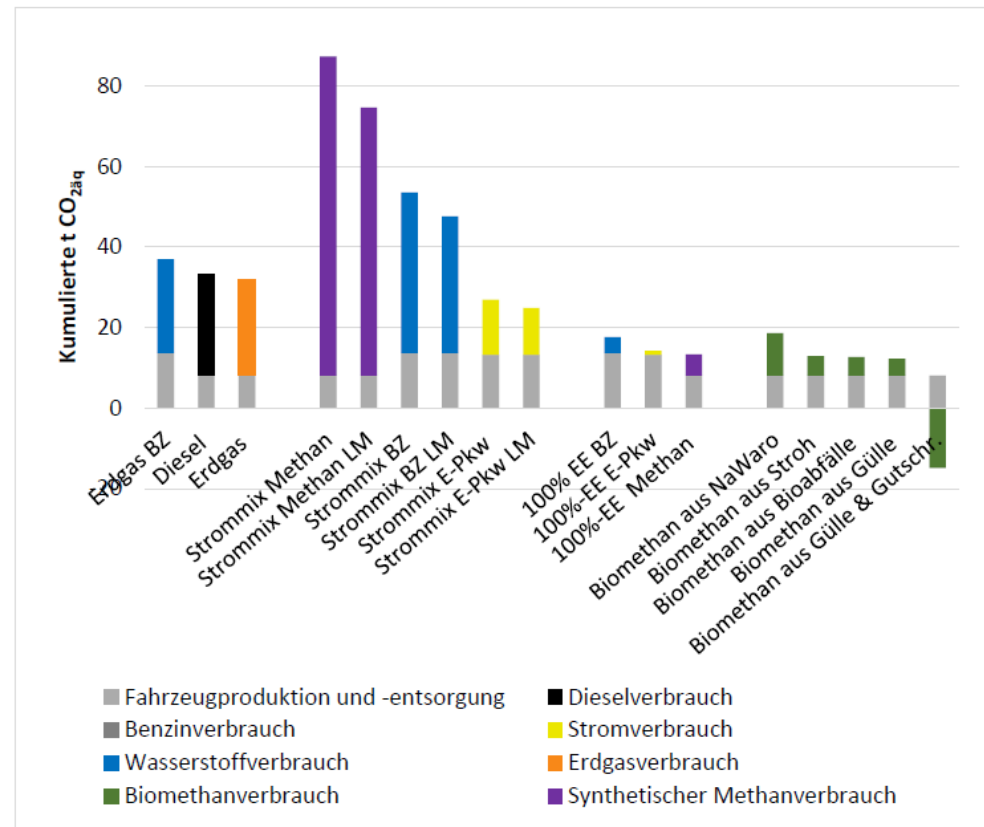


Abbildung 2-7: Treibhausgasemissionen eines Mittelklassefahrzeugs mit unterschiedlichen Antriebstechnologien, über den Lebensweg von 182.000 km und von 2019 bis 2031 bilanziert (BZ: Brennstoffzelle, E-Pkw: Batteriefahrzeug, LM: Mit Lastmanagement, EE: Erneuerbarer Strom)

Source: Fraunhofer et al. (2019): Klimabilanz, Kosten und Potenziale verschiedener Kraftstoffarten und Antriebssysteme für Pkw und Lkw

FRAUNHOFER ET AL.: BIOMETHANE IS A VERY COST-EFFICIENT FUEL



- CNG vehicles are most cost-efficient today and will stay so in the near future
- Cost potential for biomethane not accurate here > the additional revenue generated from the GHG quota is not factored in:

TODAY, BIOMETHANE IN GERMANY HAS THE SAME PRICE AS CNG AND CAN EVEN BE CHEAPER

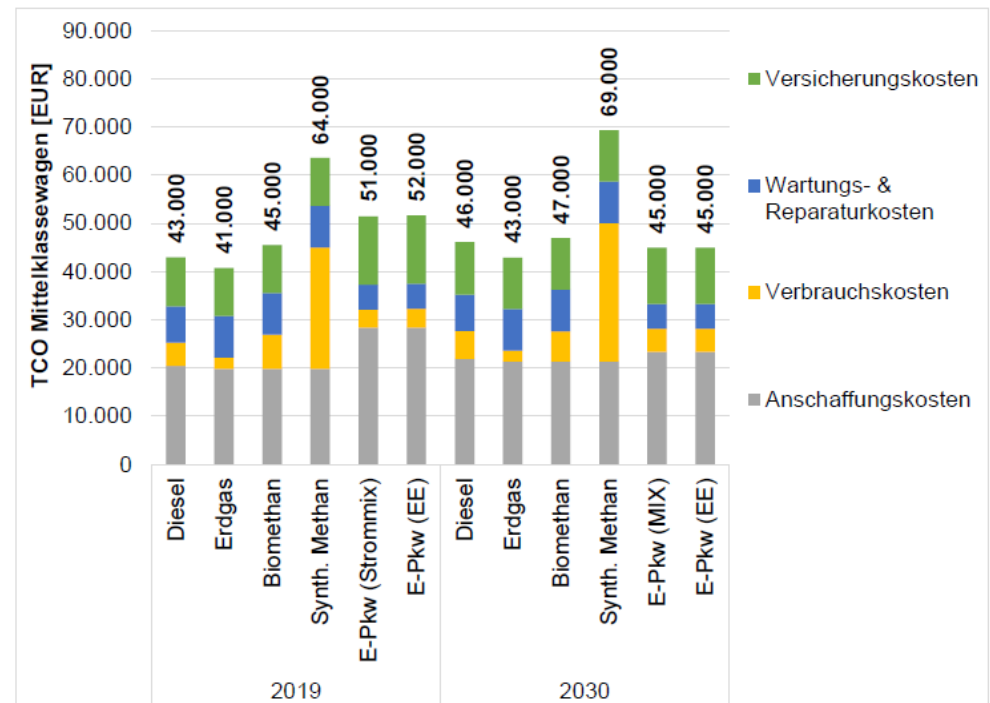


Abbildung 3-8: TCO eines Mittelklassewagens mit unterschiedlichen Antriebsalternativen im Vergleich

REQUIRED SET OF MEASURES FOR 100 % BIOMETHANE



1

ENABLING MORE
BIOMETHANE
SUPPLY

2

IMPLEMENTING
RED II EARLY

3

REMOVE
ADMINISTRATIVE
HURDLES

01 | ENABLING MORE BIOMETHANE SUPPLY



IMPORTING BIOMETHANE VIA GAS GRID

- Importing biomethane, PtG etc. via the gas grid to be counted towards the quota is still prohibited
- ECJ ruled in case C-549/15 in June 2017 (Sweden vs. E.ON Biofor Sverige)
- Only a service regulation explicating the GHG reduction mechanism needs to be changed

REMOVING THE “VEGAN”-POLICY

- Animal fats or oils have been excluded from the German biofuel quota since 2012
- Implementation resulted in blending prohibition + broad definition of fats & oils
- Biomethane for use in the fuel sector may come only from „vegan biogas plants“
- Out of > 25 biomethane plants running on waste & residue, the biomethane of only 4 qualify for use in the fuel sector



BlmSchG comprises ordinances for these topics since 2014 (§ 37d)

02 | IMPLEMENTING RED II EARLY



INTRODUCE NEW REFERENCE VALUES

- There were no reference values for > 90% of biomethane
- Individual calculations for all waste codes and feedstocks necessary
- New reference value differentiates between common feedstock (waste, maize, manure) & state of the art plants
- Manure may be awarded with a credit for avoided methane emission avoidance as a fertilizer

INCREASE ADVANCED BIOFUELS QUOTA

- Many of our European neighbors have already implemented the quota for advanced biofuels in 2018
- Most of them started at a quota of 0.5 – 1.0 %
- German quota starts at 0.05 % in 2020
- 100 % biomethane at all CNG filling stations in Germany would allow us to reach 0.5 % much quicker



Transportation of RED II into German national law possible in 2019
by amending the BImSchV

03 | REMOVE ADMINISTRATIVE HURDLES FOR ELECTRICITY & GAS AS A FUEL



- Current certification & verification systems are tailored to fluid biofuels, which are being processed right at refineries
- Grid bound energy sources such as electricity, biomethane H₂ & PtG that are decentrally produced and distributed in small parts. Experiences:
 - Bundling the quota through pre-suppliers or service providers not possible
 - No confirmations received for quota fulfillment in the course of the year
 - Therefore extensive documentation
 - Transferring surplus quantities to the following year almost not possible
 - Disclosure requirements to mineral oil companies (obligated parties) are too extensive



Transportation of RED II into German national law possible in 2019
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100% BIOMETHANE AT ALL CNG FILLING STATIONS IN 2020 IS POSSIBLE



500+ biomethane plants in Europe with 20+ TWh production



Biomethane from waste & manure has highest GHG saving potential



No additional costs for CNG stations or oil companies



Due to quota increase to 6 % in 2020 new fulfillment options need to be detected



**MORE THAN
1 MILLION TONS
OF GHG SAVINGS P.A.
IN 2020**



Response to Dieselgate: lowest NOx- and particle emissions





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