

Germany

Drivers and Policies

The development of advanced motor fuels in Germany is driven by two goals: (1) complying with European and international climate protection strategies and (2) reducing particulate matter and nitrogen oxide emissions in highly polluted metropolitan areas. The main public driver regarding policy in the transport sector is the revised European Union (EU) Renewable Energy Directive II (RED II). By the end of 2020, a fleet consumption limit of 95 grams of carbon dioxide (CO₂) per kilometer will apply to all newly registered passenger cars and a fleet consumption reduction of 37.5% in 2030 compared to the reference year (2021).^{1,2} The discussion about diesel engines has been ongoing since 2015. In February 2018, the Supreme Administrative Court allowed diesel-driving bans for cars up to Euro 5. The current trend shows that the greenhouse gas (GHG) quota alone (in force since 2015) will not meet the actual GHG reduction requirements of –40% by 2030 in comparison to 1990. In fact, the need for expanding advanced biofuels has been questioned by the increasing electrification of the fleet; further, the number of electric vehicles and plug-ins has increased since 2017 (see “Advanced Motor Fuels Statistics” [AMFS]), although the share in the total number of vehicles remains small. Exploiting synergies in combining biomass (BTx)- and electricity/power (PTx)-based technologies in context of SynBioPTx (e.g., by using bio-CO₂, using PT-hydrogen for product synthesis and fuel refining) offers new perspectives also in the transport sector.³ The German Energy Agency (dena) launched the Global Alliance Power Fuels in September 2018 with key partners from industry.⁴ In general, Germany’s public debate focuses on electric mobility and battery-powered vehicles. Only a committed policy to support advanced motor fuels would strengthen the market perspective, which is only partly reflected in the Government’s Mobility and Fuels Strategy⁵ and the national and European legislation. In January 2018, the Upstream Emissions Reductions (UER)⁶ ordinance, implementing EU legislation, was published.

¹ <https://eur-lex.europa.eu/eli/reg/2009/443/>

² https://ec.europa.eu/germany/news/20181218-co2-grenzwerte-autos_de

³ Naumann, K., Schröder, J., Oehmichen, K., Etzold, H., Müller-Langer, F., Remmele, E., Thuneke, K., Raksha, T., and Schmidt, P., 2019, Monitoring Biokraftstoffsektor. 4. überarbeitete und erweiterte Auflage, Leipzig: DBFZ (DBFZ-Report Nr. 11), ISBN 978-3-946629-04-7

⁴ <https://www.dena.de/en/newsroom/meldungen/dena-launches-global-alliance-power-fuels/>

⁵ <https://www.bmvi.de/SharedDocs/EN/Dossier/MKS/mobility-and-fuels-strategy.html>

⁶ https://www.bgbl.de/xaver/bgbl/start.xav?startbk=Bundesanzeiger_BGBl#_bgbl__%2F%2F%*5B%40attr_id%3D%27bgbl118005.pdf%27%5D__1520407817723

Depending on the development of the total amount of fuel used, the average specific GHG prevention and compliance with up to 1.2% GHG avoidance through UER, the absolute amount of biofuels will probably remain at a constant level until 2019.² From 2020 on, the mineral oil industry can apply UER measures to comply with legal requirements. The Government requires the mineral oil industry to reduce its GHG emissions by 6% from 2020 on, with a base year of 2010. Furthermore, the latest amendment to the German Emission Control Act⁷ has banned all double-counting and excludes animal fats from the quota eligibility. However, recent regulations expand the list, including bio-based, co-refined hydrated oils that have been produced sustainably, Power to X (PtX),⁸ and the use of electricity in electric vehicles (EVs).⁹ To decarbonise the transport sector, high priority has recently been given not only to electro-mobility for short-distance traffic and passenger cars, but also to the enforcement of compressed natural gas (CNG) infrastructure along the most important middle- and long-distance road networks. CNG mobility is expanding, as reflected in the Volkswagen Group's "TOGETHER – Strategy 2025."^{10,11} In addition, the Government strongly supports the use of liquefied natural gas (LNG) for heavy-duty transport and waterborne application. In 2016, the Federal Ministry of Transport and Digital Infrastructure (BMVI) provided €1 billion (\$1.2 billion US) in incentives for improving alternative fuelling infrastructure, implementing grants to buy EVs, and fostering R&D and demonstration in these fields, including the implementation of a competitive infrastructure for hydrogen and fuel cell technology.¹² A total of €300 million (\$339 million US) is available for the 2017–2020 programme, foreseeing the installation of 15,000 (normal and fast) charging stations. In addition, the BMVI established grants for public procurement to equip car fleets with EVs.¹³ Recently, the Government postponed its goal to have at least 1 million registered EVs by 2020 to 2022. Despite the new incentives, EV sales remain low (see AMFS) but have increased since 2017. Thus, Germany remains at risk for missing the 1 million-EV goal and its climate targets for road transportation. The EC's Alternative Fuel Infrastructure Directive foresees that until 2025, 208,000 charging stations will be required.¹⁴ In contrast, the National Platform E-mobility (NPE) considers

⁷ <https://www.gesetze-im-internet.de/bimschg/BJNR007210974.html>

⁸ <https://www.gesetze-im-internet.de/biokraft-nachv/BJNR318200009.html>

⁹ <https://www.gesetze-im-internet.de/emog/BJNR089800015.html>

¹⁰ <https://www.volkswagenag.com/en/group/strategy.html>

¹¹ <https://www.ngvglobal.com/blog/status-cng-mobility-germany-rising-0222>

¹² "National Strategy for the Expansion of Alternative Fuels' Infrastructure"

¹³ <https://www.bmvi.de/DE/Themen/Mobilitaet/Elektromobilitaet/Ladeinfrastruktur/Ladeinfrastruktur.html>

¹⁴ <https://t3n.de/news/ladeinfrastruktur-e-autos-2025-966132/>

70,000 public ac charging points, 7,100 public dc charging points and an additional 2.4 to 3.5 million private charging points in 2022.¹⁵ Currently, large cities have only one public charging station per 50,000 inhabitants. An investment of an estimated €1.6 billion to €2.5 billion (\$1.8 billion to \$2.8 billion US) would be required to create sufficient coverage. German natural gas (CNG) interest groups have supported the CNG infrastructure. Tax reliefs for CNG have been extended until 2024 and will decrease afterward. In 2019 and 2020, lorries powered by natural gas are exempt from road tolls. Tax exemptions on biofuels in the agricultural and forestry sector underpin a niche market and will be effective beyond 2018; those for liquefied petroleum gas (LPG) will be phased out by 2023.

Advanced Motor Fuels Statistics

Figure 1 shows the 2017 German fuel consumption for use in road transportation. The consumption of biofuels totaled 3.4 Mt, primarily low-level blends of biodiesel, hydrogenated vegetable oil, bioethanol, and biomethane.

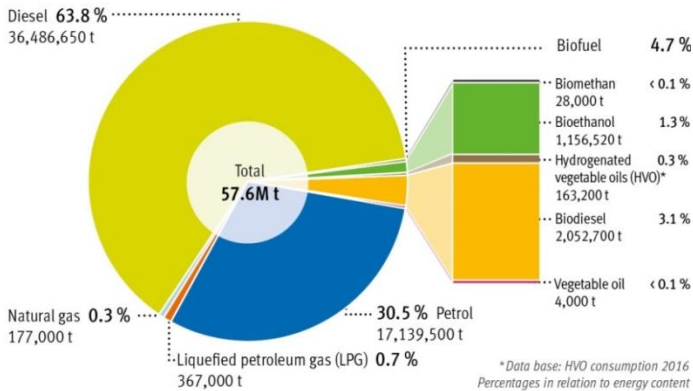


Fig. 1 Fuel Consumption in the Transport Sector in Germany, 2017

Source: FNR on the basis of BAFA, Destatis, DVFG, BDEW, BLE 2018¹⁶

¹⁵ Fortschrittsbericht 2018. Markthochlaufphase. Hg. v. Gemeinsame Geschäftsstelle Elektromobilität der Bundesregierung (GGEMO). Berlin. http://nationale-plattform-elektromobilitaet.de/fileadmin/user_upload/Redaktion/NPE_Fortschrittsbericht_2018_barrierefrei.pdf

¹⁶ Federal Office for Economic Affairs and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle), BAFA et al. (Federal Statistics Office [Destatis], DVFG [German LPG Association], the Federal Ministry of Finance [Bundesministerium der Finanzen, or BMF], Agency for Renewable Resources [Fachagentur Nachwachsende Rohstoffe e.V., or FNR]), February 2018.

Moreover, to a minor extent, biomethane is used for CNG. Lacking incentives, there is no market demand for E85 and pure biodiesel. Tables 1 and 2 show the 2010–2018 trends for biofuels and biofuel blends. The switch at the beginning of 2015 in the biofuels quota legislation from quantitative quotas to GHG-reduction quotas, and the settlement of a compromise on the EU level on the RED in 2015, has increased the average GHG reduction of biofuels on the German market to 81% in 2017.¹⁷ Table 3 shows the number of passenger cars in Germany by fuel type for 2015–2018. (In the tables, n/a means data not available.)

Table 1 Trends in German Biodiesel/FAME Sales, 2010–2018, in mt

Sale	2010	2011	2012	2013	2014	2015	2016	2017	2018
Blend	2,236	2,116	1,928	1,741	1,970	1,978	2,000	2,063	2,177
Pure biodiesel	0,293	0,097	0,131	0,030	0,005	0,003	0,001	n/a	n/a
Total	2,529	2,213	2,059	1,772	1,975	1,981	2,001	2,063	2,177

Table 2 Trends in German Bioethanol Sales, 2010–2018, in mt

Sale	2010	2011	2012	2013	2014	2015	2016	2017	2018
E85	0,018	0,019	0,021	0,014	0,010	0,007	n/a	n/a	n/a
Ethanol	1,028	1,054	1,090	1,041	1,082	1,049	1,047	1,043	1,079
ETBE	0,122	0,162	0,142	0,154	0,119	0,116	0,124	0,111	0,110
Total	1,165	1,233	1,249	1,206	1,209	1,171	1,167	1,154	1,189

Table 3 Number of Passenger Cars in Germany by Fuel Type on January 1, 2015–2018

Year	Gasoline	Diesel	LPG	CNG	EV	Hybrid	Plug-in
2015	29,837,614	13,861,404	494,148	81,423	18,948	107,754	X
2016	29,825,223	14,532,426	475,711	80,300	25,502	130,365	X
2017	29,978,635	15,089,392	448,025	77,187	34,022	165,405	20,975
2018	30,451,268	15,225,296	421,283	75,459	53,861	236,710	44,419

LPG = liquefied petroleum gas according to European fuel quality standard EN 589.

CNG = compressed natural gas according to German fuel quality standard DIN 51624.

EV = electric vehicle.

X = values not comparable.

Source: KBA 2019¹⁸

¹⁷ https://www.ble.de/SharedDocs/Downloads/EN/Climate-Energy/EvaluationAndProgressReports2017.pdf;jsessionid=E12E6C1FC9997802159DF7A542FF49BD.1_cid335?__blob=publicationFile&v=3

¹⁸ KBA (Kraftfahrt-Bundesamt; Federal Motor Transport Authority), 2019, https://www.kba.de/DE/Statistik/Fahrzeuge/Bestand/j%C3%A4hrlich/2019_b_barometer.html?nn=2084378

A total of 56.5 million vehicles, including 4.4 million motor bikes, were registered in Germany as of January 1, 2018,¹⁹ along with 46.5 million (82%) passenger cars, 3 million trucks, 2.2 million towing vehicles, 79,400 buses, and 296,000 other vehicles.

Research and Demonstration Focus

Public funding for alternative motor fuels on the national scale is supported by the BMVI²⁰ (infrastructure, e-mobility, LNG, CNG, jet fuel, “National Strategy to Extend the Infrastructure for Alternative Fuels”), the Federal Ministry of Education and Research (BMBF)²¹ (PtX; “Kopernikus Projects”), and the Ministry of Economic Affairs and Energy (BMWi),²² focusing on eFuels in the “Energiewende im Verkehr” programme, including a total funding of €87 million (\$97.7 million US).²³ Under the Renewable Resources Funding Scheme of the BMEL,²⁴ 23 R&D projects have received funding of €6 million (\$6.74 million US) in 2018. Novel routes for the production of fuels or fuel additives and the adaptation of internal combustion engines to multiple fuels are examples of the main topics. Because of an adverse European framework for biomass-based fuels, increased funding is not envisaged.

Outlook

Energy policy and research and innovation frameworks at the EU and international level have the potential to strengthen the advanced motor fuel market, if consensus is reached that all measures are required to meet CO₂ reduction targets. But new EU legislation, mainly the RED II, also presents risks to alienate fuel producers and the related market. Measures discussed above to promote e-mobility, CNG, and LNG will have a positive impact on the market in general but not necessarily for advanced biofuels. Further R&D activities (e.g., reducing the GHG emissions of biofuels to make them compatible with the RED II) are needed to meet persistent challenges for the near future.

Additional Information Sources

- Bundesverband der deutschen Bioethanolwirtschaft, www.bdbe.de
- Bundesverband Regenerative Kraft, www.brm-ev.de/en
- Verband der Deutschen Biokraftstoffindustrie, biokraftstoffverband.de

¹⁹ https://www.kba.de/DE/Statistik/Fahrzeuge/Bestand/FahrzeugklassenAufbauarten/b_fzkl_zeitreihe.html

²⁰ <https://www.bmvi.de/EN>

²¹ <https://www.bmbf.de/en>

²² <https://www.bmwi.de/Navigation/EN/Home/home.html>

²³ <https://www.energieforschung.de/forschung-und-innovation/energiewende-im-verkehr>

²⁴ <https://www.bmel.de/EN>