



Federal Ministry for the
Environment, Nature Conservation
and Nuclear Safety



Development of renewable energies in 2006 in Germany

As at: 21 February 2007

Latest data from the Federal Environment Ministry
on the development of renewable energies in Germany in 2006
on the basis of data from the
Working Group on Renewable Energies/Statistics (AGEE-Stat)

IMPRINT

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As at: 21 February 2007

1. Shares in primary energy and final energy supply; Importance for climate protection

The use of renewable energies continued to develop very positively in 2006. Their **share in primary energy consumption** increased from around 4.7% in 2005 to around 5.3% in 2006 (calculated according to the so-called physical energy content method). In comparison with 2000 (2.6%), this is more than double.

The contribution to **total final energy supply** (electricity, heating, fuel) increased to 7.4% in 2006 (2005: 6.6%).

The importance of renewable energies for **climate protection** remains high: For 2006, their total CO₂ reduction was calculated at **around 97 million tonnes** (through substitution of other energy forms in the electricity, heating and fuel sectors), of which **around 44 million tonnes CO₂ saving resulted from the Renewable Energy Sources Act (EEG) alone**. In 2006 alone, an **additional CO₂ saving of around 11 million tonnes** was achieved through the expansion of renewable energies.

Table 1: Key data on renewable energies in Germany 2005/2006

	2005 ¹⁾	2006 ¹⁾	Changes
Share RE in total primary energy consumption	4.7 %	5.3 %	+ 12.8 %
Share RE in total final energy consumption	6.6 %	7.4 %	+ 12.2 %
Share RE electricity in total gross electricity consumption	10.4 %	11.8 %	+ 13.4 %
Share RE heating in total heat consumption	5.3 %	5.9 %	+ 11.3 %
Share RE in total fuel consumption of road traffic	3.8 %	4.7 %	+ 23.7 %
CO ₂ emissions avoided through RE ²⁾	ca. 86 m t	ca. 97 m t	+ 12.7 %
- of which through EEG	ca. 37 m t	ca. 44 m t	+ 18.9 %
Total turnover from RE	ca. €18.1 bn	ca. €21.6 bn	+ 19.3 %
of which:			
- Turnover from constructing plants	ca. €10.3 bn	ca. €11.3 bn	+ 9.7 %
- Turnover from operating plants	ca. €7.8 bn	ca. €10.3 bn	+ 32.1 %
Employees in RE sector	ca. 157,000 (2004)	ca. 214,000	+ ca. 36 % compared with 2004

RE = renewable energies

1) provisional data

2) calculated according to substitution of other energy forms

The share of **electricity produced from renewable energies** in total gross electricity consumption totalled around 11.8% in 2006 (2005: around 10.4%). Germany is thus already well on the way to achieving its national goal for 2010 in the course of 2007 (12.5% as agreed at European level). The Renewable Energy Sources Act (EEG) is primarily responsible for this, according to which the largest share of RE electricity is fed into the public electricity grid and paid for.

On the **heating market**, a share in total final energy consumption for heating of around 5.9% was achieved in 2006, compared with 5.3% in the previous year.

The contribution of biofuels to **fuel supply** in road traffic increased from 3.8% (2005) to around 4.7% (2006).

2. Contributions of individual RE sectors

The use of **wind energy** again made the largest contribution to **electricity production** from renewable energies in 2006 with 30.5 billion kWh (2005: 27.2 billion kWh). This equals a share in total electricity consumption in Germany of around 5%. With a new installed capacity of 2,233 MW in 2006, the construction of wind energy plants increased by around 23% compared with the previous year. In total, at the end of 2006, 18,685 wind energy plants were in operation with an installed capacity of 20,622 MW. Germany thus remains world leader in this field, well ahead of the USA and Spain.

Electricity production from **hydropower** remained stable in 2006 with 21.6 billion kWh (2005: 21.5 billion kWh). In this area there was only a relatively small increase in installed capacity; the weather conditions in 2006 did not lead to any fundamental change in electricity production.

Electricity production from biomass (without gas from landfills and sewage treatment plants, biogenic wastes) totalled approx. 13.1 billion kWh in 2006 (2004: approx. 8.6 billion kWh). This equals a share of around 2.2% in total gross electricity consumption. Electricity production from biogas greatly increased; due to the provisions of the EEG, it almost doubled from around 2.8 billion kWh in 2005 to around 5.4 billion kWh in 2006.

A significant increase was also recorded in **electricity from solar power** (photovoltaics). It increased from 1.3 billion kWh in 2005 to around 2 billion kWh in 2006.

The use of **geothermal energy for electricity production** in 2006 remained limited to the first plant in Neustadt-Glewe. However, further projects have entered the specific planning stage or are already under construction, such as the power plant in Unterhaching near Munich.

In the **heating sector**, demand for renewable energies remains high. In 2006 alone, almost 140,000 plants were supported through the German government's market incentive programme, thus triggering investment of 1.5 billion euro.

The annual increase in **solar thermal power systems** exceeded the limit of 1 million square metres of solar panel area for the first time in 2006. At the end of 2006, a total of over 8 million square metres were installed in Germany. These not only contributed to heating process water, but also increasingly to heating.

Demand for **biomass in the heating sector** (especially wood) increased by an estimated 10% in 2006. In total around 84 billion kWh were supplied from total biomass. This equals around 94% of total heating supply from renewable energies.

The use of **geothermal power in the heating sector** continued its upward trend in 2006. Sales of near-surface heat pumps more than doubled compared to the previous year, to around 44,000 plants.

Table 2: Share of sectors in total final energy consumption in 2006 in Germany

	Electricity		Heating		Fuel		Total		Changes
	2005*	2006*	2005*	2006*	2005*	2006*	2005*	2006*	2005/2006
	[TWh]								[%]
Hydropower	21.5	21.6	-	-			21.5	21.6	0.5
Wind power	27.2	30.5	-	-			27.2	30.5	12.1
Biomass**	13.5	18.6	76.3	83.9	22.6	27.5	112.4	130.0	15.6
Photovoltaic	1.3	2.0	-	-			1.3	2.0	53.8
Solar thermal power	-	-	3.0	3.4			3.0	3.4	13.3
Geothermal power	< 0.1	< 0.1	1.6	2.1			1.6	2.1	31.3
Total	63.6	72.7	80.9	89.4	22.6	27.5	167.0	189.6	13.5
* provisional data, in some cases estimates, as at February 2007									
** solid, fluid, gaseous biomass, biogenic share of waste, gas from landfills and sewage treatment plants									
Sources: BMU according to Working Group on Renewable Energies/Statistics (AGEE-Stat); Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW); Working Group on Energy Balances (AGEB); Federal Statistical Office (StBA)									

A clear growth was again recorded for **biofuels** in 2006. Sales increased from around 2.3 million tonnes in 2005 to at least 2.8 million tonnes in 2006. New production capacities and continued increases in fossil fuel prices into the second half of the year played a role here. In addition to the continued dominant sale of biodiesel (2005: 1.8 million tonnes), significant volumes of bioethanol (0.5 million tonnes) and vegetable oil (0.3 million tonnes) were also recorded.

3. Jobs, RE as an economic factor

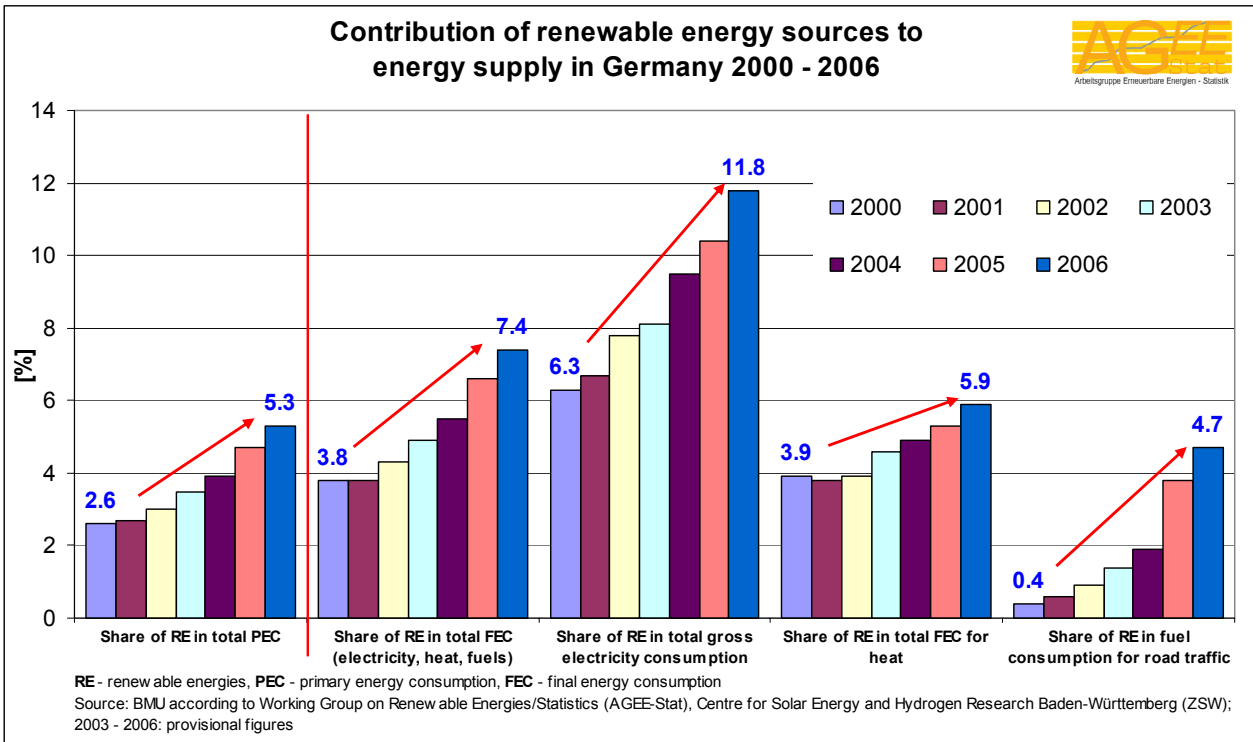
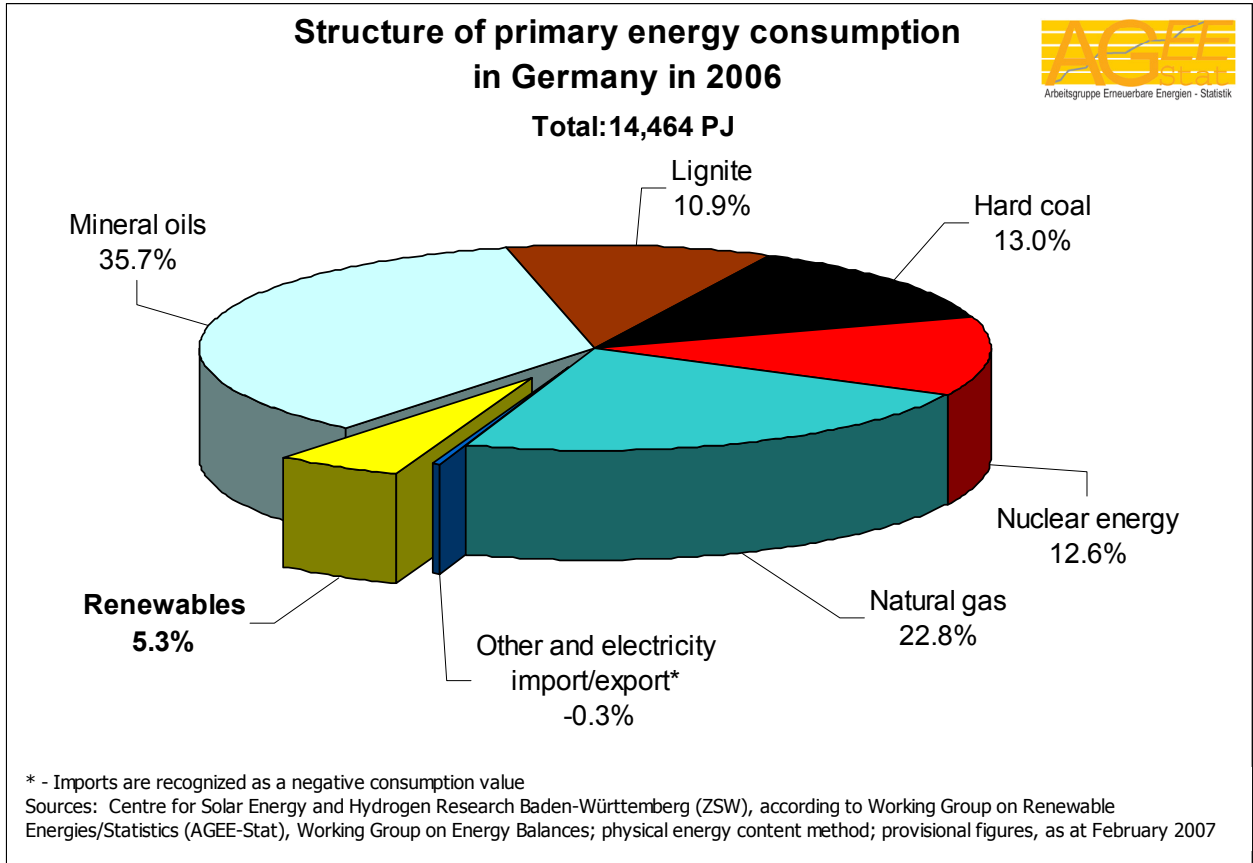
Renewable energies are increasingly becoming an important economic factor in Germany. A first analysis for the BMU shows that the **domestic turnover in 2006** increased by 19% in comparison with the previous year **to 21.6 billion euro**. The sector with the largest turnover was the use of biomass for energy with 38%, followed by the use of solar power (28%) and wind power (26%). From the total turnover, investment in setting up plants in Germany accounted for around 11.3 billion euro and revenues connected to plant operation for around 10.3 billion euro.

Linked to this, there is also significant **growth in employment**. According to an ongoing BMU research project by the Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW), the number of people working in the renewables sector in Germany, including foreign trade and upstream value-added stages, totalled around **214,000** in 2006. Compared with 2004, around **57,000** new jobs were thus created. This is an increase of around 36% in comparison with 2004. The reasons for this increase included in particular huge demand for plants for heat generation, which can be traced back to the high oil and gas prices, the increased production of plants and components, especially in the photovoltaics and biogas sectors, exports by the wind power industry and a clear increase in the supply of biofuels. German industry has succeeded in placing all renewable energy sectors in a leading technological position globally. Renewable energies thus make a key contribution to Germany as a location for business and investment.

Further information on renewable energies is available on the BMU website and at www.erneuerbare-energien.de.

Charts and tables on the development of renewable energies in 2006 in Germany

As at: 21 February 2007



Contribution of renewable energy sources to energy supply in Germany in 2006



Share of renewable energy sources		
in total primary energy consumption calculated according to physical energy content method	[%]	5.3
in total gross electricity consumption		11.8
in total heat supply *		5.9
in total road traffic		4.7

CO ₂ reduction through the use of renewable energy sources		
all renewable energy sources	[million t]	97
alone through the EEG		44

Final energy supply from renewable energy sources			
Electricity	Wind energy	[TWh] = (billion kWh)	30.5
	Hydropower		21.6
	Biomass		16.7
	of which solid biomass, including biogenic waste		10.2
	of which biogas		5.4
	of which liquid biomass		1.1
	Landfill and sewage gas		1.9
	Photovoltaics		2.0
	Geothermal energy		0.0004
	Total electricity		72.7
Heat	Biomass	[TWh] = (billion kWh)	83.9
	of which solid biomass, including biogenic waste		77.6
	of which liquid biomass		1.0
	of which biogenic gaseous fuel		5.4
	Solar thermal energy		3.4
	Deep geothermal energy		0.1
	Near surface geothermal energy		1.9
Total heat	89.4		
Biogenic fuels	Biodiesel (2 million t)	[TWh] = (billion kWh)	20.7
	Vegetable oil (300,000 t)		3.1
	Bioethanol (500,000 t)		3.7
	Biogenic fuels (total)		27.5
Total final energy from renewable energies:			189.6

provisional figures, in some cases estimates, as at February 2007

* share in total final energy consumption for heat

Sources: BMU according to Working Group on Renewable Energies/Statistics (AGEE-Stat), Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW), Working Group on Energy Balances (AGEB), Federal Statistical Office (StBA), German Solar Industry Federation (BSW), ISET Kassel, Institute for Energy and Environment (IE), German Electricity Association (VDEW)

Renewable energy sources as a share of energy supply in Germany									
	1998	1999	2000	2001	2002	2003 ^{*)}	2004 ^{*)}	2005 ^{*)}	2006 ^{*)}
Final energy consumption [%]									
Electricity generation (in relation to total gross electricity consumption)	4.8	5.5	6.3	6.7	7.8	8.1	9.5	10.4	11.8
Heat supply (in relation to total heat supply)	3.5	3.5	3.9	3.8	3.9	4.6	4.9	5.3	5.9
Fuel consumption (in relation to fuel consumption in road traffic)	0.2	0.2	0.4	0.6	0.9	1.4	1.9	3.8	4.7
Share of renewable energies in total final energy consumption in Germany	3.1	3.3	3.8	3.8	4.3	4.9	5.5	6.6	7.4
Primary energy consumption (PEC) [%]									
Electricity generation (in relation to total PEC)	0.8	0.9	1.1	1.1	1.4	1.6	1.8	2.1	2.4
Heat supply (in relation to total PEC)	1.3	1.3	1.4	1.4	1.5	1.8	1.9	2.0	2.2
Fuel consumption (in relation to total PEC)	0.03	0.03	0.06	0.1	0.1	0.2	0.3	0.6	0.7
Share of total PEC	2.1	2.2	2.6	2.7	3.0	3.5	3.9	4.7	5.3

Share of PEC calculated according to the physical energy content method
^{*)} provisional figures, in some cases estimates, as at February 2007
 from 2003 new assessment of heat supply from RE due to improved data basis (data collected from the Energy Statistics Act (EnStatG)
 Sources: according to Working Group on Renewable Energies/Statistics (AGEE-Stat); Centre for solar Energy and Hydrogen Research Baden-Württemberg (ZSW); Working Group on Energy Balances (AGEB); Federal Statistical Office (StBA); Institute for Energy and Environment (IE); German Solar Industry Federation (BSI); German Electricity Association (VDEW); Association of German Network Operators (VDN)

Share of renewable energy sources in total final energy consumption in Germany in 2006						
	Electricity		Heat		Fuels	
	2005 [*]	2006 [*]	2005 [*]	2006 [*]	2005 [*]	2006 [*]
[%]						
Hydropower	3.5	3.5	-	-		
Wind energy	4.5	5.0	-	-		
Biomass**	2.2	3.0	5.0	5.5	3.8	4.7
Photovoltaic	0.2	0.3	-	-		
Solar energy	-	-	0.2	0.2		
Geothermal	< 0.1	< 0.1	0.1	0.1		
Total	10.4	11.8	5.3	5.9	3.8	4.7

^{*} provisional figures, in some cases estimates, as at February 2007
^{**} solid, liquid, gaseous biomass, biogenic share of waste, landfill and sewage gas
 Sources: BMU according to Working Group on Renewable Energies/Statistics (AGEE-Stat); Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW); Working Group on Energy Balances (AGEB); Federal Statistical Office (StBA)

Contribution of renewable energy sources to electricity generation in Germany 1990 - 2006



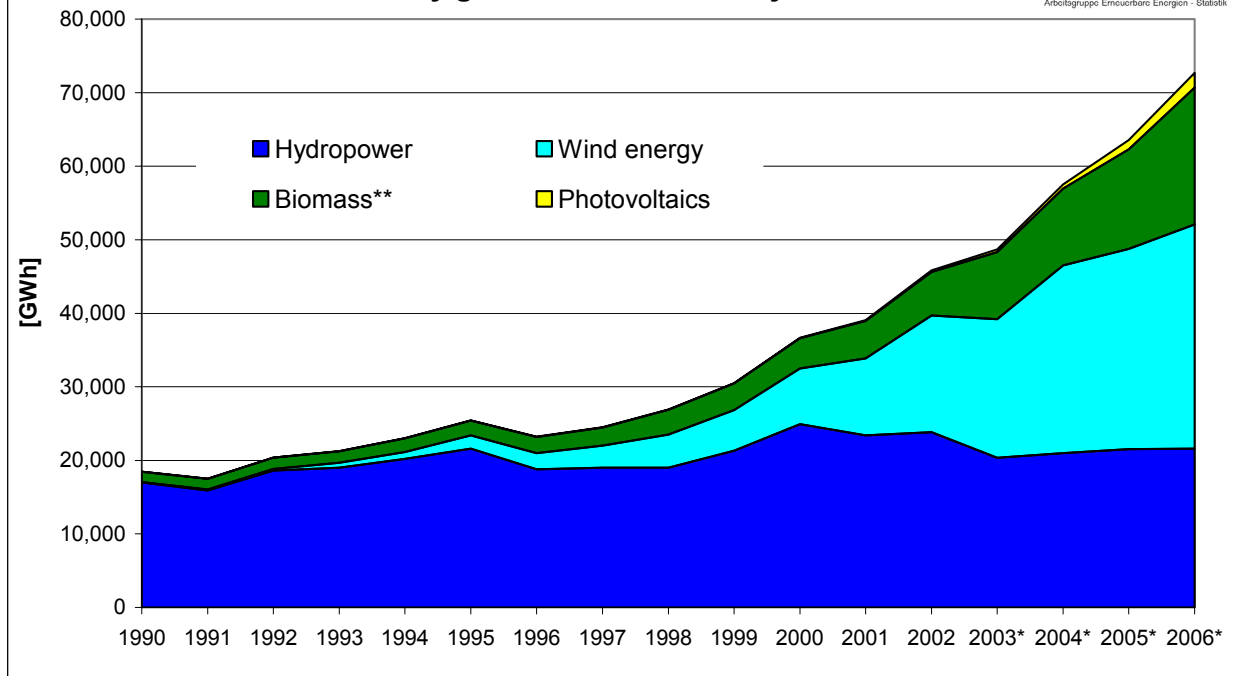
	Hydropower	Wind energy	Biomass **	Photovoltaics	Geothermal energy	Total electricity generation	Share of gross electricity consumption
[GWh]							
1990	17,000	40	1,422	1	0	18,463	3.4
1991	15,900	140	1,450	2	0	17,492	3.2
1992	18,600	230	1,545	3	0	20,378	3.8
1993	19,000	670	1,570	6	0	21,246	4.0
1994	20,200	940	1,870	8	0	23,018	4.3
1995	21,600	1,800	2,020	11	0	25,431	4.7
1996	18,800	2,200	2,203	16	0	23,219	4.2
1997	19,000	3,000	2,479	26	0	24,505	4.5
1998	19,000	4,489	3,392	32	0	26,913	4.8
1999	21,300	5,528	3,641	42	0	30,511	5.5
2000	24,936	7,550	4,129	64	0	36,679	6.3
2001	23,383	10,509	5,065	116	0	39,073	6.7
2002	23,824	15,859	5,962	188	0	45,833	7.8
2003*	20,350	18,859	9,132	333	0	48,674	8.1
2004*	21,000	25,509	10,463	557	0.2	57,529	9.5
2005*	21,524	27,229	13,534	1,282	0.2	63,569	10.4
2006*	21,600	30,500	18,588	2,000	0.4	72,688	11.8

* provisional figures

** solid, liquid, gaseous biomass, biogenic share of waste, landfill and sewage gas

Sources: BMU according to Working Group on Renewable Energies/Statistics (AGEE-Stat), Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW), Working Group on Energy Balances (AGEB), Federal Statistical Office (StBA), German Solar Industry Federation (BSW), ISET Kassel, Institute for Energy and Environment (IE), German Electricity Association (VDEW), German Wind Energy Association, ISET Kassel, provisional figures, February 2007

Contribution of renewable energy sources to electricity generation in Germany 1990 - 2006



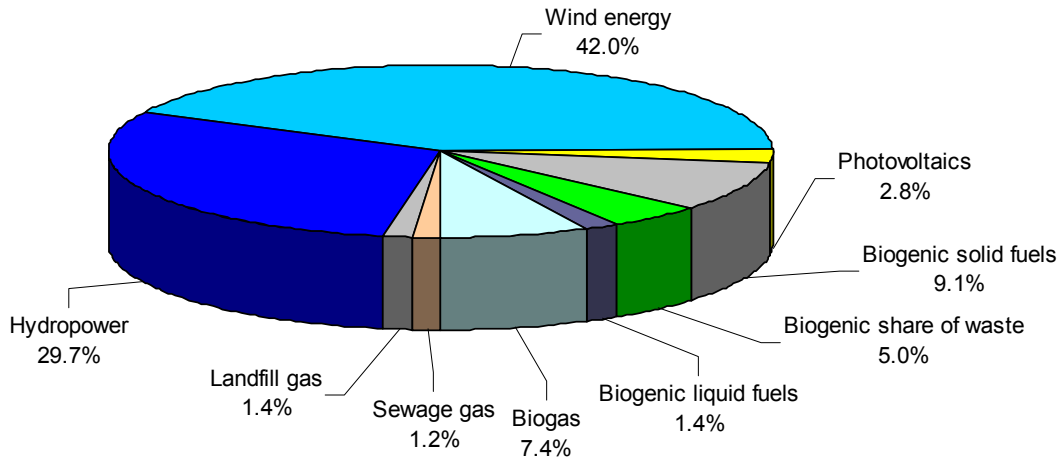
* provisional figures, February 2007

** solid, liquid, gaseous biomass, biogenic share of waste, landfill and sewage gas; electricity from geothermal energy is not presented due to the low volumes of electricity

Sources: BMU according to Working Group on Renewable Energies/Statistics (AGEE-Stat), Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW), Working Group on Energy Balances (AGEB), Federal Statistical Office (StBA), German Solar Industry Federation (BSW), ISET Kassel, Institute for Energy and Environment (IE), German Electricity Association (VDEW), German Wind Energy Association (BWE)

Structure of electricity generation from renewable energy sources in Germany in 2006

Total: 72.7 TWh

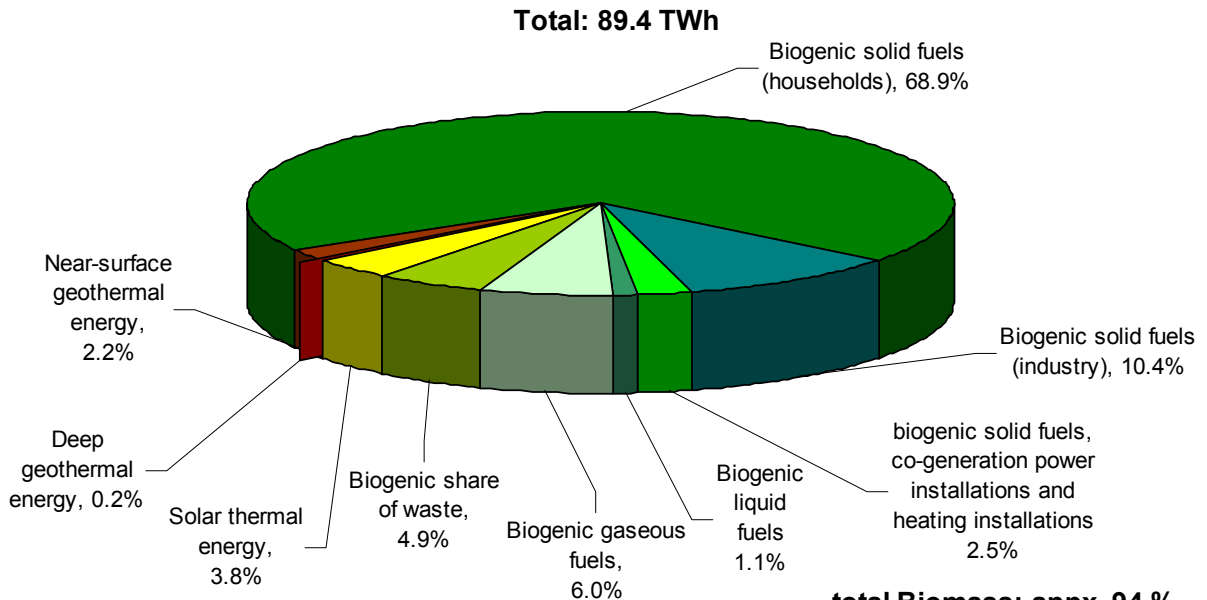


total Biomass: appx. 23 %
(excludind Landfill and sewage gas)

Source: BMU according to Working Group on Renew able Energies/Statistics (AGEE-Stat), Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW), electricity from geothermal energy is not presented due to the low volumes of electricity, provisional figures, February 2007

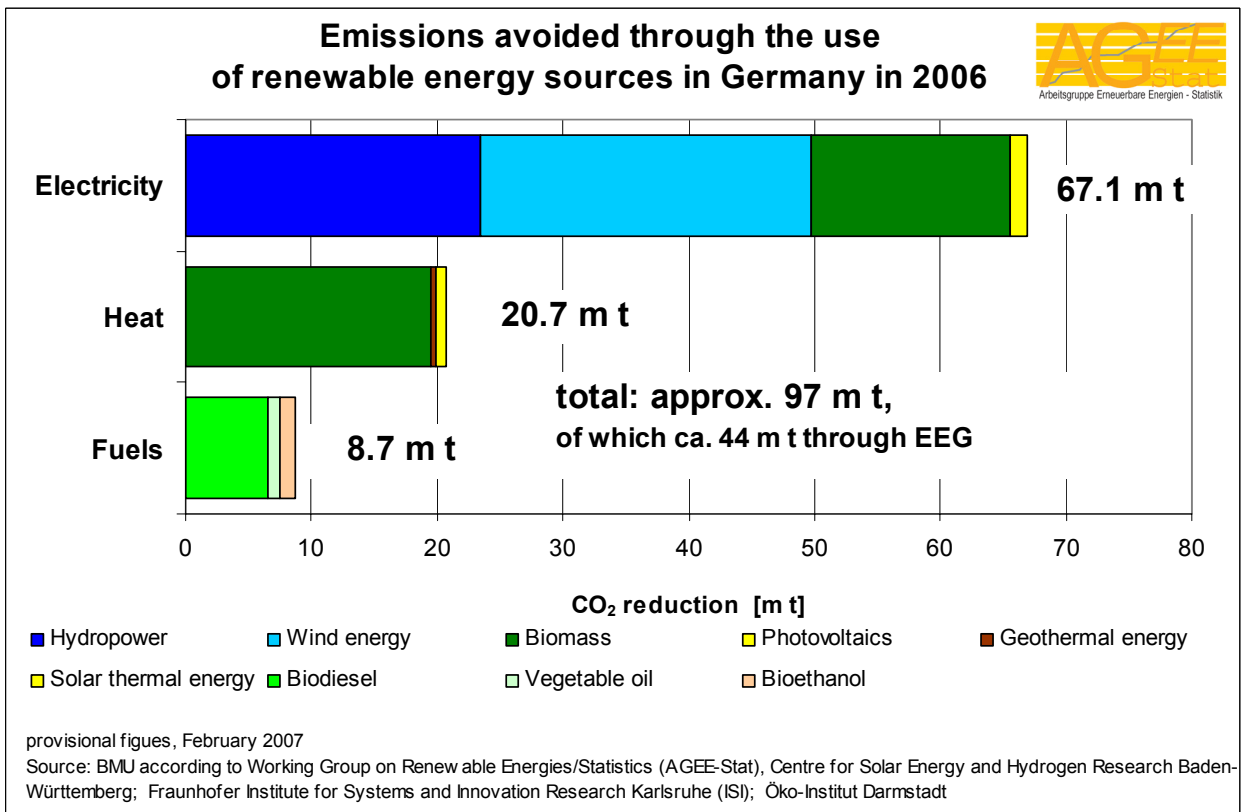
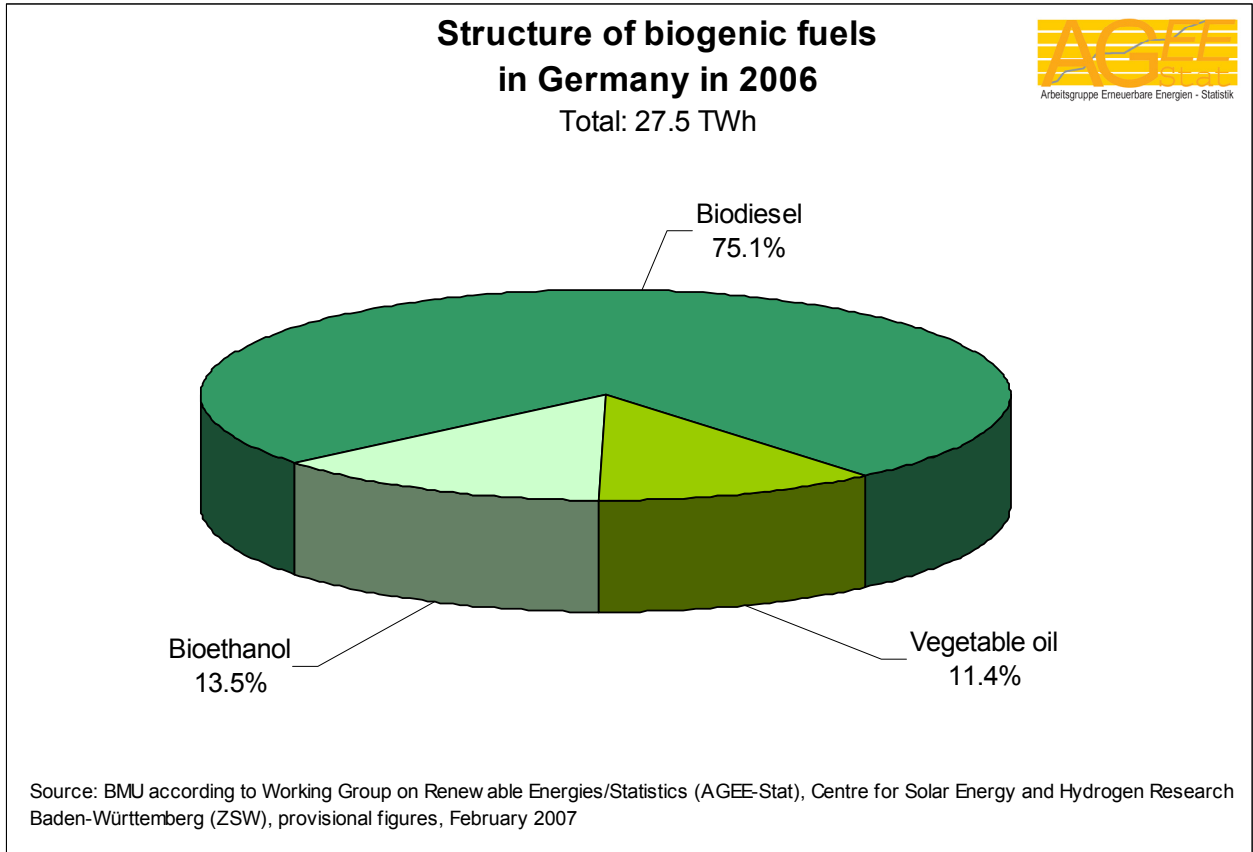
Structure of heat supply from renewable energy sources in Germany in 2006

Final energy for heat generation



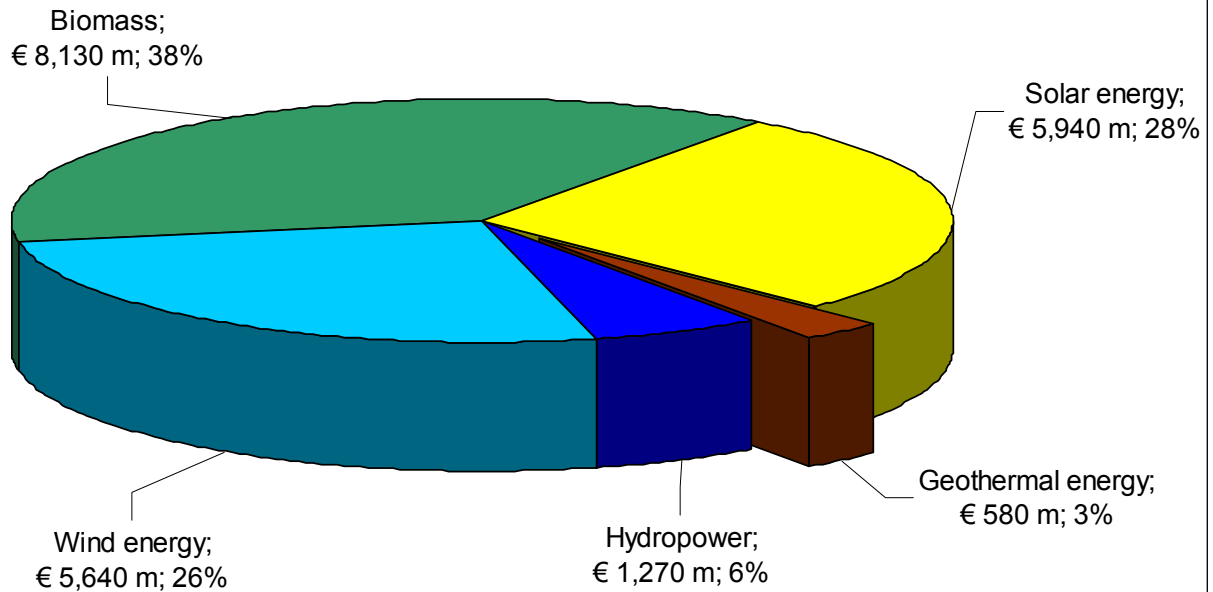
total Biomass: appx. 94 %

Source: BMU according to Working Group on Renew able Energies/Statistics (AGEE-Stat), Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW), provisional figures, February 2007



Total turnover with renewable energy sources in Germany in 2006

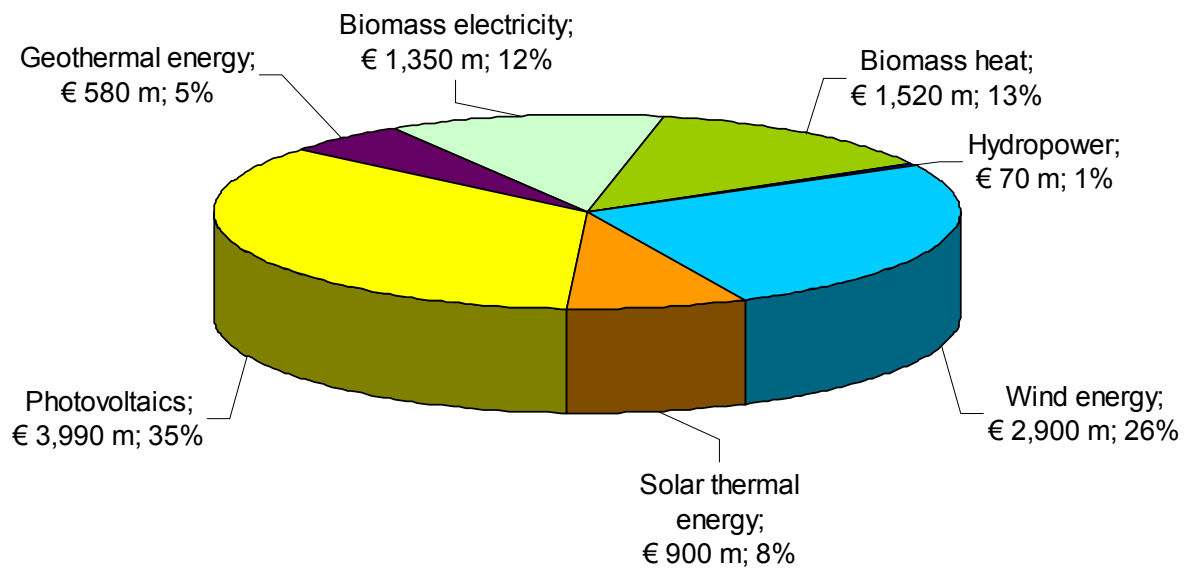
Total: approx. € 21.6 billion



Source: Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW), 2007, provisional figures

Turnover from the construction of plants for the use of renewable energy sources in Germany in 2006

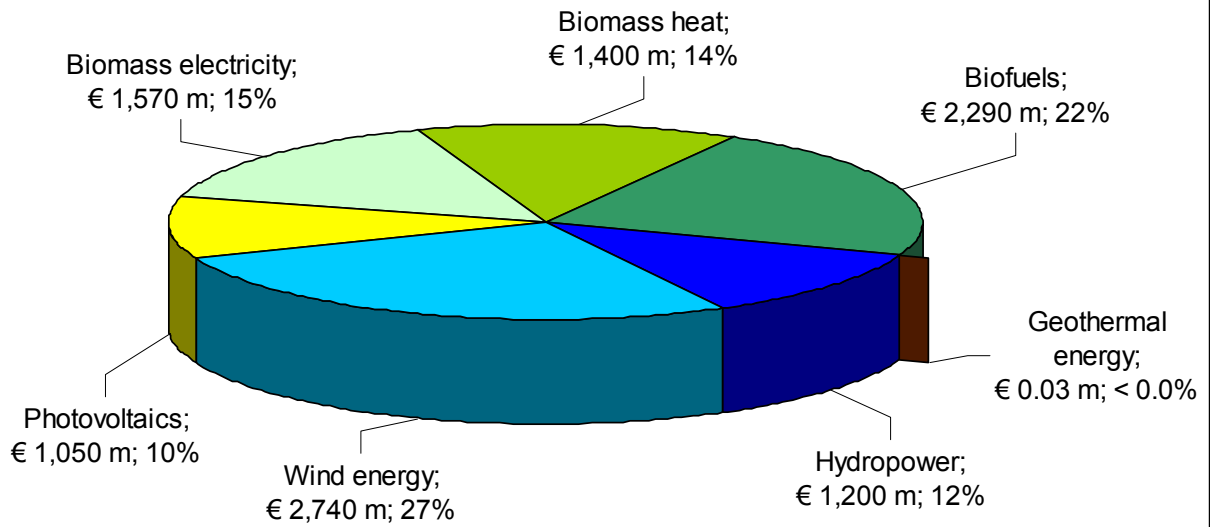
Total: approx. € 11.3 billion



Quelle: Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW), 2007, provisional figures

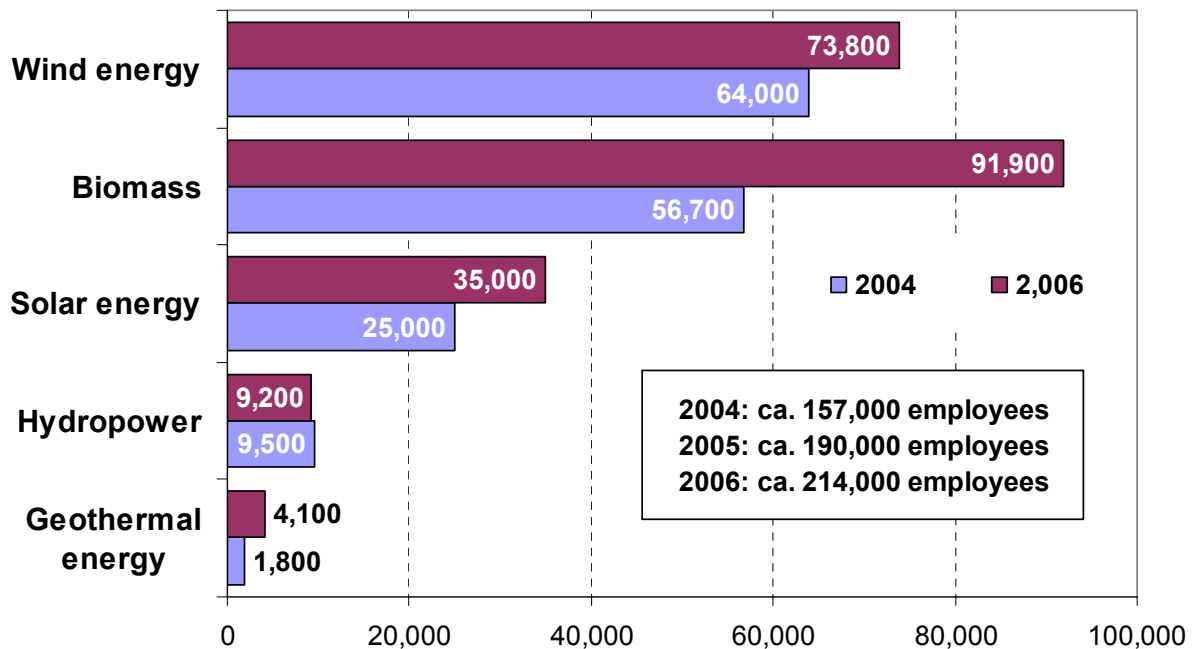
Turnover from the operation of plants for the use of renewable energy sources in Germany in 2006

Total: approx. € 10.3 billion



Source: Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW), 2007, provisional figures

Employees in the renewable energy sources sector in Germany



Source: ZSW (head of project)/DW/DLR/GWS: "Wirkungen des Ausbaus erneuerbarer Energien auf den deutschen Arbeitsmarkt", results of an ongoing research project for the BMU

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