IEA-Advanced Motor Fuels
ANNUAL REPORT 2015

AUSTRIA

Austria

Introduction

Austria is a small, Central European country with a territory of 84,000 km² (8.4 million ha) and a population of 8.6 million, which accounts for 1.7% of the European Union (EU) 28 population (EUROSTAT 2015[1]).

The gross domestic product (GDP) in Austria was worth €337.16 billion[2] in 2015 (0.50% of the world economy). The automobile industry is one of the most important industrial sectors in the country, with a GDP of €35 billion. In particular, it features a strong component supplier industry with global competence in the fields of engine development, lightweight construction, and clean mobility. International companies rely on Austria as a research and development (R&D) location. More than 450,000 employees work in the production and development of drivetrains. Thus, every ninth job is connected to the automotive industry. The development of advanced propulsion systems and their energy carriers has become a key factor in the country's competitive capability in recent years.

In 2014, the final quantity of energy consumed in Austria was about 1,063 petajoules (PJ), which is a decrease from that in 2013 (1.122 PJ).[3] The transport sector with 34% (367 PJ) has the highest share of final energy consumption, followed by the production sector with 30% (315 PJ). This distribution did not change much within the last two decades.

Contrary to general expectations, global growth did not take off in 2014. With 3.4%,[4] the global economy growth remained at about the same level as the two years before. In Austria, the economy grew by just 0.8% in 2015 (0.3% in 2014), according to the Austrian Institute of Economic Research (WIFO). Thus, the last spurt of economic growth was recorded in 2011, which was followed by three sluggish years. Austria had difficulty in joining the successively brighter trend. This was primarily due to low investment on the part of businesses consequent to uncertainties regarding the development of domestic and foreign sales markets, diminished consumption by private households as a result of a moderate increase in real incomes, and a lack of

1 http://ec.europa.eu/eurostat/data/database.
2 http://www.statistik.at/web_de/statistiken/wirtschaft/volkswirtschaftliche_gesamtrechnungen/index.html.
3 http://www.statistik.at/web_de/statistiken/energie_und_umwelt/energie/energiebilanzen/.
4 http://www.statista.com/statistics/273951/growth-of-the-global-gross-domestic-product-gdp/.

any strong foreign trade impetus. Plunging fuel prices slowed down inflation. Inflation (consumer price index) in Austria was 0.9 % in 2015. Housing, catering services, and food were the foremost contributors to inflation, according to the WIFO.

Fuel consumption declined by 2.5% in 2014 for petrol and by 1.5% for diesel over the year. The sale of petrol has been decreasing for years due mostly to a gradual increase in the efficiency of cars, while diesel consumption reflects economic growth to a greater extent (Figure 1).

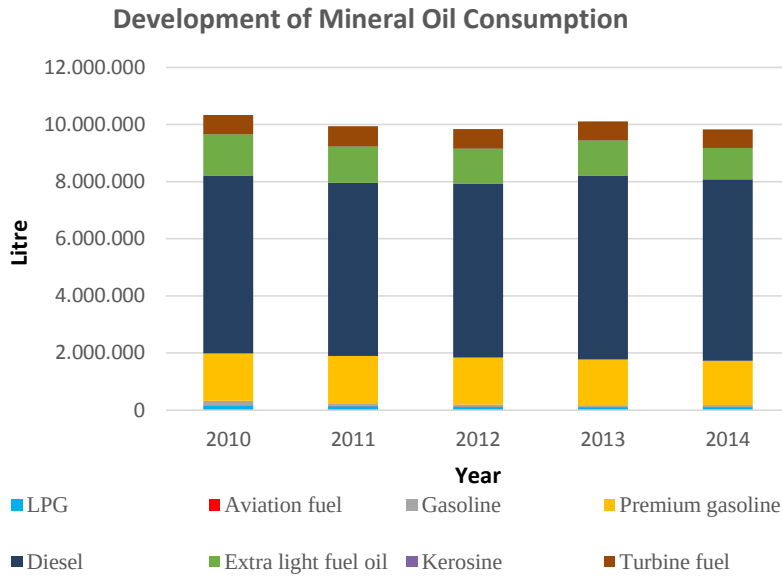


Fig. 1 Consumption of Mineral Oil by Type of Fuel in Austria, 2010–2014
(Source: Mineralölbericht 2015)

In 2014, the overall petroleum consumption, excluding the petrochemical industry, amounted to 10.6 million tons (down 2.75% from 2013). Domestic demand for natural gas shrank by 8% to 7.4 billion cubic meters (m^3), the result of a major reduction in electricity generation by gas-fuelled power plants. In Austria, the companies OMV and RAG are prospecting for and extracting crude oil and natural gas in economically relevant quantities at the Vienna Basin, and in the molasses zone of Upper Austria and Salzburg.

Oil production rose slightly in 2014, while natural gas production declined over that in 2013. Specifically, overall annual crude and natural gas liquids (NGL) production increased by 27,678 tons to 944,826 tons (a change of +3% over 2013). Crude production, excluding NGL, accounted for 883,016 tons (a change of +4.1% over 2013). Crude oil imports into Austria — sourced from many countries, including Kazhakstan, Libya and Saudi Arabia — totaled 7.5 million tons in 2014. Altogether, crude for Austria was sourced from 17 countries. Processing is carried out at the OMV refinery in Schwechat, the only refinery in Austria. In 2014, natural gas extraction (including petroleum gas) ran to 1.23 billion m^3, of which 992 million m^3 was natural gas (80%) and 243 million m^3 was petroleum gas. Natural gas imports declined by 10% to 41.8 billion m^3; exports dropped by 15% to 34.4 billion m^3. After balancing imports and exports, 7.5 billion m^3 remained in Austria.

The OMV refinery processed 8.6 million tons of crude in 2014 (8.7 million tons was processed in 2013) at a capacity utilization rate of 90%.
Ten percent of the processed crude came from domestic production and about 90% from abroad. From this input, the refinery produced 39% diesel, 21% petrol, 14% fuel oil (extralight, light, and heavy), 11% petro-chemical basics, 8% jet A-1 fuel, 4% bitumen, and 3% other products. Diesel and petrol had biogenic fuel components admixed to them; altogether, about 234,000 tons of fatty acid ethyl ester (FAME) and 82,000 tons of ethyl alcohol. Total consumption of petroleum products in Austria from liquefied petroleum gas (LPG) to petrol, gas oil, fuel oils and bitumen, but excluding petrochemical basics, was 10.6 million tons in 2014 (down 2.75% from 2013).

Austrians consumed almost 8 million tons of petrol and diesel (down 1.7% from 2013), or about 9.65 billion L (including biogenic components), in 2014. Of these, 2.15 billion L was petrol and 7.5 billion L was diesel (Figure 2). Petrol consumption declined by 2.5% from that in 2013, while diesel recorded a slighter reduction of 1.5%. The amount of extralight fuel oil consumed was 1.1 million tons, or 10.7% less than in 2013 (1.3 billion L). Extralight fuel oil continued its downward trend: sales were down by 17% from those in 2013.

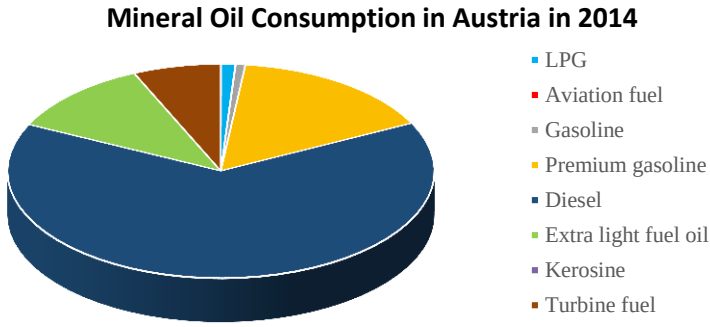


Fig. 2 Austria's Mineral Oil Consumption in 2014
(Source: Mineralölbericht 2015)

Greenhouse Gas Emissions in Austria from 1990 until 2020

In 2013, greenhouse gas (GHG) emissions in Austria amounted to 79.6 million tons of carbon dioxide equivalents (CO_2e). The GHG emissions were thus 0.2% (0.2 million ton) below the levels of 2012. The decreasing trend observed since 2005, the year with the highest emission levels, has thus continued. The decrease is mainly due to the decrease in emissions in the energy production sector. Total emissions in Austria in 2013 were 1.2% above those in 1990. Since 2013, there has been no overall national target for all GHG emissions, since a distinction is made between emissions falling under the emission trading system (for which there is only one European target) and those not included in the system. For Austria, the emission reduction to be achieved by 2020 (relative to 2005) is 16%.

Sector Emissions and Targets of the Austrian Climate Strategy

The main sources of GHG emissions in 2013 were in the following sectors: energy and industry (45.6%), transport (28.0%), buildings (10.5%), and agriculture (9.7%). GHG emissions in the transport sector in 2013 amounted to about 22.3 million tons of CO_2e, an increase of 1.0 million ton (+ 4.7%) compared with 2012. This can be attributed to a sharp increase in fuel sold (+ 4.4%) and a slight decrease in biofuel sold (in its pure form and blended) of 1.4%. Since 1990, a 61% increase in transport emissions has been observed, mainly due to an increase in vehicle kilometers travelled and a strong increase in the net amount of fuel exported in vehicle tanks.[5]

[5] http://www.umweltbundesamt.at/fileadmin/site/publikationen/REP0568.pdf.

Quantities of Biofuels in Austria

Since October 2005, biofuels have been placed on the market in Austria primarily by mixing biodiesel with diesel, and, since October 2007, by mixing bioethanol with fossil petrol grades. By October 1, 2009, the "substitution obligation" to substitute biofuels for other fuels in accordance with fuel regulations had increased to 5.75%. Since the introduction of the Austrian Fuel Regulation in 2012, the country has been obligated to substitute at least a share of 3.4% of fossil gasoline fuels and at least 6.3% of fossil diesel fuels by using biofuels. In addition to blending fuels, municipal and business vehicle fleets are obligated to migrate to pure biofuels or to increase their use of biofuels by more than 40%.

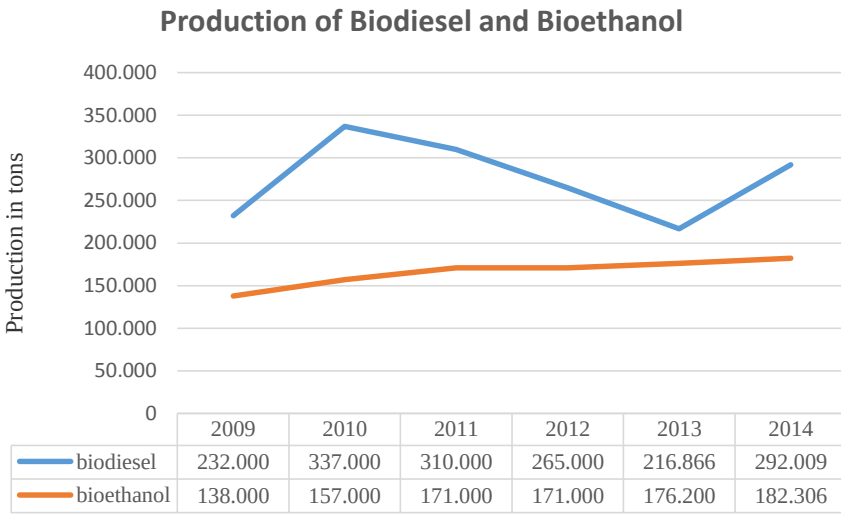
In 2014, a high percentage of fossil fuels had been substituted by the use of biofuels. Compared to 2013, the amount of biofuels used has risen, which can also be attributed to better detection of these fuels in comparison to 2013. Overall, the consumption of gasoline compared to 2013 declined slightly. For 2014, only those amounts of biofuels that were quantified by appropriate sustainability certificates were taken into account. Until mid-2014, there was no legal obligation for verifying the sustainable use of pure biofuels (e.g., 100% biodiesel [B100]) by means of certificates. Therefore, until mid-2014, the amounts of B100 without certificates of proofed sustainability were not taken into account for the calculation of the substitution target. Due to the significantly higher detection of biofuels in pure use, the substitution ratio strongly increased compared to 2013.

In total, about 576,533 tons of biodiesel, 87,872 tons of bioethanol, and 16,028 tons of vegetable oil were used in Austria in 2014.[6] Over the course of calendar year 2014, the required substitution target of 5.75% (measured by energy content) was significantly exceeded; the final was 7.7%. Thus, the substitution rate in comparison to 2013 (6.2%) clearly increased. Austria, together with Germany, France, and Sweden, is still located at the top of the EU 28.

Biodiesel and Bioethanol in Austria

In 2013, 6,107,678 tons of diesel was sold, of which 5,869,745 tons was blended with 7.0 vol% biodiesel (see Figure 3).

[6] https://www.bmlfuw.gv.at/umwelt/luft-laerm-verkehr/verkehr-laermschutz/alternatkraftstoffe/biokraftstoffbericht.html.



	2009	2010	2011	2012	2013	2014
biodiesel	232.000	337.000	310.000	265.000	216.866	292.009
bioethanol	138.000	157.000	171.000	171.000	176.200	182.306

Fig. 3 Trends in the Production of Biodiesel and Bioethanol in Austria, 2009–2014
(Source: Biokraftstoffbericht 2015)

In 2014, 292,009 tons of biodiesel were produced in Austria by nine producers. This amount covers about 56% of the domestic consumption of biodiesel, which represents about 12% more than in 2013. In 2013, a total of 1,623,904 tons of gasoline were sold. All gasoline fuels contained at least 4.60 vol% of bioethanol. Therefore, with the addition of the quantities marketed as "superethanol," 87,872 tons of bioethanol were sold during 2014. The total demand of bioethanol for biofuel substitution can be covered by the production plant at Pischelsdorf (Lower Austria), which can annually process up to 191,000 tons of grain into fuel. In 2014, 182,306 tons of ethanol (about the same as in 2012 and 2013) was processed from using 56% maize and 44% grain.

Vegetable Oil and Biogas in Austria

Biogas produced from biomass is almost entirely used in Austria for the generation of electricity and heat. At the beginning of 2015, Austria contained 384 biogas plants with a maximum capacity of 113.9 MW in total. Currently, 7 biogas plants supply purified biogas directly into the natural gas grid. This enables the transport of the produced biogas over long distances. According to experts, the sum of biogas produced in Austria amounts to between 387,000 and 607,000 tons. In 2014, the total quantity of vegetable oil used for agricultural applications was 769 tons. Furthermore, the quantity of vegetable oil used for highway transport amounted to 15,259 tons.

In addition to blending bioethanol and biodiesel into fossil fuels, Austria tries to force the pure use of BD100, bioethanol (E85 – "superethanol"), and vegetable oil, and a significant increase in the use of biogas. According to the National Energy Strategy, the most effective measure was the introduction of E10 and B10 following the approval of the corresponding European Standard for these fuels. Using biofuels achieved savings of about 1.9 million ton CO_2e in 2014 (1.7 million ton CO_2e in 2013).

Fleet Distribution and Number of Vehicles in Austria

As of December 31, 2015, 8.6 million people were living in Austria, and 4.7 million passenger vehicles were on Austrian roads. According to Statistics Austria, a total of 6,545,878 vehicles (including 4,748,108 passenger cars) were registered in Austria as of December 31, 2015. Newly registered motor vehicles totaled 401,039 in 2015 (a decrease of 1.4% in comparison to 2014). Newly registered passenger cars accounted for 308,555 vehicles — a decrease of 1.7% from 2014.

A study[7] conducted by a Viennese insurance group about consumers' preferences for buying a new car, pointed out that 44% of all car owners plan to buy a new car within the next two years, but 80% of them would not pay more for eco-mobility. The preferences are diesel (50%) and gasoline (30%), followed by hybrid electric vehicles (HEVs) (15%) and battery electric vehicles (BEVs) (5%).

However, an ongoing trend toward advanced propulsion systems can be seen in the numbers of vehicles on Austrian roads in 2015 (Figure 4). The majority of these vehicles are flex-fuel vehicles (FFVs, powered by gasoline or ethanol [E85]) and HEVs (with a gasoline engine and an electric motor). Because of significant progress in the electrification of the drivetrain, it is foreseeable that the number of HEVs will strongly increase within the next years.

In addition to HEVs, BEVs are very popular in Austria. In numbers, these total 15,862 plug-in hybrid electric vehicles (PHEVs), which feature an eco-motor via an internal combustion engine (93% gasoline/7% diesel). The number of BEVs increased to 5,032 in 2015 (3,032 in 2014). The number of vehicles driven by compressed natural gas (CNG) and LPG, (including

[7] https://www.generali.at/fileadmin/media/pdf/Presse/user_upload/20150522_Grafiken_Autostudie_2015.pdf.

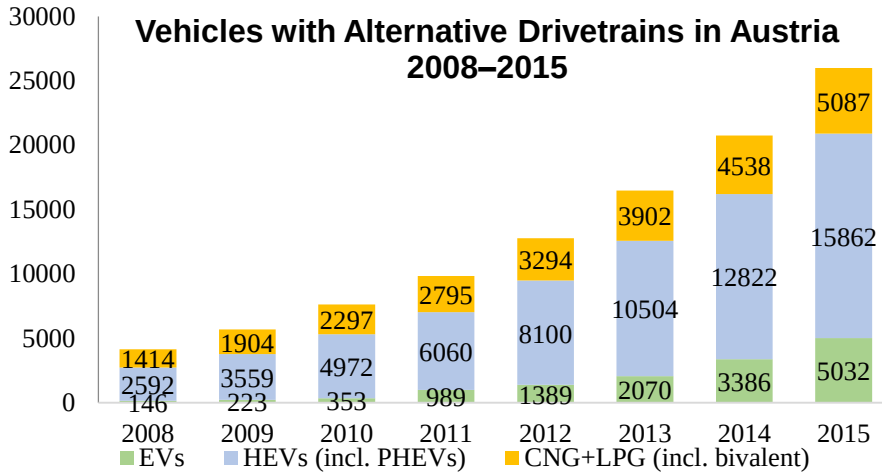


Fig. 4 Trends in Vehicles with Alternative Drivetrains in Austria, 2008–2015

bivalent ones) rose to 5,087. The number of vehicles driven by hydrogen rose to 6.[8]

Taking into account the absolute number of new registrations based on alternative drivetrains (5,901 vehicles), their proportion of total registrations counts for 1.9% of all new registered vehicles. Table 1 shows the development of the fleet distribution of passenger cars by drivetrains between 2013 and 2015.

Development of Filling Stations

Generally, established trends in the saturated domestic petrol market of petrol stations continued in 2015. By the end of 2015, Austria had a total of 2,622 publicly accessible petrol stations. Austria has the lowest prices for diesel and gas fuels in Europe. As an annual average, the price of Eurosuper at the petrol station is €1.35/L; for diesel, the price is €1.3/L. The EU average continued to be clearly above the Austrian average, by €.19/L for Eurosuper and by €.10/L for diesel.

[8] http://www.statistik.at/web_de/statistiken/energie_umwelt_innovation_mobilitaet/verkehr/strasse/kraftfahrzeuge_-_bestand/index.html.

Table 1 Fleet Distribution of Passenger Cars by Drivetrain in Austria, 2013–2015

Drivetrain	2013	2014	2015
Gasoline	1,997,302[a]	2,004,724	2,012,885
Diesel	2,621,133	2,663,063	2,702,922
Electric	2,070	3,386	5,032
LPG	1	1	1
CNG	2,219	2,397	2,475
H_2 (hydrogen)	0	3	6
Bivalent gasoline/ethanol (E85)	6,397	6,380	6,254
Bivalent gasoline/LPG	250	279	311
Bivalent gasoline/CNG	1,432	1,865	2,300
Hybrid gasoline/electric	10,049	12,232	14,785
Hybrid diesel/electric	455	591	1,077
Total	4,641,308	4,694,921	4,748,048

[a] Includes gasoline/ethanol (E85).

Source: Statistics Austria, KFZ Bestand as per end of 2012 through December 31, 2015.[9]

Table 2 shows the number of filling stations in Austria. The number of natural gas filling stations has increased in recent years. Today, there are approximately 171 public filling stations in Austria that have CNG dispensers. In Europe, Austria is currently the champion in terms of number of CNG filing stations per size of the country; it offers the best CNG coverage in Europe.

Policies and Legislation

Since 2011, an increase in the mineral oil tax for conventional vehicles has been in effect — €0.04/L for gasoline and €0.05/L for diesel. As compensation for drivers, the commuting allowance was increased by 10%. In Austria, pure biofuels are exempt from the tax.

Since December 2010, the tax rates have been as follows for 1,000 L of fuel:

- For gasoline containing a minimum of 46 L of biofuel and a maximum of 10 mg/kg of sulphur, the tax is €482 ($540 US); the tax is €515 ($577 US) for gasoline without this.

[9] http://www.statistik.at/web_de/statistiken/energie_umwelt_innovation_mobilitaet/verkehr/index.html.

Table 2 Filling Stations for Alternative Fuels and Conventional Gas Stations in Austria, 2012–2015

Filling Stations	2012	2013	2014	2015
CNG (public)	146	175	174	171
LPG	32	36	38	38
Biogas	1	3	3	3
E85	28	33	33	29
Electric vehicle (public charging station, Level 2 AC)	1,060	1,160	1,449	1,705
H_2 (public station)	1	1	1	3
Vegetable oil	19	20	20	20
Conventional (public)	2,575	2,515	2,640	2,622

Source: Fachverband der Mineralölindustrie, Mineralölbericht 2015[10]

- For diesel containing a minimum of 66 L of biofuel and a maximum of 10 mg/kg of sulphur, the tax is €397 ($444 US); the tax is €425 ($476 US) for diesel without this.

Starting in July 2008, the Normverbrauchsabgabe (NoVA) — a uniquely bonus/malus system for CO_2 emissions — was introduced for taxing the acquisition of new vehicles. As of March 2014, the calculation of the NoVA has been in accordance with the CO_2 emissions of the car. New cars that emit less than 90 g of CO_2/km do not have to pay the NoVA. The excess amount (i.e., amount over 90 g) is divided by 5 and gives the NoVA tax rate. For vehicles with CO_2 emissions above 250 g/km, the NoVA increased by 20€/g of CO_2.

Austria is pushing strongly for eco-mobility. States and communities offer many promotions such as purchase premiums. Many insurance companies provide a discount of 10% to 20% for electric vehicles. For companies, associations, and non-profit organizations, there is support for 30% of the environment-related investment costs for the acquisition and conversion.

Until the end of 2015, vehicles that run on alternative drivetrains (hybrids, those using fuels E85, CNG, LPG, or H_2), receive a tax reduction of €600 ($639 US). Since January 1, 2013, HEVs and range extender vehicles have been subject to the motor-dependent insurance tax, but only for the engine

[10] https://www.wko.at/Content.Node/branchen/w/Mineraloelindustrie/fachverband-mineraloelindustrie-mineraloelbericht-2014.pdf.

power of the combustion engine; BEVs are exempt from the motor-dependent insurance tax.

Federal Funds and Supporting Programs

Pushing advanced propulsion systems forward in Austria is done by exposure through promotions and funding programs, as well as increasing the attractiveness of eco-mobility by regulatory measures.

Each year, Austria is obligated to record all energy-related research, development, and first-of-its-kind demonstration projects and supporting programs financed by public funds. The results of this annual survey emphasize the importance of HEVs and EVs for Austria.
Since 2007, the Austrian government has more than tripled public funding in the energy research, development and demonstration (RD&D) sectors, adopted a new energy research strategy, and launched several priority programs. In 2014, Austria's public expenditures for energy-related R&D amounted to €143.1 million; an increase of 14.9% over expenditures in 2013 and representing an all-time high (Figure 5). The research areas of energy efficiency (43.1%), smart grids and storage (24.7%), and renewables (22.7%) define the priorities of publicly financed energy research within Austria.

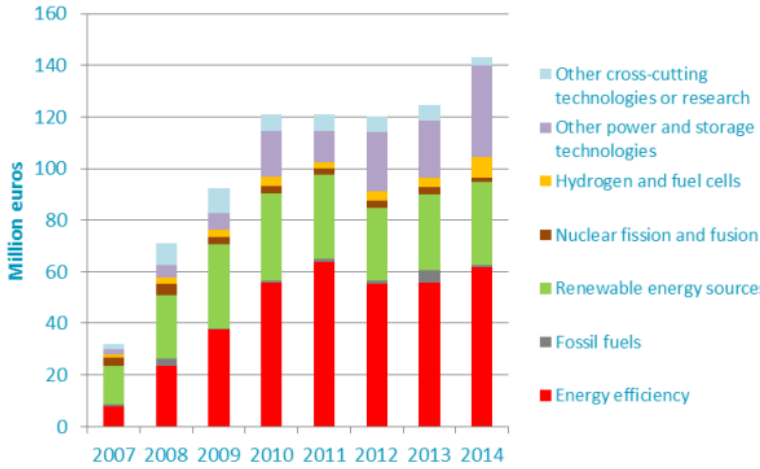


Fig. 5 Austria's Public Expenditure for Energy-related R&D in 2014
(Source: BMVIT 2015)[11]

[11] http://www.nachhaltigwirtschaften.at/iea_pdf/201512_energieforschungserhebung_2014_praesentation_en.pdf.

The subcategories with the highest expenditures in 2014 (shown in millions of euros) were electricity transmission and distribution (€21.5), efficient residential and commercial buildings (€17.8), communities and smart cities (€13.4), photovoltaics (€11.5), energy storage (€11.5), biofuels (€9.4), hybrid and electric vehicles (€8.5), energy efficiency in industry (€8.1), solar heating and cooling (€5.1), and fuel cells (€5.1).

About 80% of these expenditures were provided by governmental authorities; the remaining part came from publicly funded research institutions and universities provided in equity capital. Seventy-one percent of the funds were used for applied research, and 17% for experimental development. Expenditures for first-of-its-kind demonstration amounted to 7% in 2014. Basic research represented a small, yet very important, portion of 5%. A strong decrease in expenditures to a moderate level can be seen in terms of fossil fuels, where €616,533 were used for this area in 2014 (−87.7% in comparison to 2013).

With €9.4 million in 2014, biofuels funding volume increased by €1 million in comparison to 2013. The high share of "unallocated," which can be seen in Figure 6, came basically due to many integrated projects and financing of a competence center Bioenergy 2020+.

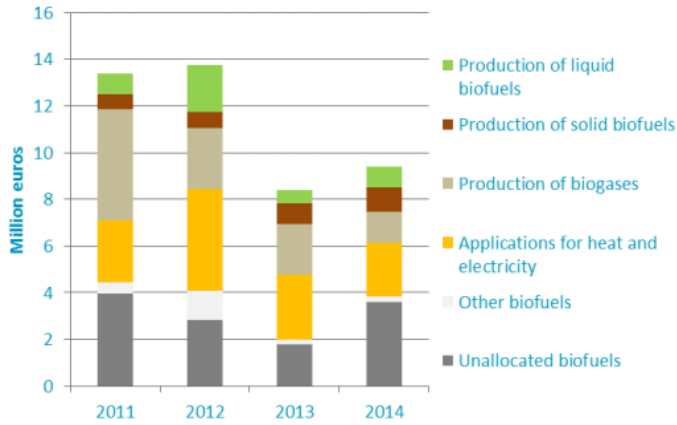


Fig. 6 Development of Energy Research Public Expenditure – Bioenergy, 2011–2014
(Source: BMVIT 2015)[12]

[12] ibid.

Austria has some programs that fund and support the implementation of advanced fuels. One launched in 2004, called "klima:aktiv Mobil," is Austria's action program for mobility management to reduce CO_2 emissions and to promote environmentally friendly and energy-efficient mobility. The program provides free advice and financial support to help businesses, fleet operators, and property developers, as well as cities, municipalities, regions, and tourism operators to develop and implement sustainable mobility projects and transport initiatives.

In order to develop a sustainable energy system, the **"**e!MISSION.at" program was funded in 2012 by the Climate and Energy Fund. It supports innovations that make a significant contribution toward protecting the climate and increasing efficiency. The focus of funding is on energy efficiency, renewable sources of energy, smart energy systems, and eco-mobility.

In 2006, the Federal Ministry for Transport Innovation and Technology (abbreviated BMVIT) established the Austrian Association for Advanced Propulsion Systems (A3PS) as a strategic public-private partnership for close cooperation among industry, research institutions, and the Ministry, with the goal of developing and launching alternative propulsion systems and fuels.

"Mobility of the Future,"[13] Austria's national transportation research funding program (2012–2020), was developed and adopted by BMVIT. It is a mission-oriented R&D program to help Austria create a transport system designed to meet future mobility and social challenges by identifying and refining middle-to long-term technological improvements. It includes four complementary areas in which different research themes are addressed: passenger transport; transport infrastructure; vehicle technologies, and freight transport.

A great deal of R&D took place in Austria in 2015. The following are excerpts from ongoing R&D:

- *Fuel4Me*.[14] This project aims at developing and demonstrating an integrated and sustainable process for continuous biofuel production from microalgae, thereby making the second generation of biofuels competitive alternatives to fossil fuels. One of the largest nonuniversity research institutions in Austria — JOANNEUM RESEARCH Forschungsgesellschaft mbH — is performing the sustainability

[13] http://www.bmvit.gv.at/en/service/publications/downloads/mobility_of_the_future.pdf.
[14] http://www.fuel4me.eu/.

assessment of the Fuel4Me project, as well as participating in the communication and dissemination of project results.

- *Flex fuel reformer for fuel cell systems*.[15,16] This Technical University of Graz project examines the decentralized production of high purity hydrogen from locally available hydrocarbons by using methane and biogas. Output of this project is a decentralized small-scale production unit for pressurized pure hydrogen based on different renewable hydrocarbons.
- *CO_2 use.* Carbon dioxide, which is purified from flue gas, is used for the cultivation of phototrophic microorganisms (e.g., microalgae). From the produced biomass, the product (e.g., an alternative for fossil plastics) will be isolated and the residual biomass will enter a biogas process. Via anaerobic digestion, energy (biogas) is produced and the nutrients will be made available. These nutrients are recirculated for algae cultivation. This national project is led by EVN AG (an Austrian-based producer of electricity).
- *Winddiesel.* Funded by the Austrian Climate and Energy Fund, this project is the first leap to convert wind power to diesel. For this purpose, wind power is converted by electrolysis to hydrogen; the hydrogen is then added to synthesis gas from a biomass gasifier. The primary goal of the project is to develop a slurry reactor that is suitable to be operated between 30% and 100% load. Via change of the syngas composition of an attached gasification plant, hydrogen generated from excess wind power plants can be injected and more Fischer-Tropsch (FT) diesel can be produced. Additional R&D is under way in parallel to this design in order to minimize the development risk essential.
- *GreenFly.* This project is funded by BMVIT under the Austrian aviation program TAKE-OFF. In the long term, the aviation industry will need liquid hydrocarbons as fuel. One technology to produce renewable kerosene is the FT technology in which the waxes are converted over hydroprocessing into kerosene and diesel. The goal of this project is to develop a CO2-neutral engine for small airplanes and unmanned aerial vehicles (UAVs) based on an existing rotary engine and to supply this engine with synthetic kerosene from biomass.
- *Barrel/day*. Funded by the Austrian COMET program within Bioenergy 2020+, Technical University Vienna and Bioenergy2020+ have been working since 2004 on the FT synthesis, using syngas from dual fluidized bed steam gasification. In this project, the FT slurry reactor is scaled up from lab scale to 1 bbl/day, and long-term tests using syngas

[15] http://www.h2fc-fair.com/hm14/images/tech-forum-presentations/2014-04-10-1030.pdf.

[16] http://www.tugraz.at/en/institute/ceet/forschung/fuel-cell-research/.

from wood are performed. The main goal is to get enough data so that at the next step, a demonstration plant can be realized.

- *Hydrogen from biomass.* This project is funded by the Austrian COMET program within Bioenergy 2020+. Renewable hydrogen can be produced by several pathways, but biomass gasification is at the moment one of the most economic ones. Bioenergy 2020+, together with Technical University Vienna, is investigating two different approaches for hydrogen production from wood. One is based on polygeneration, where only a slip stream of syngas is converted to hydrogen and the rest of the syngas is used for heat and power production. The polygeneration concept is an excellent option for producing decentralized hydrogen on demand. The second approach is the maximization of hydrogen for large-scale applications (e.g., refineries). Both pathways are being investigated experimentally and by simulation approaches.

Austria is quite involved in the development and implementation of advanced biofuels. Austrian companies working in that field include:

- Bio Energy International AG (BDI) has again received several orders for biodiesel plants.
- Vogelbusch delivers distillation technology for ethanol plants (Inbicon).
- Lenzing AG is a leader in fiber technologies.
- Repotec provides plants for gasification (GoBiGas).
- Agrana Group, a food company, produces ethanol fuel.
- Andritz supplies treatment plants for the digestion of cellulose (POET, Biochemtex).
- Ecoduna offers a technology for algae cultivation.

Implementation: Use of Advanced Motor Fuels

Two of the main aims of Austrian energy policy have been to reduce the country's dependence on energy imports and to strengthen the security of its supply. The share of renewable energy production increased from about 69% in 2000 to about 78% in 2014, of which primary energy production from renewables other than biomass and from biomass and biogenic waste are distributed nearly equally. Bioenergy and waste now provide about 20% of the total prime energy supply, an exceptionally high share by international comparison.

In 2014, alternative fuels used in the transportation sector represented approximately 9.02% (8.35% in 2013) of the fuel used, as shown in Figure 7. The predominant fuel consumed was diesel blended with 7.0 vol% biodiesel, followed by gasoline with 4.60 vol% bioethanol. The number of

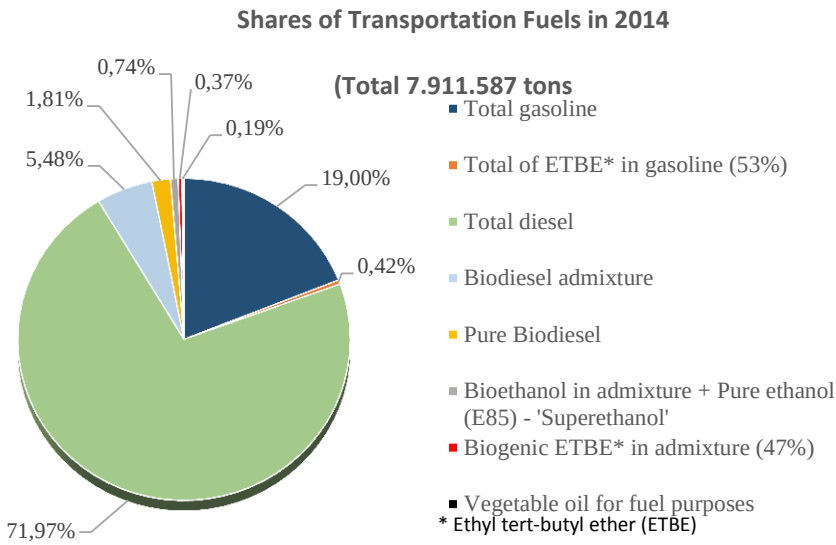


Fig. 7 Shares of Transportation Fuels in Austria in 2014
(Source: Lebensministerium 2015)[17]

registered vehicles with alternative drivetrains increased in 2014. As shown in Table 2, the number of alternative fuel stations is still increasing, with CNG and electrical charging stations being notable.

Outlook

Austria has more than tripled public funding for energy RD&D since 2007, and the government continues to try to increase energy RD&D funding. The country aims to enhance its domestic energy security; the International Energy Agency (IEA) says that it should increase its energy efficiency and produce more natural gas domestically. In a report *Energy Policies of IEA Countries: Austria 2014 Review*,[18] the IEA encourages Austria to start shale gas exploration activities to increase its energy security and reduce its dependence on Russian imports. The introduction of a law in Austria obliges companies to have a detailed environmental inspection before each planned project, but this raises costs. The Austrian energy group OMV has abandoned plans to produce shale gas in Austria because addressing all

[17] https://www.bmlfuw.gv.at/umwelt/luft-laerm-verkehr/verkehr-laermschutz/alternatkraftstoffe/biokraftstoffbericht.html.
[18] http://www.iea.org/Textbase/npsum/austria2014sum.pdf.

environmental concerns related to fracking makes it not viable economically.

Additional References

Relevant institutions and programs:

- Austrian Ministry for Transport, Innovation and Technology, http://www.bmvit.gv.at/
- Statistic Austria, www.statistik.at
- The Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, https://www.bmlfuw.gv.at/en.html

Benefits of Participation in the AMF TCP

Austria benefits in a number of ways by participating in the AMF TCP. Membership offers great opportunities with regard to international contacts and the exchange of knowledge, information, and results that can support domestic authorities. Participating in this TCP gives Austria wider and easier access to information and analyses. Thus, it helps to raise awareness of advanced motor fuel issues and areas that need further development.