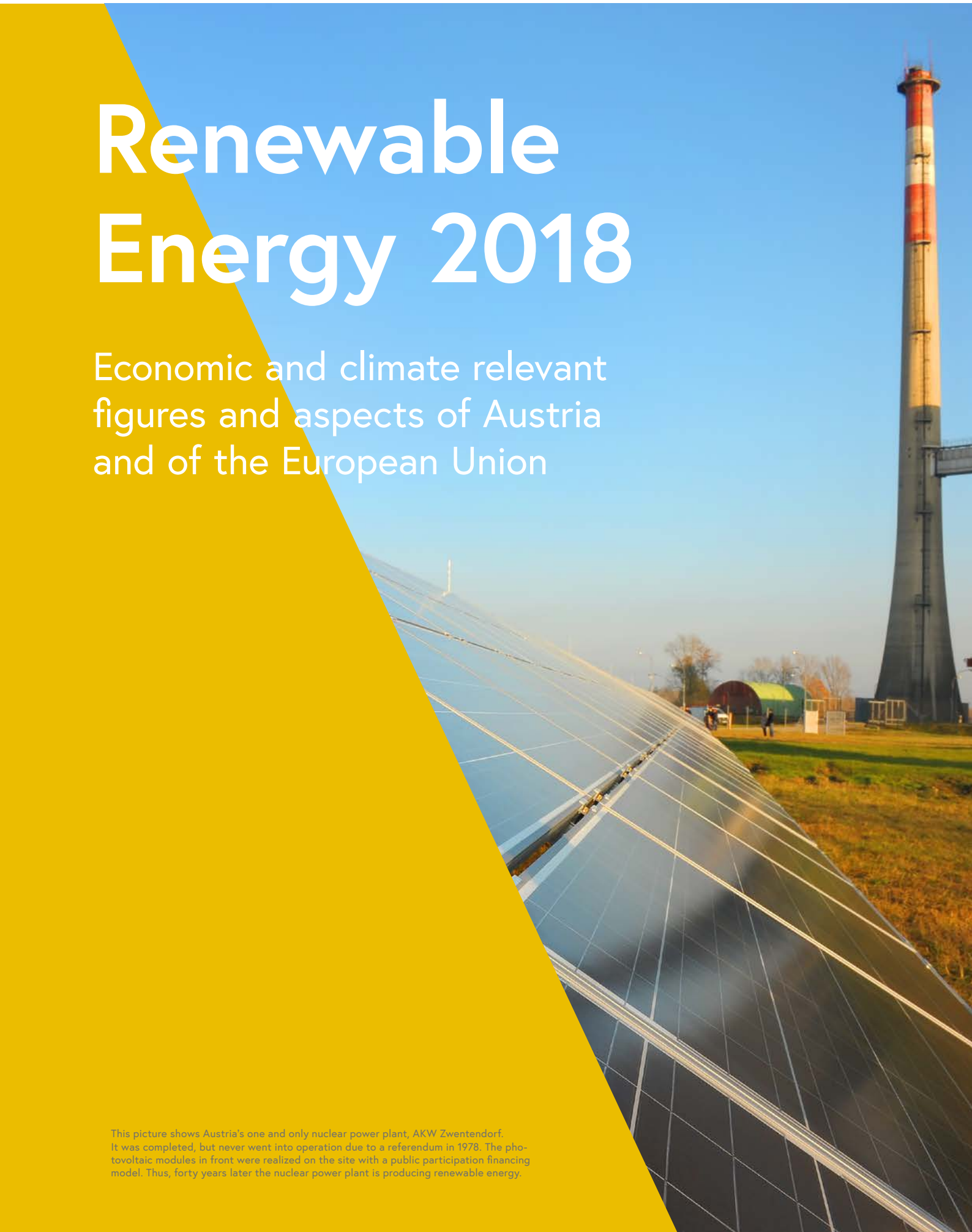
Federal Ministry
Republic of Austria
Sustainability and Tourism

Renewable Energy 2018

Economic and climate relevant figures and aspects of Austria and of the European Union



This picture shows Austria's one and only nuclear power plant, AKW Zwentendorf. It was completed, but never went into operation due to a referendum in 1978. The photovoltaic modules in front were realized on the site with a public participation financing model. Thus, forty years later the nuclear power plant is producing renewable energy.

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Vienna, September 2018

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Foreword

Elisabeth Köstinger
Federal Minister for
Sustainability and Tourism

Climate change is the biggest challenge of the 21st century. Austria has set itself ambitious goals for climate and environment protection. The Climate and Energy Strategy of the Austrian Government #mission2030 shall be the end of the fossil era. The key to success is decarbonizing the economy and energy systems. Austria intends to reduce its greenhouse gas emissions by 2030 by 36% compared to 2005 and to produce 100% of electricity from renewable sources. These goals will be achieved by a combination of efficient use of all energies, a rising share of renewable energy production and targeted support of innovative technologies.

It is crucial that politics, economy and society work closely together. The energy transition is not only a moral liability but also a chance for companies to create future-proof jobs and new export opportunities. Both public and private investment have to support the energy transition. Public funding should encourage private investment. All public incentives and grants should be tested to ensure they will not run counter to climate and energy targets. Increased awareness-raising and information campaigns should boost demand for climate-friendly, energy-efficient products, services and technologies and encourage the necessary investments. With initial and continuing training, highly qualified staff will be able to support the necessary transformation.

It is not about de-industrialization, but transition. Energy transition is much more than change of technologies; it is also a cultural project–the awareness that we need a new way to produce, to work, to consume and to live. The underlying structures of energy supply, of settlements, of transport have to be made fit for the energy transitions and the new conditions of changed climates. Doing so will not only protect the climate but will raise economic value and will make Austria future-proof. We cannot postpone the necessary steps any further. It is high time to act decidedly!

Introduction

The energy and climate policy of the European Union aims at the limitation of the global warming to 2 degrees Celsius compared to the pre-industrial level and it aims at the transformation of the European economies in sustainable economic systems.

The first climate and energy package was decided by the Heads of State and Government of the EU member states in 2007. The targets of the package concern the period up to 2020 and plan a decrease in greenhouse gas emissions by 20% in relation to 1990, reaching a share of renewable energy in the energy consumption of the EU of 20%, as well as the improvement of the energy efficiency by 20%.

Based on this first climate and energy package, the frame for a long-term EU climate and energy policy up to 2030 was decided by the Heads of State and Government of the EU member states in 2014. This agreement contains a decrease in greenhouse gas emissions by at least 40% compared to the level of 1990, an increase of the share of renewable energy sources to at least 27%, and an increase of energy efficiency by at least 27%.

The long-term plans of the EU by 2050 aim at an extensive decarbonization of the European economy whereby a decrease in greenhouse gas emissions by 80% compared to the level of 1990 is planned. In order to reach this ambitious goal all sectors within the frame of their technical and economic potential have to make significant contributions. Thereby continuous progress along the target path is of key importance.

The cornerstones of the Austrian climate and energy strategy for 2030 include a 36% decrease in greenhouse gas emissions compared to 2005 emissions, an increase to 45% of the share of renewable energy, and a 25–30% improvement of the primary energy intensity of the gross domestic product compared the intensity of 2015. Furthermore, by 2030, 100% of electricity consumption shall come from renewable sources.

In 2016, Austria reached a share of renewables of the total energy consumption of 33.5% and a share of renewables of the electricity consumption of 71.7%. The national goal for renewables for 2020 with 34% is therefore close. The share of renewable energy in Austria is high in comparison to most of the EU member states whereas especially the areas hydro power and solid biomass make major contributions to this share.

The present brochure presents selected indicators which make the progress on the path into a sustainable future quantifiable. Its aim is to show structural developments of the use and production of energy in the EU. The documented figures thereby refer to the latest available figures of 2016. Section diagrams show the structural variety of the EU member states, and the time series diagrams for chosen countries make the evaluation of essential trends possible.

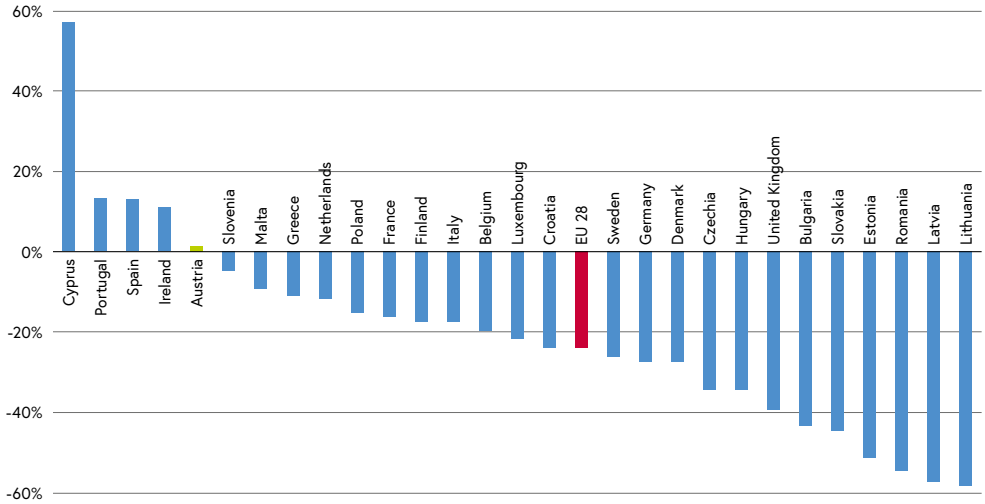
Greenhouse gas emissions of the EU 28

Regarding the greenhouse gas emissions two areas are distinguished in the EU:
The EU emissions trading system (ETS) is the EU's key tool for cutting greenhouse gas emissions from large-scale facilities in the power and industry sectors, as well as the aviation sector. The ETS covers around 45% of the EU's greenhouse gas emissions. In 2020 the emissions from these sectors should be 21% lower than in 2005.

The non ETS sectors – accounting for roughly 55% of the total EU emissions – consist of e.g. housing, agriculture, waste and transport. EU countries have agreed upon binding annual targets until 2020 for cutting emissions in these sectors compared to 2005 under the "Effort-sharing decision". The targets differ according to national wealth.

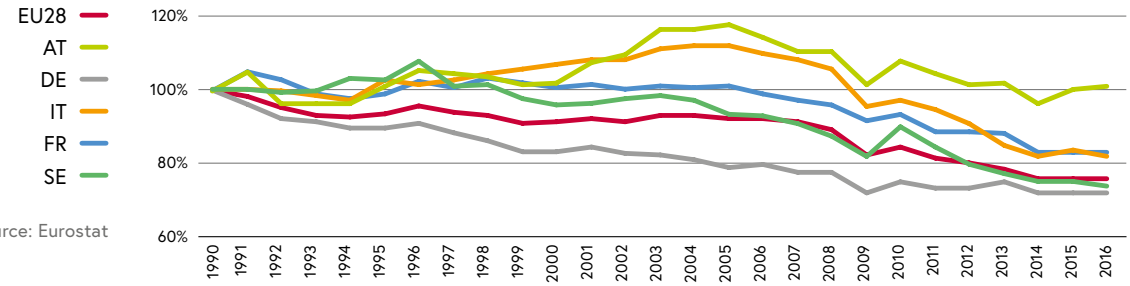
In 2016, greenhouse gas emissions in Austria amounted to 79.7 million tons of CO_{2eq}. Emissions were thus 1.0% above the level of 2015 and 1.2% above the level of 1990. The greenhouse gas emissions of the EU 28 were 24% lower in 2016 than in 1990 which is within the EU target for 2020.

Figure 1: Greenhouse gas emissions of the EU 28 countries in relation to the level of 1990 [%]



Source: Eurostat

Figure 2: Development of the greenhouse gas emissions of selected countries in relation to the level of 1990 [%]



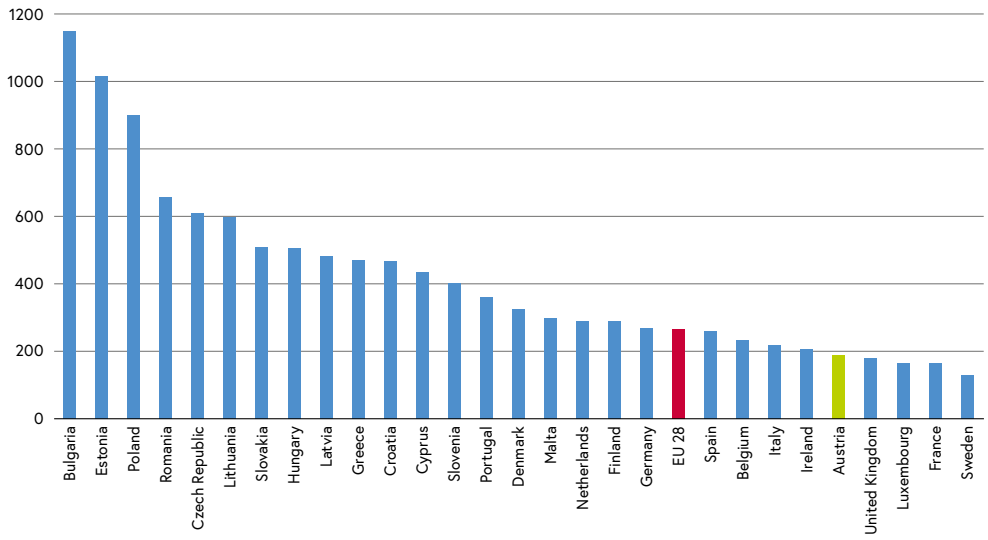
Source: Eurostat

Air emissions intensity of the EU 28

The air emissions intensity per gross value added varies in the EU 28 countries over a wide range. In 2016 the lowest intensity could be observed in Sweden with 128 grams CO_{2eq} per euro whereas the intensity in Bulgaria was 1147 grams CO_{2eq} per euro. The intensity was therefore by a factor 9 higher in Bulgaria than in Sweden. In the same year Austria had an air emissions intensity of 190 grams CO_{2eq} per euro. Austria was thereby among the EU countries with the lowest intensities.

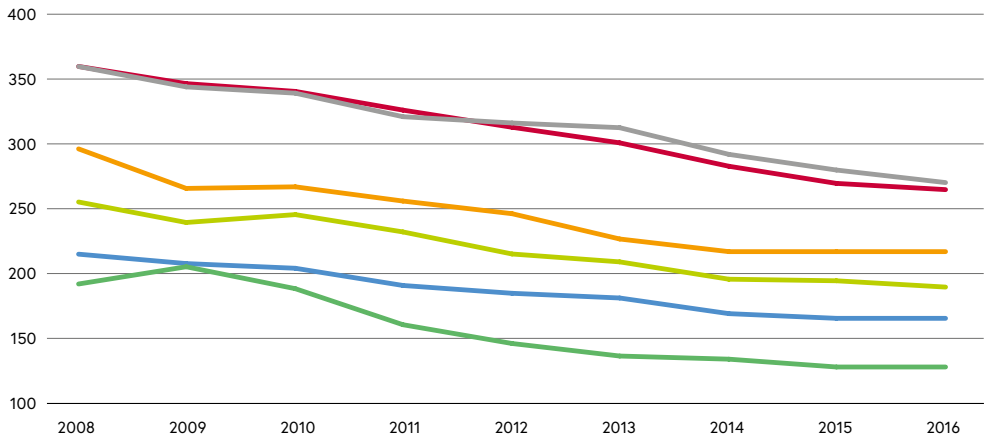
The development of the air emissions intensities has a constantly decreasing trend in most of the EU countries. Overall this has also led to a significant reduction of the air emissions intensity of the EU 28 in the past few years. In 2016 the air emissions intensity per gross value added was 265 grams CO_{2eq} per euro in the EU 28.

Figure 3: Air emissions intensity of the EU 28 countries in 2016 [grams CO_{2eq} per euro]



Source: Eurostat

Figure 4: Development of the air emissions intensity for selected countries [grams CO_{2eq} per euro]

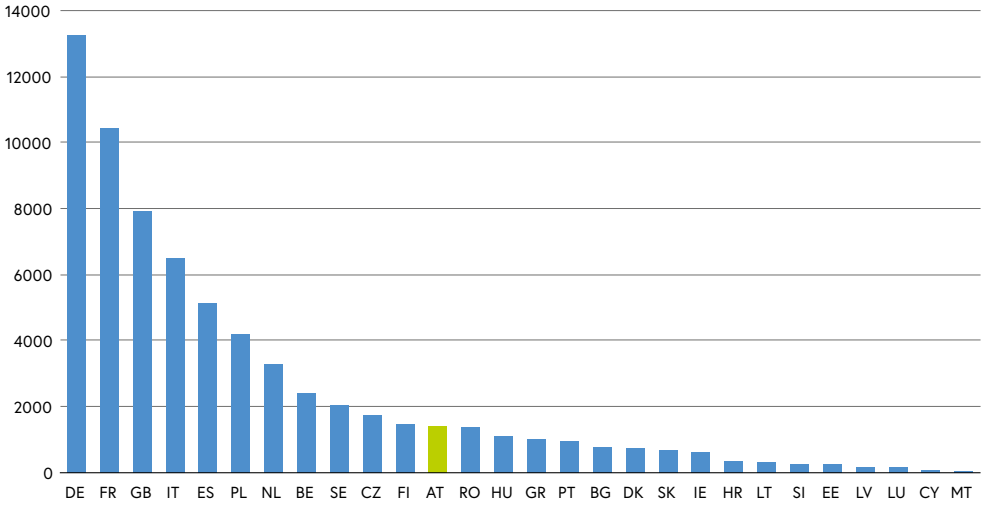


Source: Eurostat

Gross inland energy consumption of the EU 28 countries and energy intensity of the gross domestic product

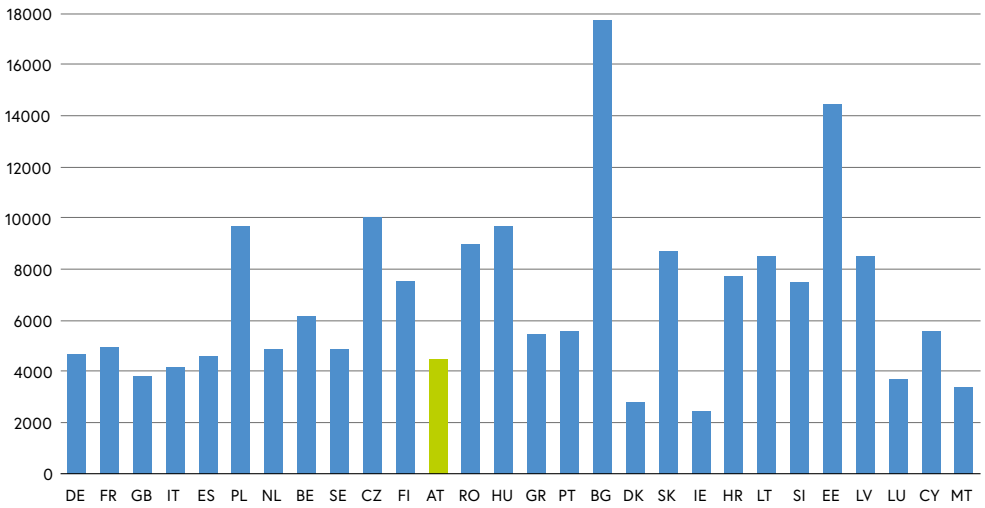
The five member states with the highest absolute energy consumption (Germany, France, Great Britain, Italy and Spain) are commonly responsible for 62.9% of the gross inland energy consumption of the EU 28. The gross inland energy consumption of Germany is thereby 9.4-times higher than the Austrian. The energy intensity of the gross domestic product of Germany, France, Great Britain, Italy and Spain is comparably low and amounts to 4420 GJ/million € on average. The energy intensity in Austria corresponds with 4471 GJ/million €, precisely the average of the great European industrial nations.

Figure 5: Gross inland energy consumption of the EU 28 countries in 2016 [PJ]



Source: Eurostat

Figure 6: Gross inland energy consumption per GDP of the EU 28 countries in 2016 [GJ/million €]

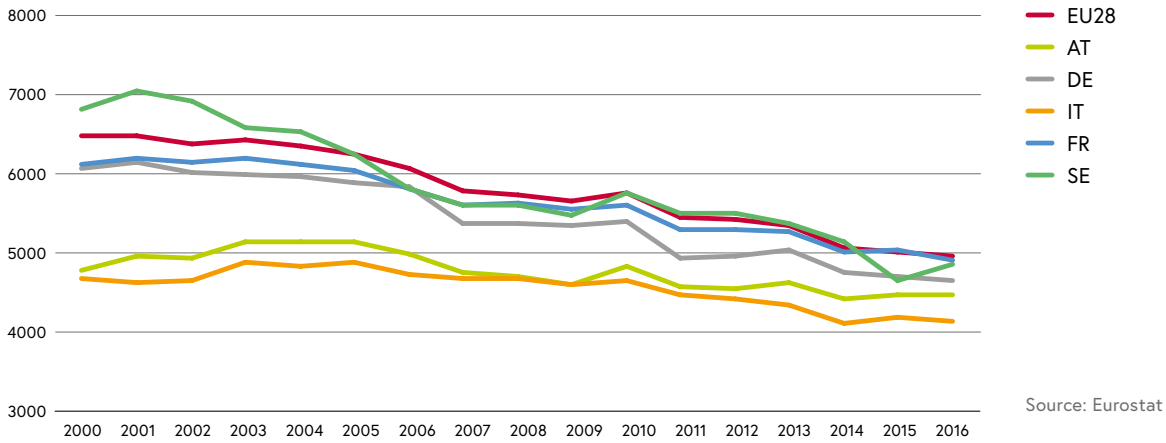


Source: Eurostat

Development of the gross inland energy consumption per economic output and per inhabitant

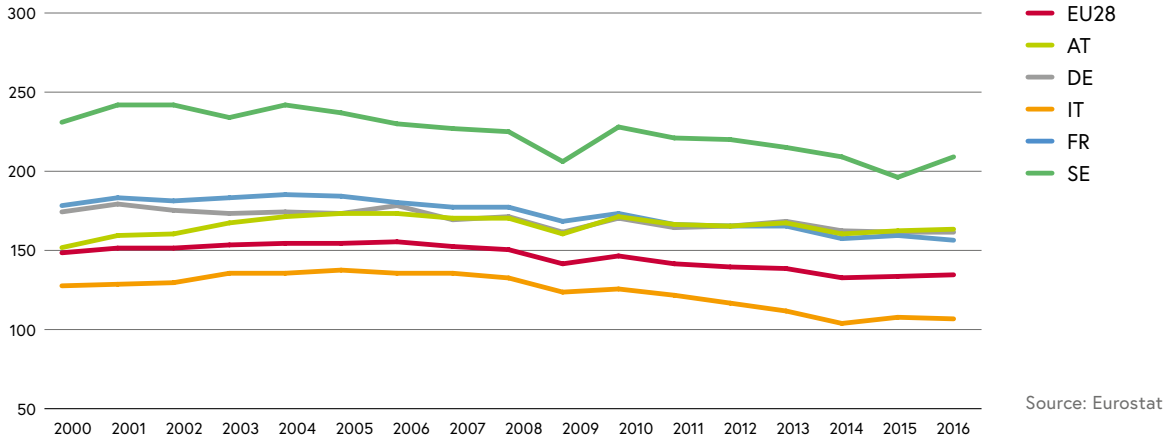
The gross inland energy consumption per economic output has successively decreased in the European Union in the period from 2000 to 2016. This also applies to the particular national states whereby not only the intensity itself has decreased but also the range of fluctuation among the particular national states. The reduction of the gross inland consumption of the EU 28 amounted to 23.4% in the period from 2000 to 2016, and the reduction in Austria amounted to 6.5%, although starting from an already significantly lower value. With regard to the energy consumption per capita, a similar trend can be observed; however, this trend is not so well-marked. In this case, the reduction in the EU 28 states amounted to 9.4% in the period from 2000 to 2016, whereas in Austria in the same period an increase of 7.3% was recorded.

Figure 7: Development of gross inland energy consumption per GDP of selected EU countries [GJ/million €]



Source: Eurostat

Figure 8: Development of gross inland energy consumption per capita of selected EU countries [GJ/capita]

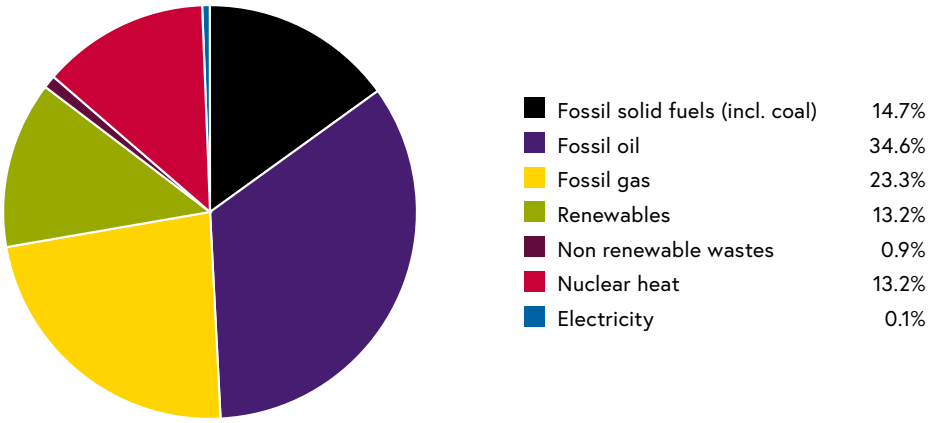


Source: Eurostat

Structure of the gross inland energy consumption of the EU 28 countries and of Austria

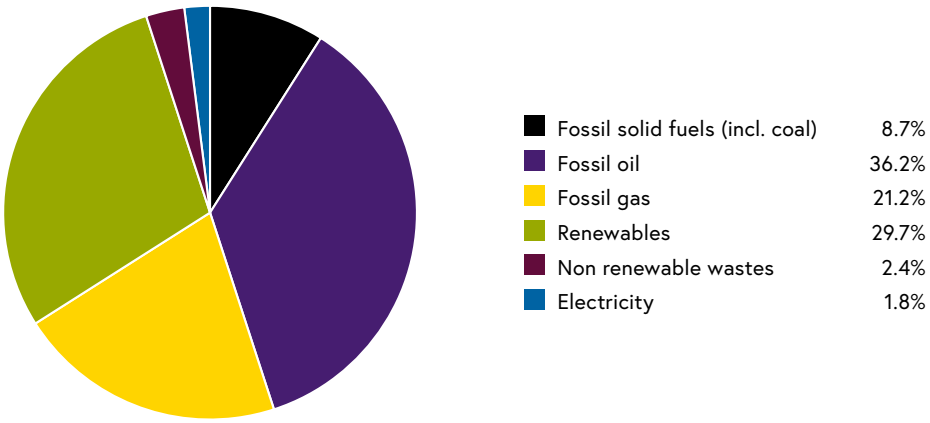
The gross inland energy consumption in the EU 28 is dominated by fossil oil (34.6%) and natural gas (23.3%), as well as coal and coal products (14.7%). Combined with nuclear power (13.2%) and a small amount of non-renewable wastes (0.9%), the gross inland energy consumption of the EU 28 amounts, therefore, to 86.8% of fossil or nuclear energy and to 13.2% of renewable energy. The gross inland energy consumption of Austria has a significantly different structure, containing a much higher percentage of renewable energy (29.7%) and no nuclear energy. The percentage of fossil oil and natural gas are comparable with the EU 28 average and the percentage of coal and coal products is comparatively lower. The high percentage of renewable energy in Austria is primarily due to the intensive use of hydro power and solid biomass.

Figure 9: Structure of gross inland energy consumption of the EU 28 countries in 2016 [%], in total 68689 PJ



Source: Eurostat

Figure 10: Structure of gross inland energy consumption of Austria in 2016 [%], in total 1418 PJ

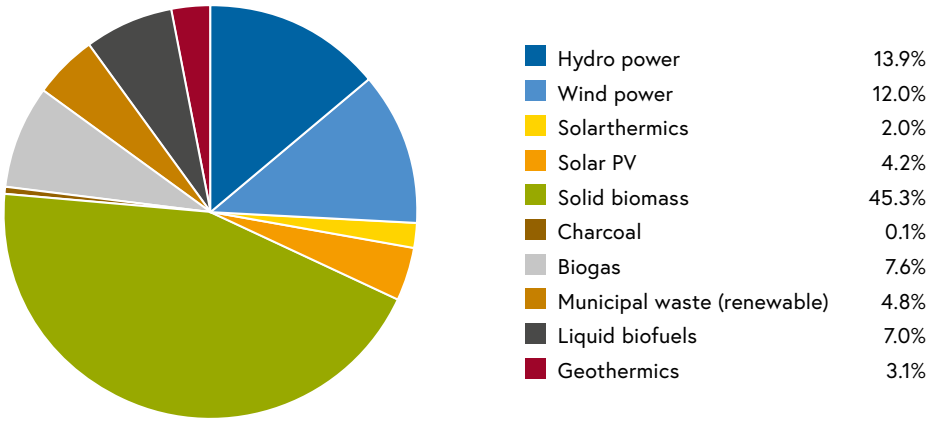


Source: Eurostat

Structure of the gross inland energy consumption of renewable energy in the EU 28 countries and in Austria

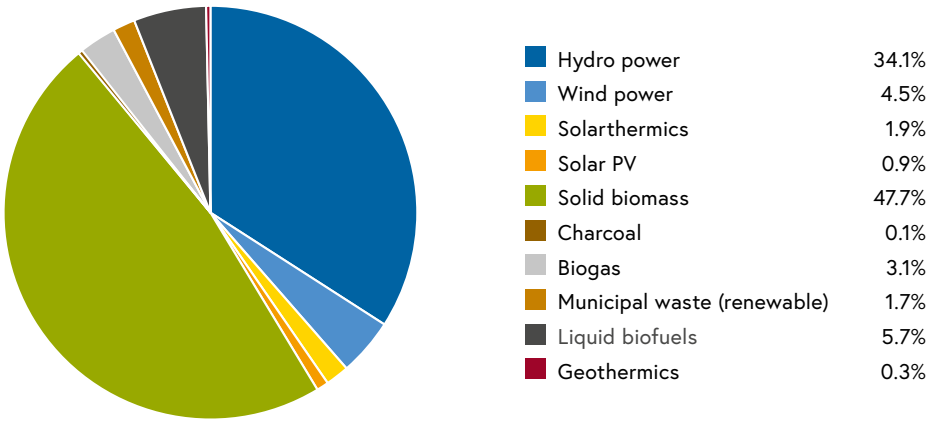
The gross inland energy consumption of renewable energy in the EU 28 countries is dominated by the use of solid biomass with a percentage of 45.4%. This contains firewood, wood chips, wood pellets and bark. Further great sectors are hydro power (13.9%), wind power (12.0%) and biogas (7.7%). Combining the mentioned sectors, this amounts to a percentage of 79.0% of all renewable energy sources at the EU level. Biodiesel, renewable wastes, photovoltaics, geothermics, solarthermics and a few others have a combined percentage of 21%. Conditions in Austria partly differ considerably from this structure. The percentage of solid biomass (47.7%) and of hydro power (34.1%) combined already amount to 81.8%, whereas, in particular, a fairly higher percentage of hydro power than in the EU 28 can be observed.

Figure 11: Structure of renewable gross inland energy consumption of the EU 28 countries in 2016 [%], in total 9069 PJ



Source: Eurostat

Figure 12: Structure of renewable gross inland energy consumption of Austria in 2016 [%], in total 421 PJ



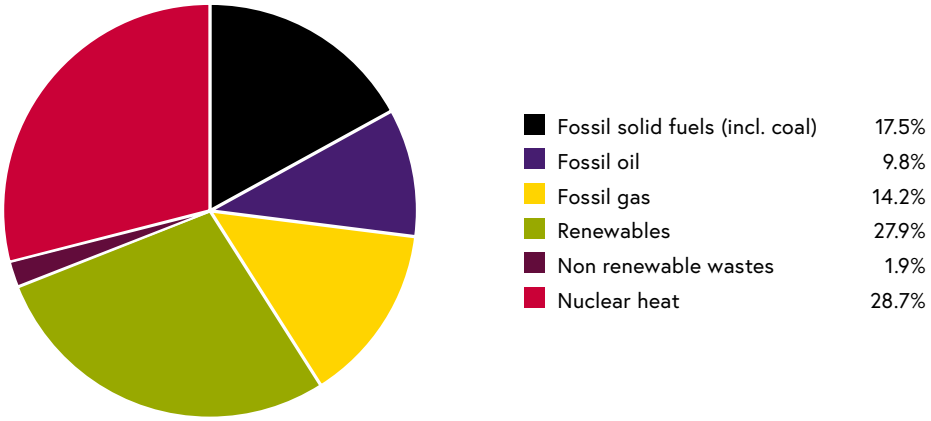
Source: Eurostat

Allocation of primary energy in the EU 28 countries and in Austria

The allocated primary energy within the state borders in the EU 28 countries is for the most part fossil energy consisting of mineral oil, natural gas, coal and non-renewable wastes (combined 43.4%) as well as an approximately equal share of nuclear energy (28.7%) and renewable energy (27.9%).

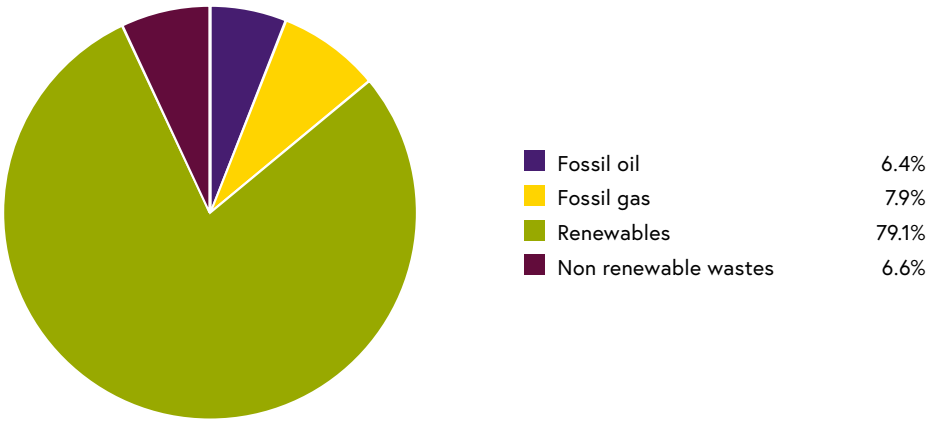
The situation in Austria differs widely from this structure. Primary energy from renewable sources dominates with 79.1%. Furthermore, mineral oil and natural gas are obtained and non-renewable wastes are used (overall 20.9%). Coal has not been produced in Austria since 1996.

Figure 13: Structure of primary energy production of the EU 28 countries in 2016 [%], in total 31627 PJ



Source: Eurostat

Figure 14: Structure of primary energy production of Austria in 2016 [%], in total 517 PJ



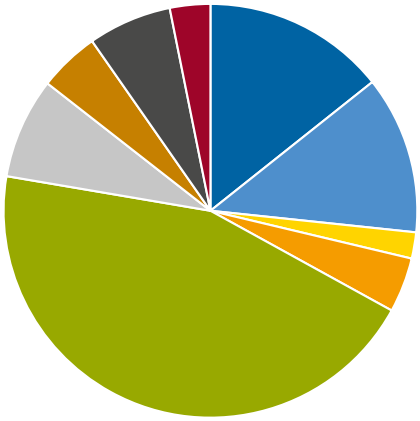
Source: Eurostat

Allocation of primary energy of renewable energy sources in the EU 28 countries and in Austria

The allocation of renewable primary energy in the EU 28 countries is similarly structured to the gross inland energy consumption because there is no structure distorting exchange over the system limits. The allocated renewable primary energy is based at a high percentage on the use of solid biomass (44.7%). The other large parts are in the area of hydro power (14.3%) wind power (12.4%) and biogas (7.9%).

The allocation of primary energy of renewable sources in Austria is mainly shaped by the use of solid biomass (48.1%) and the use of hydro power (35.1%). The structure of the allocation has a clearly lower diversification, as is the case with the EU 28 countries.

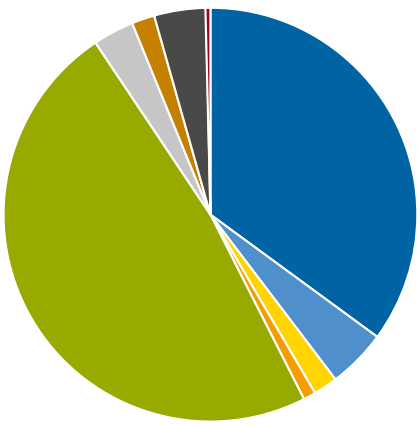
Figure 15: Structure of renewable primary energy production of the EU 28 countries in 2016 [%], in total 8822 PJ



Hydro power	14.3%
Wind power	12.4%
Solarthermics	2.0%
Solar PV	4.3%
Solid biomass	44.7%
Biogas	7.9%
Municipal waste (renewable)	4.7%
Liquid biofuels	6.5%
Geothermics	3.2%

Source: Eurostat

Figure 16: Structure of renewable primary energy production of Austria in 2016 [%], in total 409 PJ



Hydro power	35.1%
Wind power	4.6%
Solarthermics	1.9%
Solar PV	1.0%
Solid biomass	48.1%
Biogas	3.2%
Municipal waste (renewable)	1.8%
Liquid biofuels	4.0%
Geothermics	0.3%

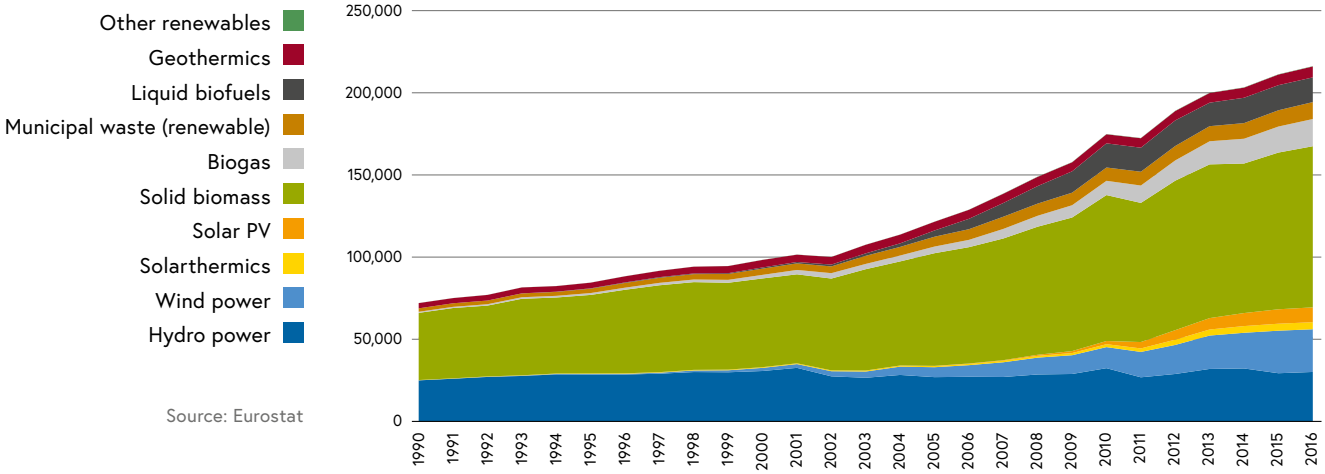
Source: Eurostat

Development of the use of renewable energy in the EU 28 countries and in Austria

The use of renewable energy has tripled in the EU 28 countries from 1990 to 2016. However, the percentage of renewable energy of the gross inland energy consumption has increased from 4.3% to 13.2%. The basis for the use of renewable energy is the use of hydro power and the use of solid biomass; the use of hydro power has increased only by a factor of 1.2 over this period whereas the use of solid biomass has increased by a factor of 2.4. Since the year 2000, on a strong growth of the "new" renewable energy sources such as wind power, biofuel or biogas can be observed.

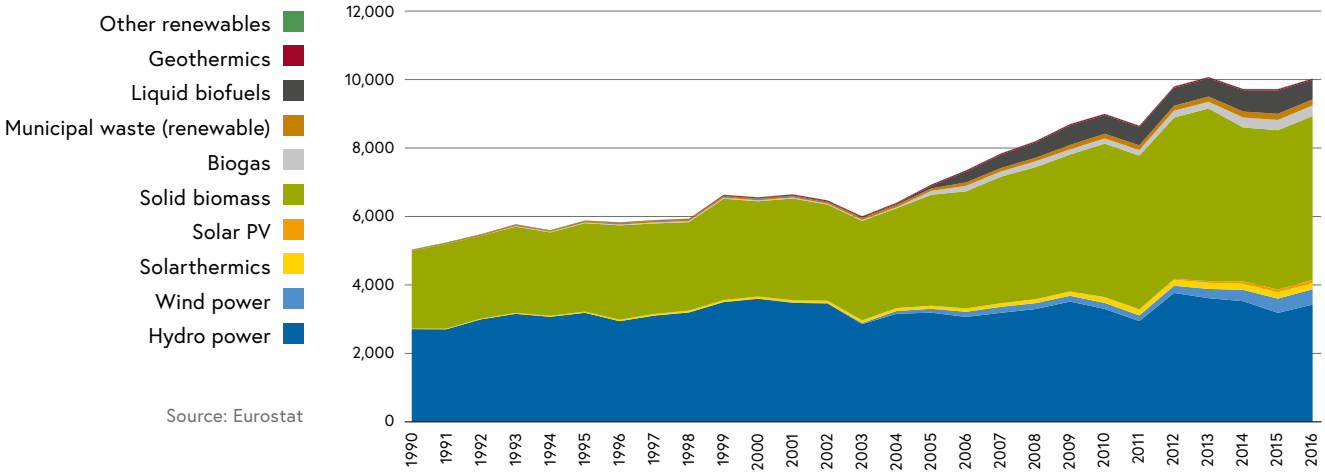
Development in Austria follows a similar course to that at the European level, where the use of renewable energy from 1990 to 2016 has doubled and the percentage of renewable energy of gross inland energy consumption has increased from 20.1% to 29.7%.

Figure 17: Renewable gross inland energy consumption in the EU 28 countries [ktoe]



Source: Eurostat

Figure 18: Renewable gross inland energy consumption in Austria [ktoe]

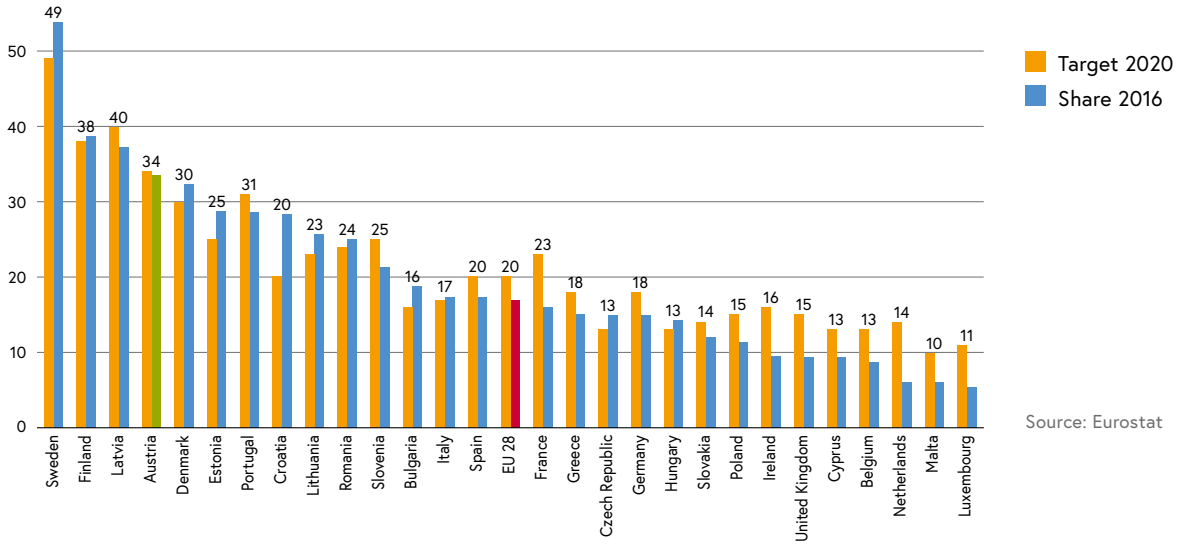


Source: Eurostat

Share of renewable energy in gross final energy consumption and targets for 2020

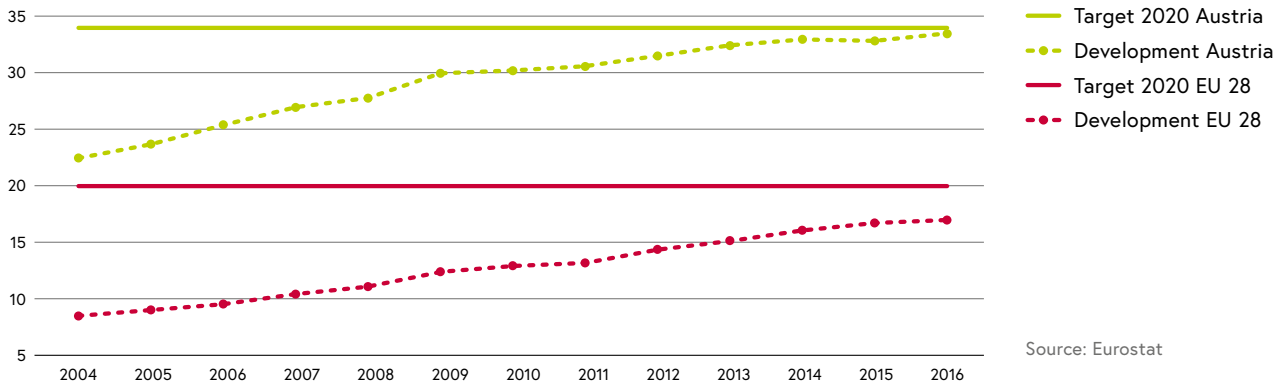
The share of renewable energy in the energy consumption of the EU 28 countries amounted to 17.0% in 2016 and was still 3.0 percentage points less than the target of 20.0% for 2020. Austria has, with 34% of renewable energy in the energy consumption mix, the fourth highest target for 2020 after Sweden, Finland and Latvia, and, is with 33.5%, only half a percentage point short of this target. Examples of countries that have already reached their renewable target in 2016 are Sweden (53.8% renewable), Finland (38.7%), Denmark (32.2%), Estonia (28.8%), Croatia (28.3%) and Lithuania (25.6%). The temporal progress of the development of the share of renewable energy shows that great efforts are still necessary if the EU target of 20.0% should be reached in 2020.

Figure 19: Share of renewable energy in gross final energy consumption; shares 2016 and target 2020



Source: Eurostat

Figure 20: Development of shares of renewable energy in gross final energy consumption and targets 2020

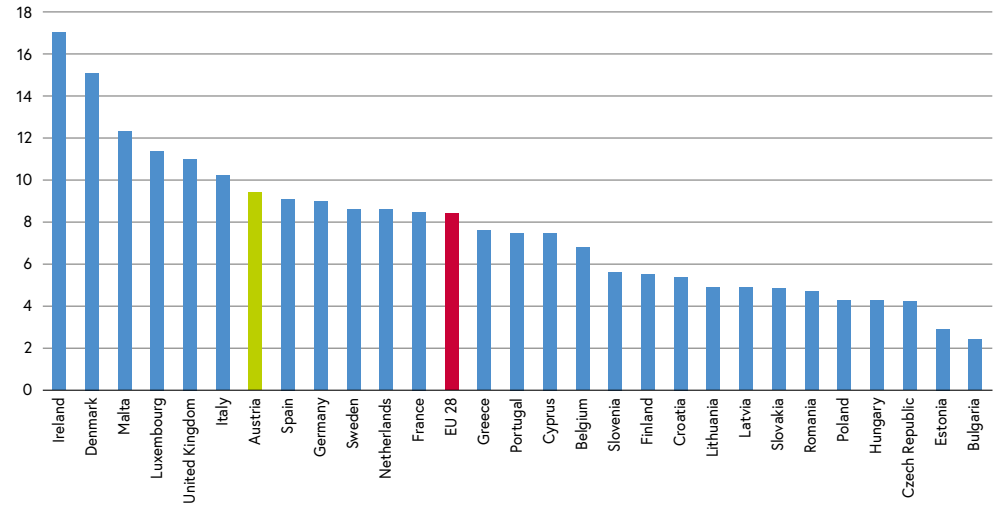


Source: Eurostat

Productivity of the gross inland energy consumption of the EU 28 countries in 2016 and temporal development

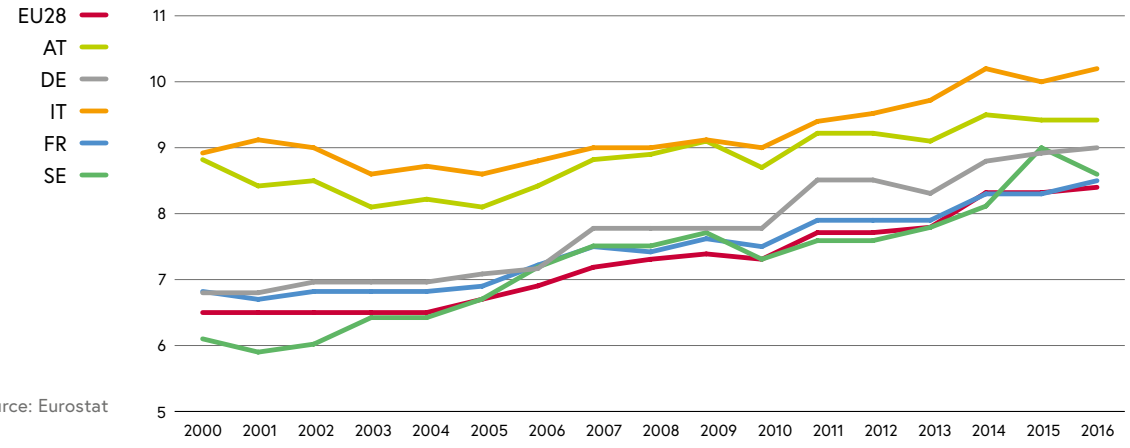
The economic productivity of the gross inland energy consumption has a great range of fluctuation among the EU 28 countries. The minimal productivity with 2.4 € per kg oil equivalent occurs in Bulgaria and the maximal productivity of 17.0 € per kg oil equivalent is found in Ireland. For the EU 28 countries the average amounts to 8.4 € per kg oil equivalent. In Austria, the productivity amounts to 9.4 € per kg oil equivalent, and is therefore above the EU 28 average. The temporal development of the productivity is marked by a constant increase for the EU 28 countries but also for most of the national states. The productivity in the EU 28 countries has increased from 2000 to 2016 by 29.2% and in Austria by 6.8%, whereas the base level in Austria was already comparatively high in 2000.

Figure 21: Energy productivity of EU 28 countries in 2016 [€/kgoe]



Source: Eurostat

Figure 22: Development of energy productivity of selected countries [€/kgoe]

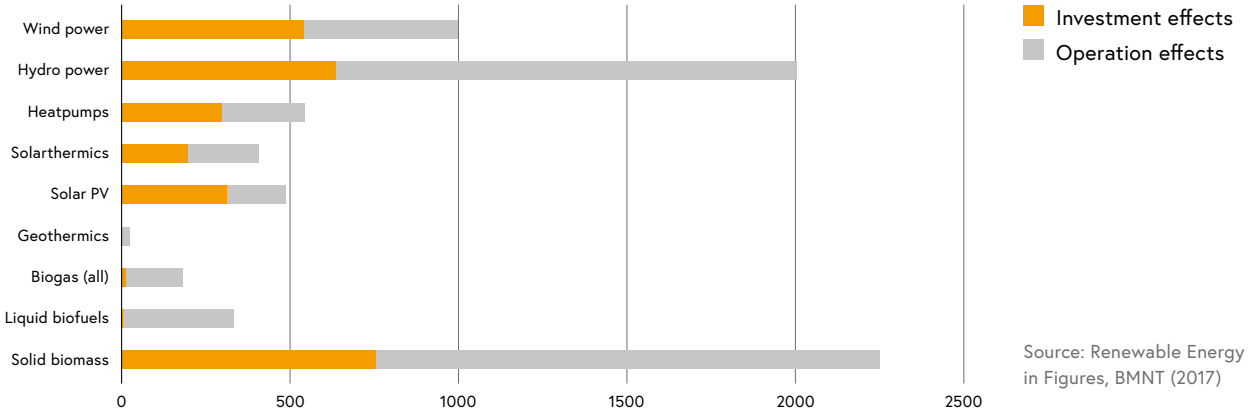


Source: Eurostat

Turnover and jobs in the economic sector technologies for the use of renewable energy in Austria

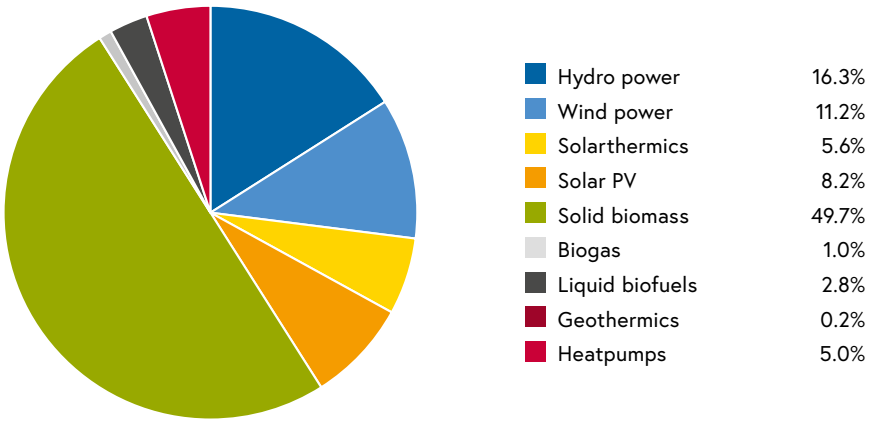
The effects of the use of renewable energy by far exceed the reduction of climate-damaging greenhouse gases and an increase of the degree of self-supply of energy in the European economies. Turnover, added value, and employment in this economic sector are equally important factors. Economic activity is created thereby through the production of the technical components, the planning and construction of the installations and through the operation and maintenance of the installations. The economic effects can be divided into investment effects and operational effects. They occur along the value-added chain in the domestic market as well as in the export market. In Austria, in the economic sector renewable energy, a primary total turnover of 7.2 billion euros and a primary employment effect of 41.600 full-time equivalents could be achieved in 2016.

Figure 23: Primary turnover of renewables in Austria in 2016 [million euros], in total 7.2 billion euros



Source: Renewable Energy in Figures, BMNT (2017)

Figure 24: Shares of primary employment of renewables in Austria in 2016 [full time equivalent], in total 41591 full time equivalents

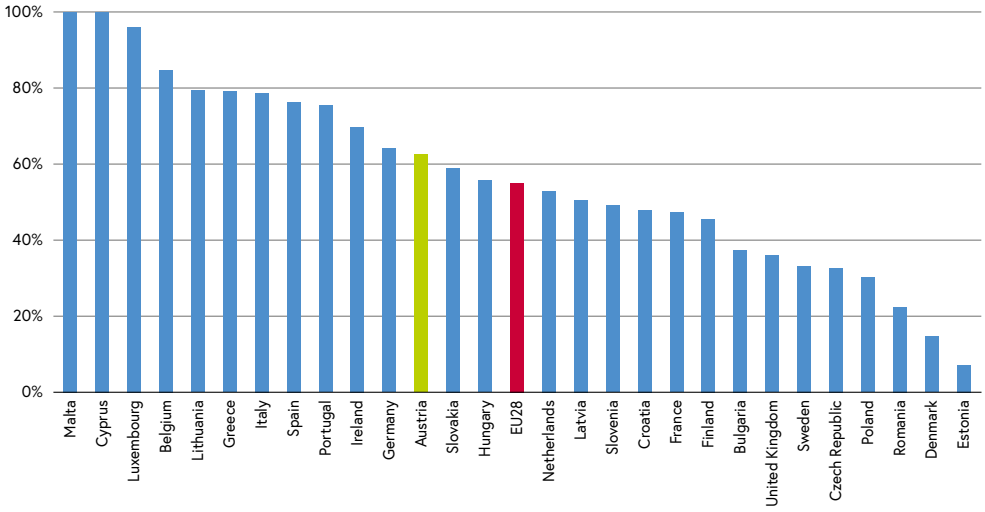


Source: Renewable Energy in Figures, BMNT (2017)

Development of net energy import in relation to gross inland consumption

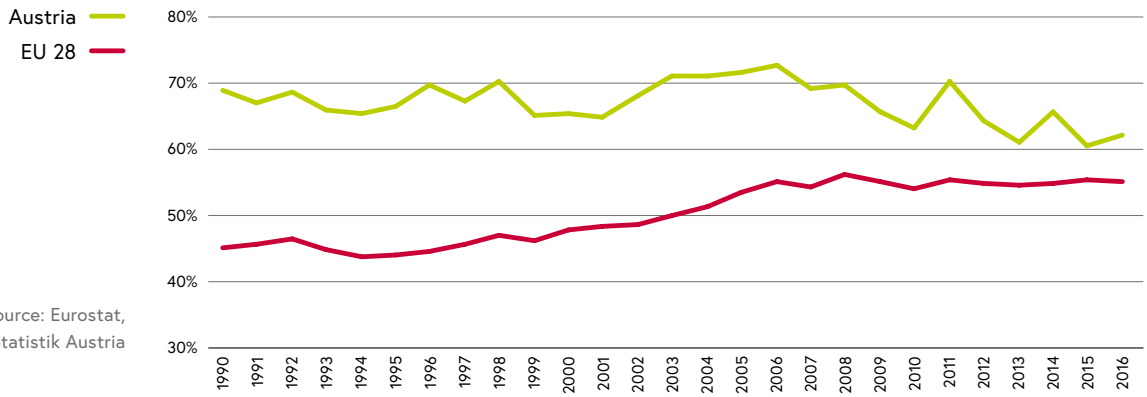
The dependence of the European Union on imported energy from partly unstable parts of the world is a topic of great strategic importance. The dependence on imports of the EU 28 countries which is measured by the relation of net imports to the gross inland energy consumption has increased in the period from 1990 to 2016 from 45.2% to 55.1%. However, the dependence on imports has thereby remained nearly steady since 2005. In 1990 Austria had a clearly higher dependence on imports of 68.9% however this rate has been reduced to 62.2% by 2016. Malta and Cyprus have within the EU 28 the highest dependence on imports (100%). Estonia and Denmark have with 7.1% and 14.5%, respectively the lowest dependence on imports. Regarding the energy sources primarily mineral oil and natural gas are imported by the EU 28 countries.

Figure 25: Net energy import in relation to gross inland consumption [%]



Source: Eurostat

Figure 26: Development of net energy import in relation to gross inland consumption [%]

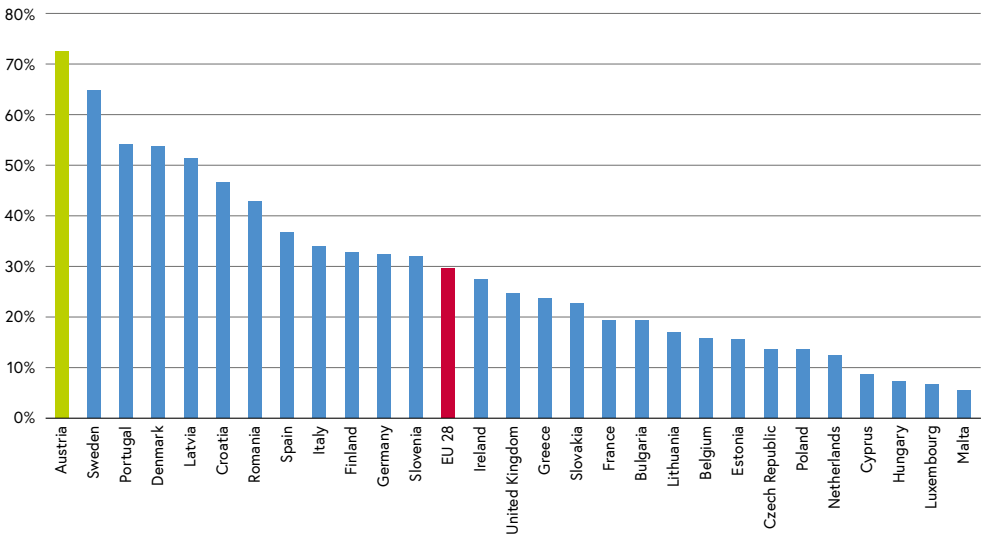


Source: Eurostat, Statistik Austria

Share of renewable energy in electricity supply

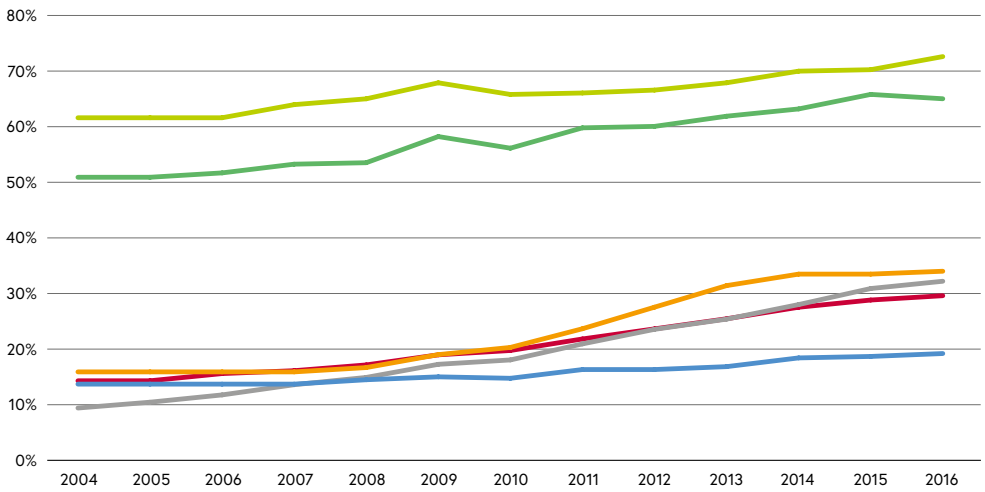
The share of renewable energy in electricity supply varies greatly in the EU 28 member states. Thereby Austria has EU-wide the highest share with 72.6% and Malta the lowest share with 5.6%. Further countries with a predominant share of renewable energy in electricity supply are Sweden (64.9%), Portugal (54.1%), Denmark (53.7%), Latvia (51.3%). The share of renewable energy in electricity supply is in most member states clearly increasing whereby the expansion of hydro power, wind power and photovoltaics play an important role. Country-specific, the conversion into electricity of wood fuels and of biogas also plays a role.

Figure 27: Share of renewable energy in electricity in 2016 [%]



Source: Eurostat

Figure 28: Development of the share of renewable energy in electricity [%]

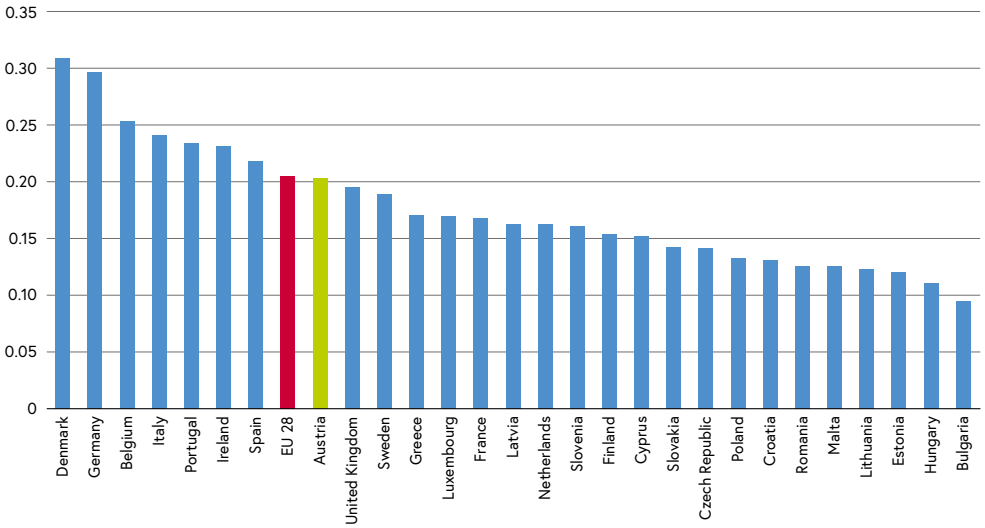


Source: Eurostat

Electricity prices

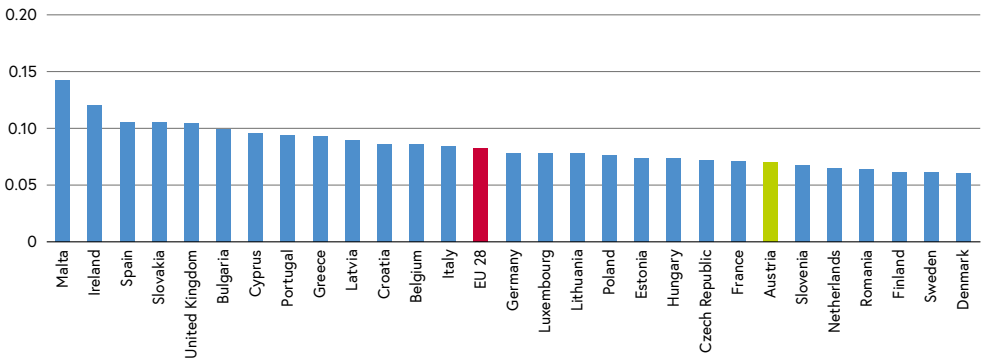
In 2016 the electricity prices for households varied within the EU 28 member states between 9.6 euro cent/kWh in Bulgaria and 30.9 euro cent/kWh in Denmark which corresponds to a factor of 3.2. Austria lies in the upper middle of the scale with an electricity price for households of 20.3 euro cent/kWh. The electricity price for the industry varied in the same year in a clearly lower range of fluctuation between 6.0 euro cent/kWh in Denmark and 14.2 euro cent/kWh in Malta which corresponds to a factor of 2.4. In this scale Austria took, with 7.0 euro cent/kWh, a place among the countries with the cheapest electricity for the industry. Thereby it is noticeable that Denmark has within the EU 28 countries the highest electricity price for households and at the same time the lowest electricity price for the industry. A direct and obvious link between the electricity price and the national electricity production mix is not the case.

Figure 29: Electricity price for medium size households in 2016 [€/kWh]



Source: Eurostat

Figure 30: Electricity price for medium size industry in 2016 [€/kWh]

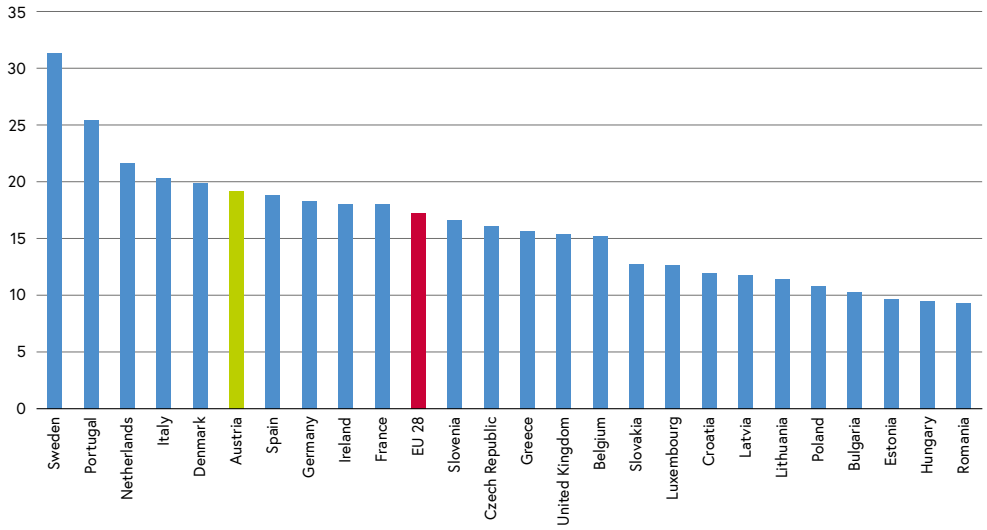


Source: Eurostat

Prices for natural gas

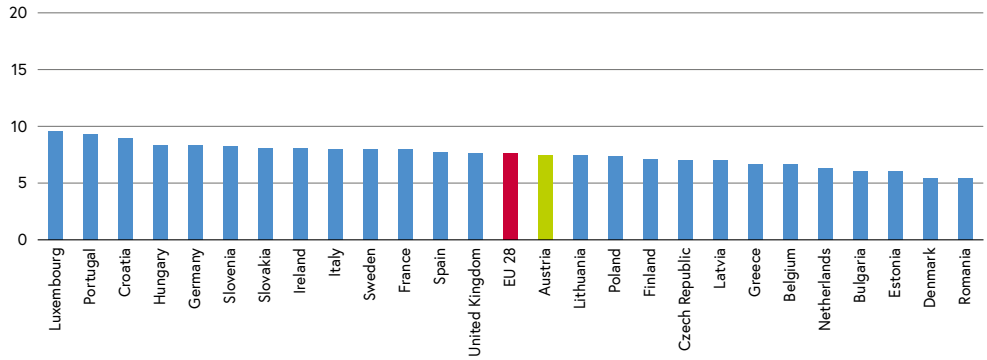
The prices for natural gas for households varied in 2016 within the EU 28 countries between 9.22 euro/GJ in Rumania and 31.35 euro/GJ in Sweden, which corresponds to a factor of 3.4. Austria was in the upper midrange of the scale with its gas price for households of 19.17 euro/GJ. The price for natural gas for the industry varied in the same year in a clearly lower range of fluctuation between 5.37 euro/GJ in Rumania and 9.49 euro/GJ in Malta, which corresponds to a factor of 1.8. In this scale Austria took a mid-field position with 7.45 euro/GJ for the gas price of the industry.

Figure 31: Gas price for medium size households in 2016 [€/GJ]



Source: Eurostat

Figure 32: Gas price for medium size industry in 2016 [€/GJ]

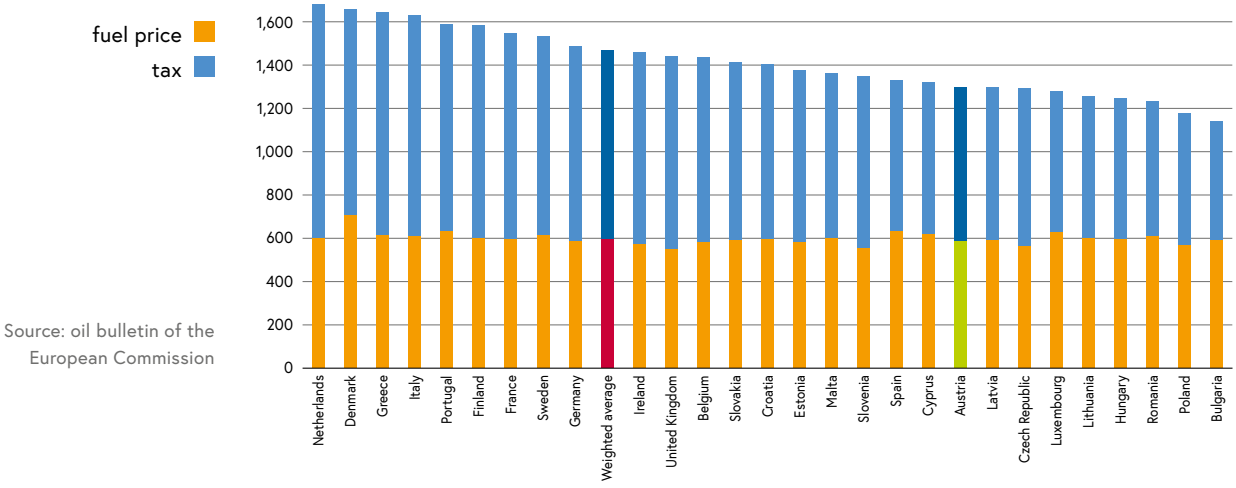


Source: Eurostat

Fuel prices

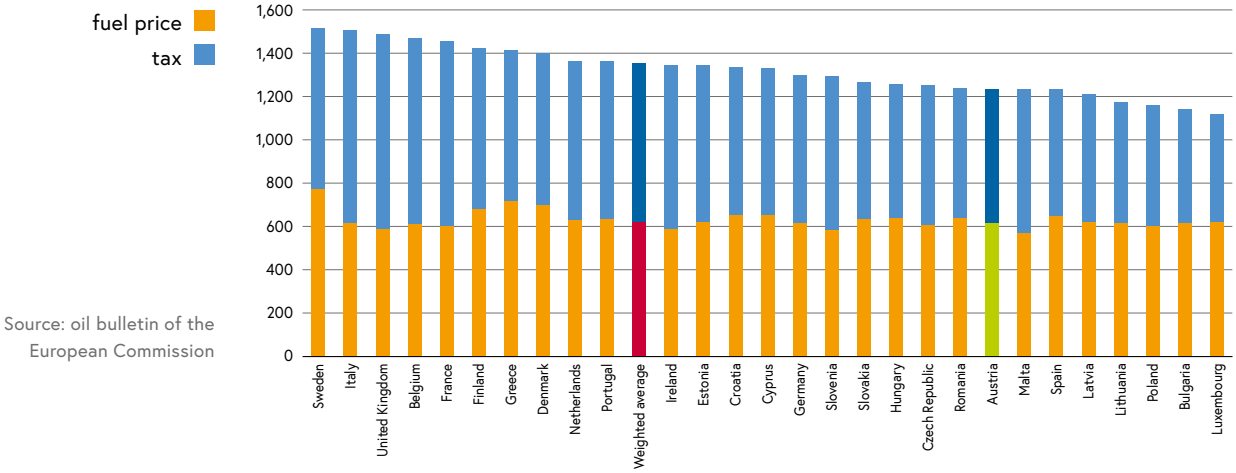
The prices for Euro-super 95 fuel varied in the EU 28 member states mid 2018 by a factor of 1.5. The cheapest Euro-super 95 fuel was thereby available in Bulgaria for 1138 euros/1000 liter, and the most expensive in the Netherlands for 1682 euros/1000 liter. The range of fluctuation is exclusively due to the various taxation of the fuel. The tax rate allocated to the pure fuel price amounted to 94% in Bulgaria and 179% in the Netherlands. The conditions are similar with diesel fuel, although the tax rate is generally set at a clearly lower level. The tax rate for diesel fuel in Luxembourg, with 80%, is the lowest and in Great Britain, with 152%, the highest. The specific prices for diesel fuels are therefore always lower than the prices for Euro-super 95 fuels. Austria takes a position in the lower mid-field of the EU 28 states for fuel prices, in both cases.

Figure 33: Structure of the price of 1000 liter Euro-super 95 fuel in August 2018 [€/1000L]



Source: oil bulletin of the European Commission

Figure 34: Structure of the price of 1000 liter diesel fuel in August 2018 [€/1000L]



Source: oil bulletin of the European Commission

Country codes of the EU 28 member states

Country	Country code
Austria	AT
Belgium	BE
Bulgaria	BG
Cyprus	CY
Czech Republic	CZ
Germany	DE
Denmark	DK
Estonia	EE
Greece	GR
Spain	ES
Finland	FI
France	FR
Croatia	HR
Hungary	HU
Ireland	IE
Italy	IT
Lithuania	LT
Luxembourg	LU
Latvia	LV
Malta	MT
Netherlands	NL
Poland	PL
Portugal	PT
Romania	RO
Sweden	SE
Slovenia	SI
Slovakia	SK
United Kingdom	UK

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