

Development of renewable energy sources in Germany 2009

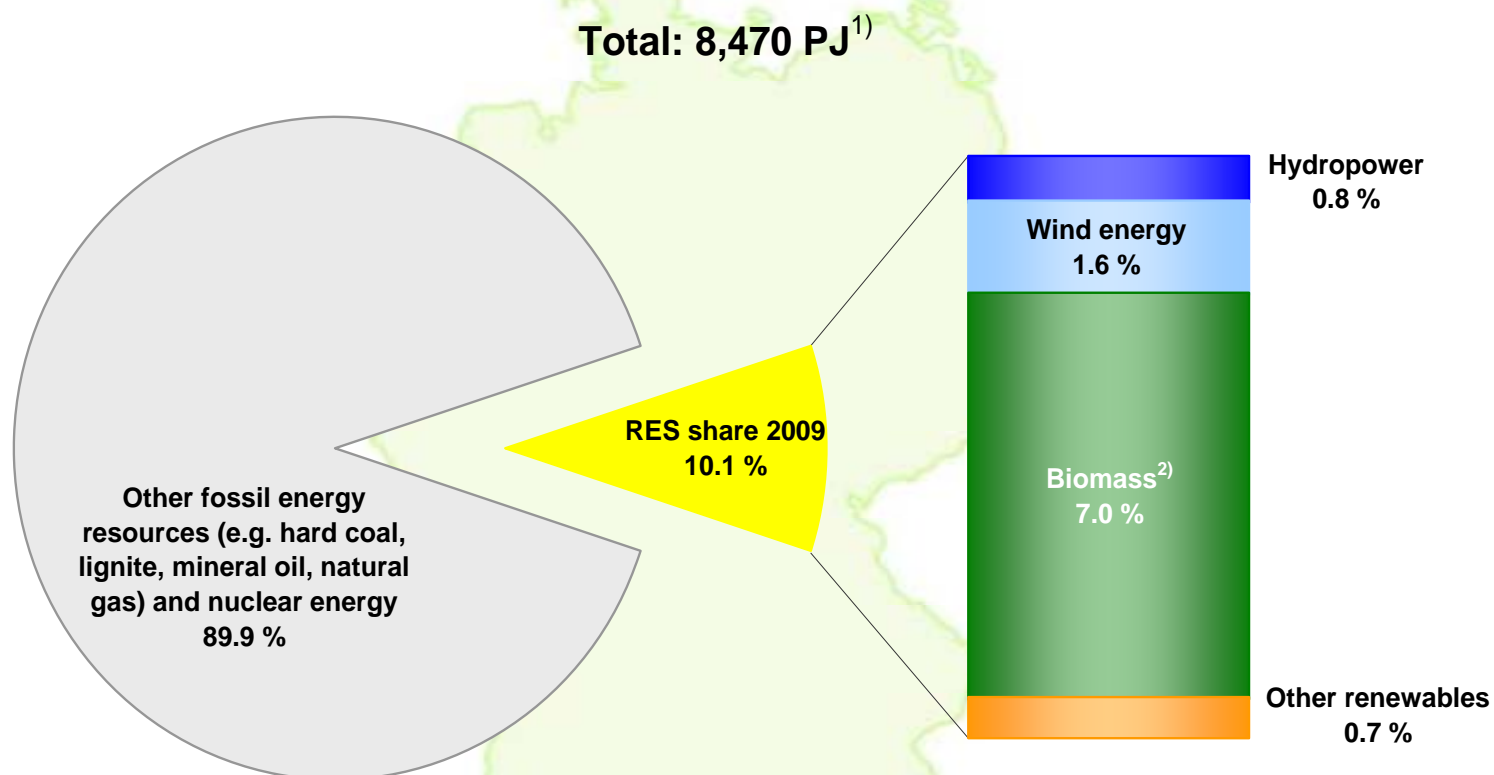
Graphics and tables
Version: March 2010

Based on statistical data from the
Working Group on Renewable Energies-Statistics (AGEE-Stat)



This presentation may be used for informational purposes if the source is being mentioned. It is, however, not permissible to make any changes to the presentation. In case of publication please send a specimen copy free of charge to division BMU-KI III 1. In case of online publication please send an exact link via email to: KI1111@bmu.bund.de.

Shares of renewable energy sources among total final energy consumption in Germany 2009

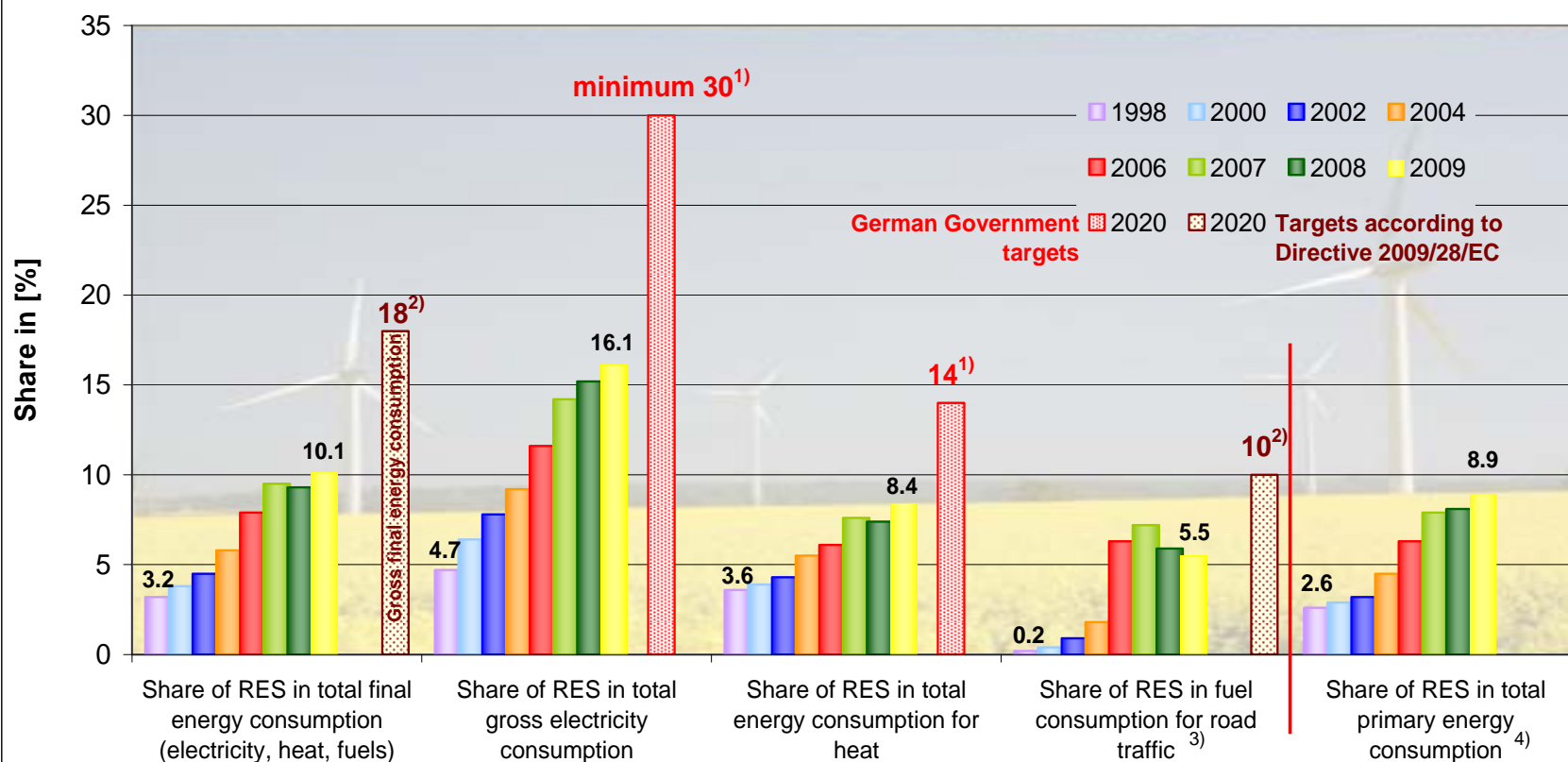


RES - Renewable Energy Sources; ¹⁾ FEC 2008 based on the Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW);

²⁾ solid, liquid, gaseous biomass, biogenic share of waste, landfill and sewage gas; Deviations in the totals are due to rounding;

Source: BMU-KI III 1 based on Working Group on Renewable Energies-Statistics (AGEE-Stat) and the Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW), according to Working Group on Energy Balances (AGEB); all figures provisional

Renewable energy sources as a share of energy supply in Germany



RES - Renewable Energy Sources; ¹⁾ Share of total final energy consumption for electricity: Renewable Energy Sources Act (EEG 2009), 25.10.2008; share of final energy consumption for heat: Renewable Energies Heat Act (EEWärmeG), 7.08.2008; ²⁾ Source: EU-Directive 2009/28/EC on the promotion of the use of energy from renewable sources, target for the share of energy from renewable energy sources in gross final consumption of energy and of the final consumption of energy in transport; ³⁾ Consumption of motor fuel, without aviation fuel; ⁴⁾ Source: Working Group on Energy Balances (AGEB); Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); Image: BMU / Brigitte Hiss; all figures provisional

Contribution of renewable energy sources to energy supply in Germany in 2009

Share of renewable energy sources

in total final energy consumption	[%]	10.1
in total gross electricity consumption		16.1
in total heat supply		8.4
in total fuel consumption ¹⁾		5.5
in total primary energy consumption ²⁾		8.9

¹⁾ Total consumption of motor fuel, without aviation fuel;

²⁾ Source: Working Group on Energy Balances (AGEB);

Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); all figures provisional

Contribution of renewable energy sources to energy supply in Germany in 2009

Final energy supply from renewable energy sources

Electricity			Heat		
Hydropower		19.0	Biomass (total)		100.8
Wind energy		37.8	therefrom:		
Biomass (total)		28.6	solid biomass, including biogenic waste		82.9
therefrom:			liquid biomass	[TWh]	7.7
solid biomass, including biogenic waste	[TWh]	17.1	biogenic gaseous fuel	=	10.2
biogas	(1 billion kWh)	10.0	Solar thermal energy	(1 billion kWh)	4.8
liquid biomass		1.5	Deep geothermal energy		0.3
Landfill and sewage gas		2.0	Near surface geothermal energy		4.7
Photovoltaics		6.2	Total heat		110.5
Geothermal energy		0.019			
Total electricity		93.5			
			Biogenic fuels		
			Biodiesel (approx. 2.5 mill. t)		26.0
			Vegetable oil (approx. 0.1 mill. t)	[TWh]	1.0
			Bioethanol (approx. 0.9 mill. t)	=	6.7
				(1 billion kWh)	
			Biogenic fuels (total)		33.8

Deviations in the totals are due to rounding;

Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat);

all figures provisional

Total final energy from renewable energy sources

237.8

Avoidance of CO₂ and Greenhouse-Gas emissions in Germany 2009

	Avoidance of CO ₂ emissions	Avoidance of GG emissions
	[mill. t]	[mill. t]
Electricity generation	70.1	74.1
<i>Through the EEG compensated power input</i>	<i>approx. 52</i>	<i>approx. 55</i>
Heat generation	29.4	29.7
Biogenic fuel generation	7.6	4.8
Total	107.1	108.6

Deviations in the totals are due to rounding;

Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat);

all figures provisional

Renewable energy sources as a share of energy supply in Germany 1998 - 2009

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Renewables as a share of total final energy consumption (FEC)	[%]											
Electricity generation (in relation to total gross electricity consumption)	4.7	5.4	6.4	6.7	7.8	7.5	9.2	10.1	11.6	14.2	15.2	16.1
Heat supply (in relation to total heat supply)	3.6	3.8	3.9	4.2	4.3	5.0	5.5	5.9	6.1	7.6	7.4	8.4
Fuel consumption ¹⁾ (in relation to total fuel consumption)	0.2	0.2	0.4	0.6	0.9	1.4	1.8	3.7	6.3	7.2	5.9	5.5
Renewables as a share of total FEC	3.2	3.4	3.8	4.1	4.5	5.0	5.8	6.8	7.9	9.5	9.3	10.1
Primary energy consumption (PEC)	[%]											
Renewables as a share of PEC²⁾	2.6	2.8	2.9	2.9	3.2	3.8	4.5	5.3	6.3	7.9	8.1	8.9

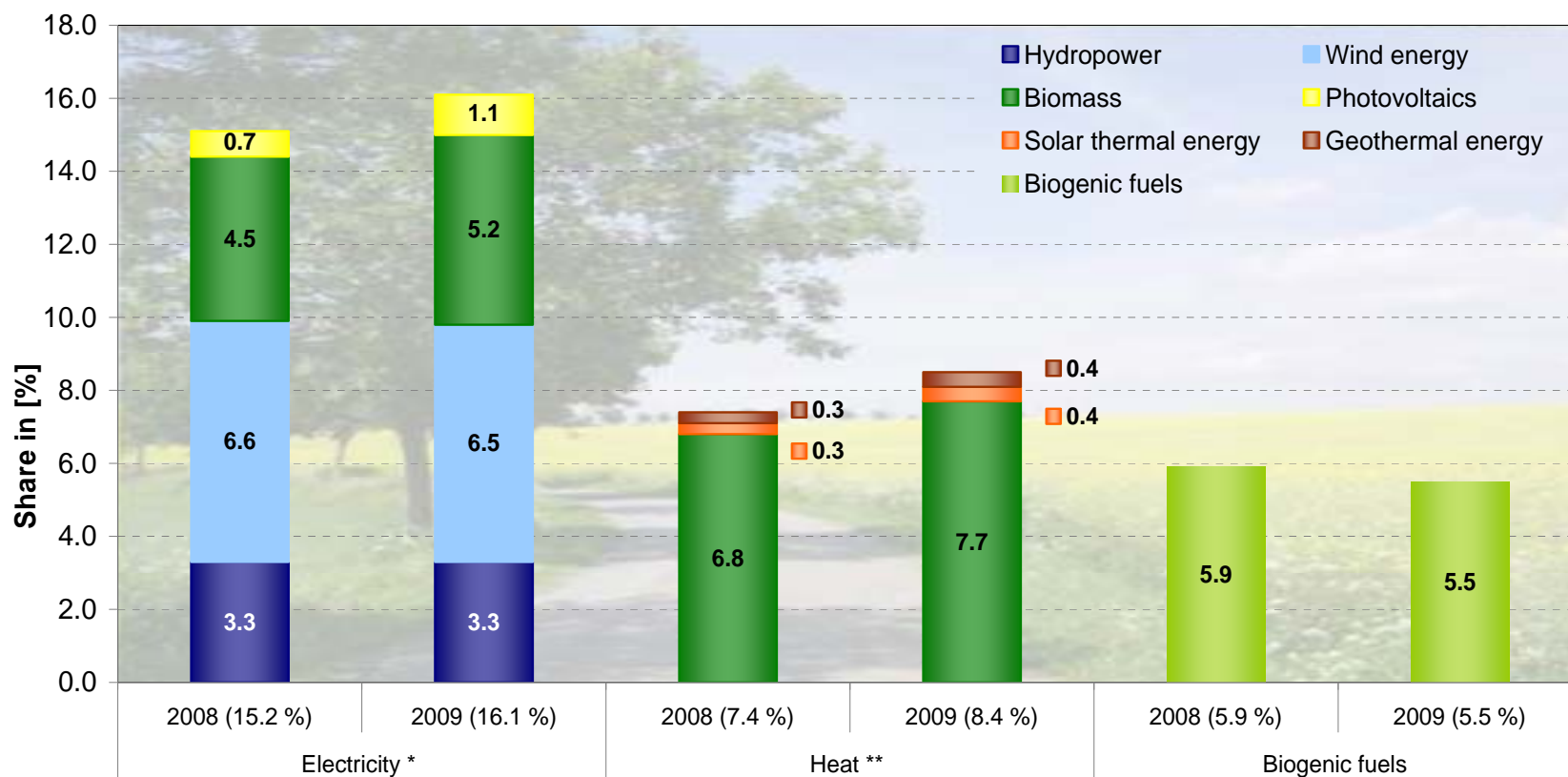
¹⁾ Until 2002, the reference variable was fuel consumption in road traffic, from 2003, the reference variable here is the total consumption of engine fuels, excluding fuel in air traffic;

²⁾ Source: Working Group on Energy Balances (AGEB);

Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat);

all figures provisional

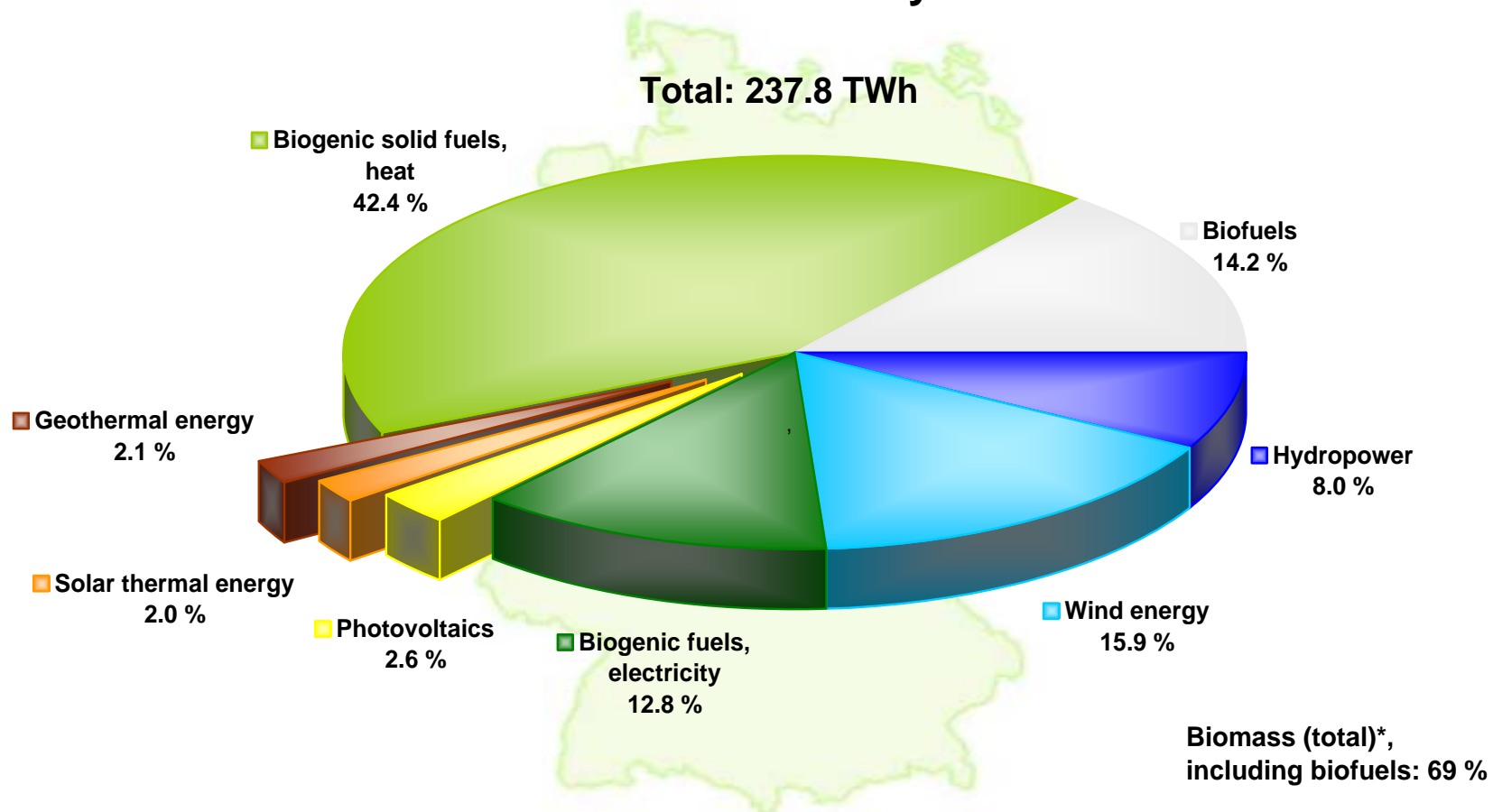
Share of renewable energy sources in total final energy consumption in Germany 2008/2009



* Biomass: solid, liquid, gaseous biomass, biogenic share of waste, landfill and sewage gas; ** Biomass: solid, liquid; gaseous biomass, biogenic share of waste; Deviations in the totals are due to rounding;

Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); Image: BMU / Dieter Böhme; all figures provisional

Structure of final energy supply from renewable energy sources in Germany 2009



* Biomass: solid, liquid, gaseous biomass, biogenic share of waste, landfill and sewage gas;
 Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); all figures provisional

Contribution of renewable energy sources to electricity generation in Germany 1990 - 2009

	Hydropower ¹⁾	Windenergy	Biomass ²⁾	Biogenic share of waste ³⁾	Photovoltaics	Geothermal energy	Total electricity generation	Share of gross electricity consumption
	[GWh]	[GWh]	[GWh]	[GWh]	[GWh]	[GWh]	[GWh]	[%]
1990	15,580	71	222	1,213	1	0	17,087	3.1
1991	15,402	100	259	1,211	2	0	16,973	3.1
1992	18,091	275	297	1,262	3	0	19,928	3.7
1993	18,526	600	433	1,203	6	0	20,768	3.9
1994	19,501	909	570	1,306	8	0	22,294	4.2
1995	20,747	1,500	665	1,348	11	0	24,271	4.5
1996	18,340	2,032	759	1,343	16	0	22,490	4.1
1997	18,453	2,966	879	1,397	26	0	23,721	4.3
1998	18,452	4,489	1,642	1,618	32	0	26,233	4.7
1999	20,686	5,528	1,847	1,740	42	0	29,843	5.4
2000	24,867	7,550	2,893	1,844	64	0	37,217	6.4
2001	23,241	10,509	3,348	1,859	76	0	39,033	6.7
2002	23,662	15,786	4,089	1,949	162	0	45,647	7.8
2003	17,722	18,713	6,085	2,161	313	0	44,993	7.5
2004	19,910	25,509	7,960	2,117	556	0.2	56,052	9.2
2005	19,576	27,229	10,979	3,047	1,282	0.2	62,112	10.1
2006	20,042	30,710	14,840	3,675	2,220	0.4	71,487	11.6
2007	21,249	39,713	19,430	4,130	3,075	0.4	87,597	14.2
2008	20,446	40,574	22,872	4,940	4,420	17.6	93,269	15.2
2009	19,000	37,809	25,515	5,000	6,200	18.6	93,543	16.1

¹⁾ In the case of pump storage power plants, electricity generated from natural inflow only; ²⁾ Until 1998 only feed-in to the general supply grid;

³⁾ Share of biogenic waste in incineration plants estimated at 50 %;

Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat);
all figures provisional

Installed capacity for electricity generation from renewable energy sources in Germany 1990 - 2009

	Hydropower	Windenergy	Biomass ¹⁾	Biogenic share of waste ²⁾	Photovoltaics	Geothermal energy	Total capacity
	[MW]	[MW]	[MW]	[MW]	[MW _p]	[MW]	[MW]
1990	4,403	55	85	499	1	0	5,042
1991	4,446	106	96	499	2	0	5,148
1992	4,489	174	105	499	3	0	5,270
1993	4,509	326	143	499	5	0	5,482
1994	4,529	618	179	499	6	0	5,831
1995	4,546	1,121	216	525	8	0	6,415
1996	4,563	1,546	252	551	11	0	6,923
1997	4,578	2,080	317	527	18	0	7,520
1998	4,600	2,871	432	540	23	0	8,467
1999	4,547	4,439	466	555	32	0	10,039
2000	4,600	6,104	580	585	76	0	11,945
2001	4,600	8,754	696	585	186	0	14,820
2002	4,620	11,994	755	585	296	0	18,250
2003	4,640	14,609	1,090	847	439	0	21,625
2004	4,660	16,629	1,449	1,016	1,074	0.2	24,828
2005	4,680	18,415	1,965	1,210	1,980	0.2	28,250
2006	4,700	20,622	2,620	1,250	2,812	0.2	32,004
2007	4,720	22,247	3,503	1,330	3,977	3.2	35,780
2008	4,740	23,897	3,973	1,440	5,877	6.6	39,933
2009	4,760	25,777	4,429	1,460	8,550	6.6	44,982

¹⁾ Solid, liquid, gaseous biomass, landfill and sewage gas;

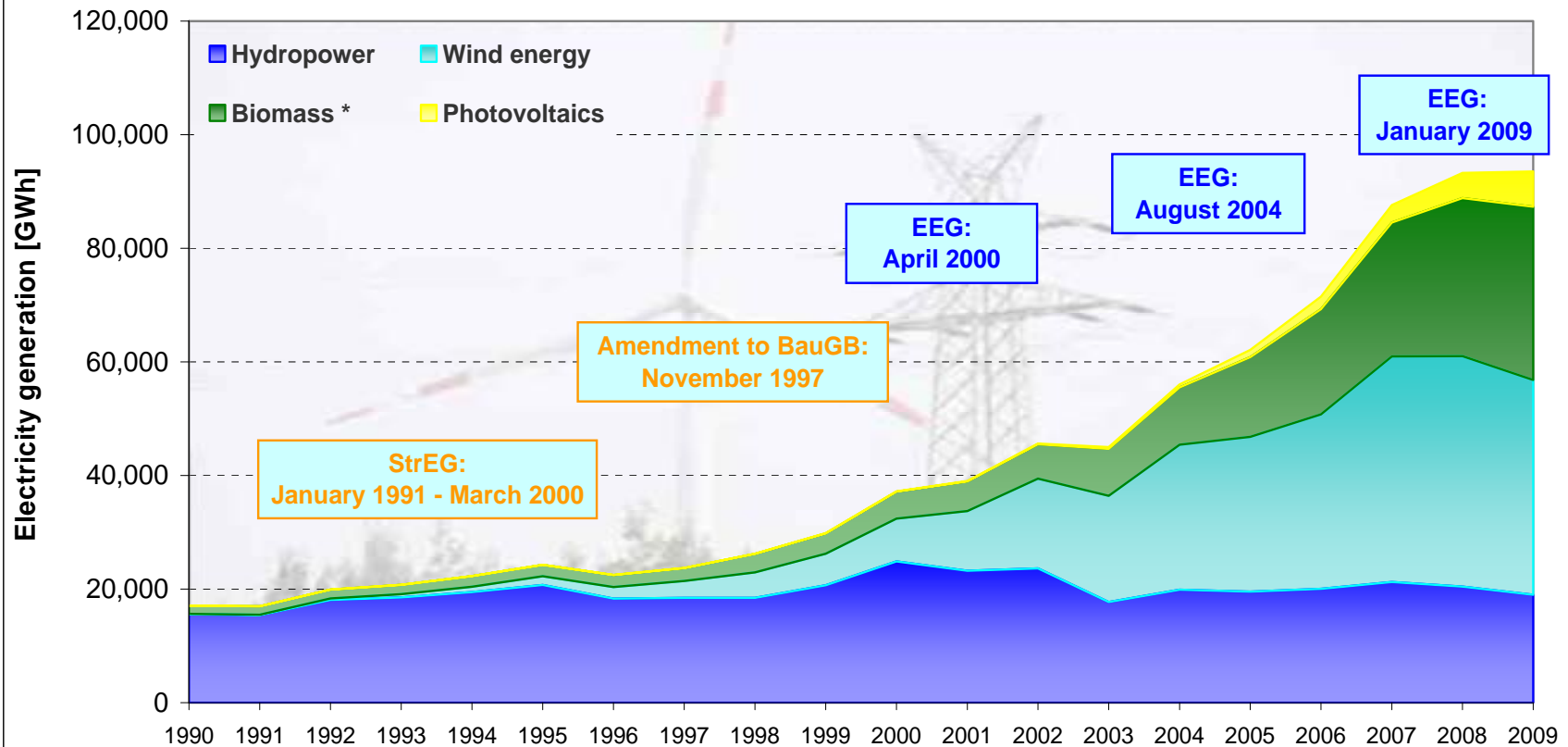
²⁾ Share of biogenic waste in incineration plants estimated at 50 %;

Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat);

all figures provisional



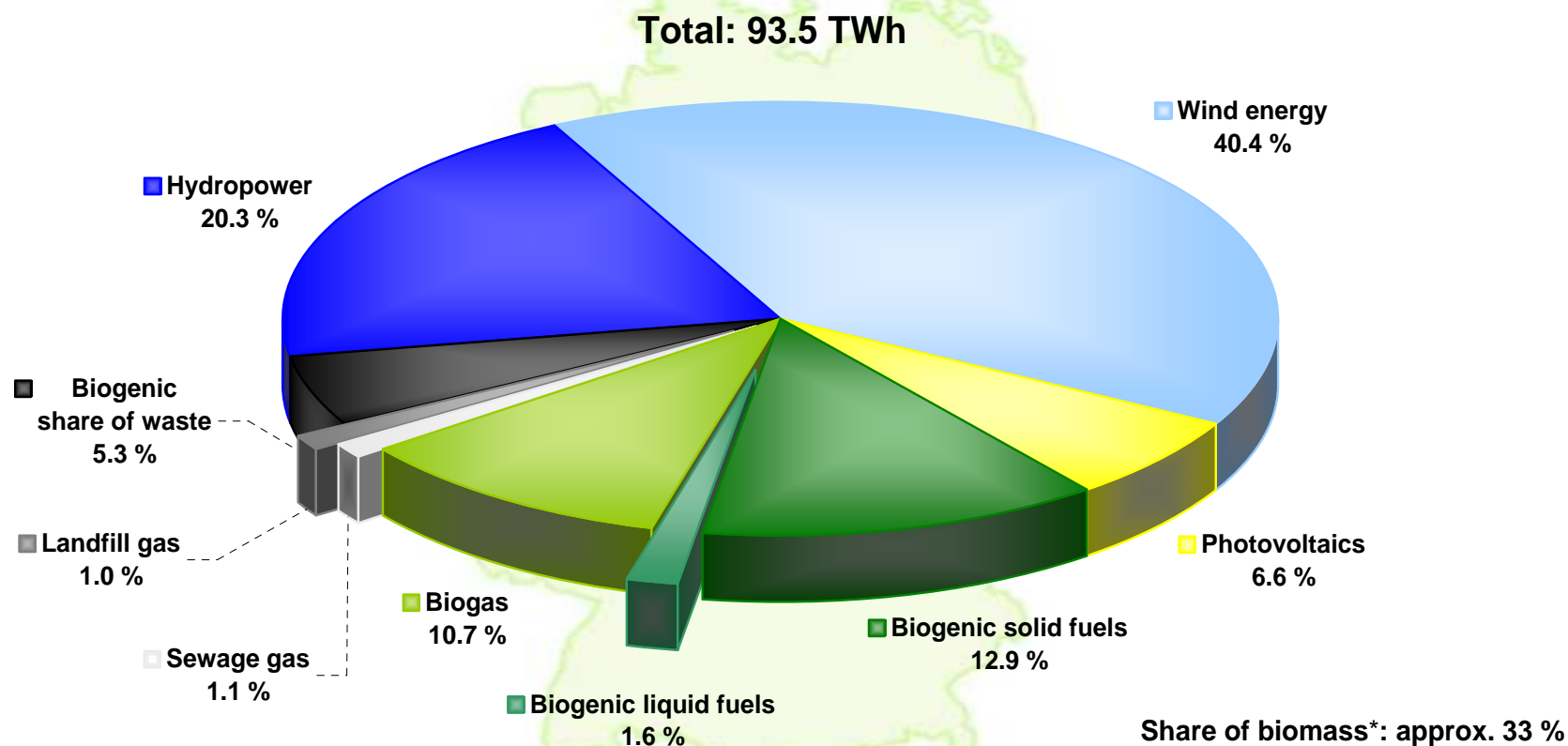
Development of electricity generation from renewable energy sources in Germany 1990 - 2009



* Biomass: Solid, liquid, gaseous biomass, biogenic share of waste, landfill and sewage gas;

Electricity from geothermal energy is not presented due to the negligible quantities of electricity produced; StrEG: Act on the Sale of Electricity to the Grid; BauGB: Construction Code; EEG: Renewable Energy Sources Act; Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); Image: BMU / Christoph Edelhoff; all figures provisional

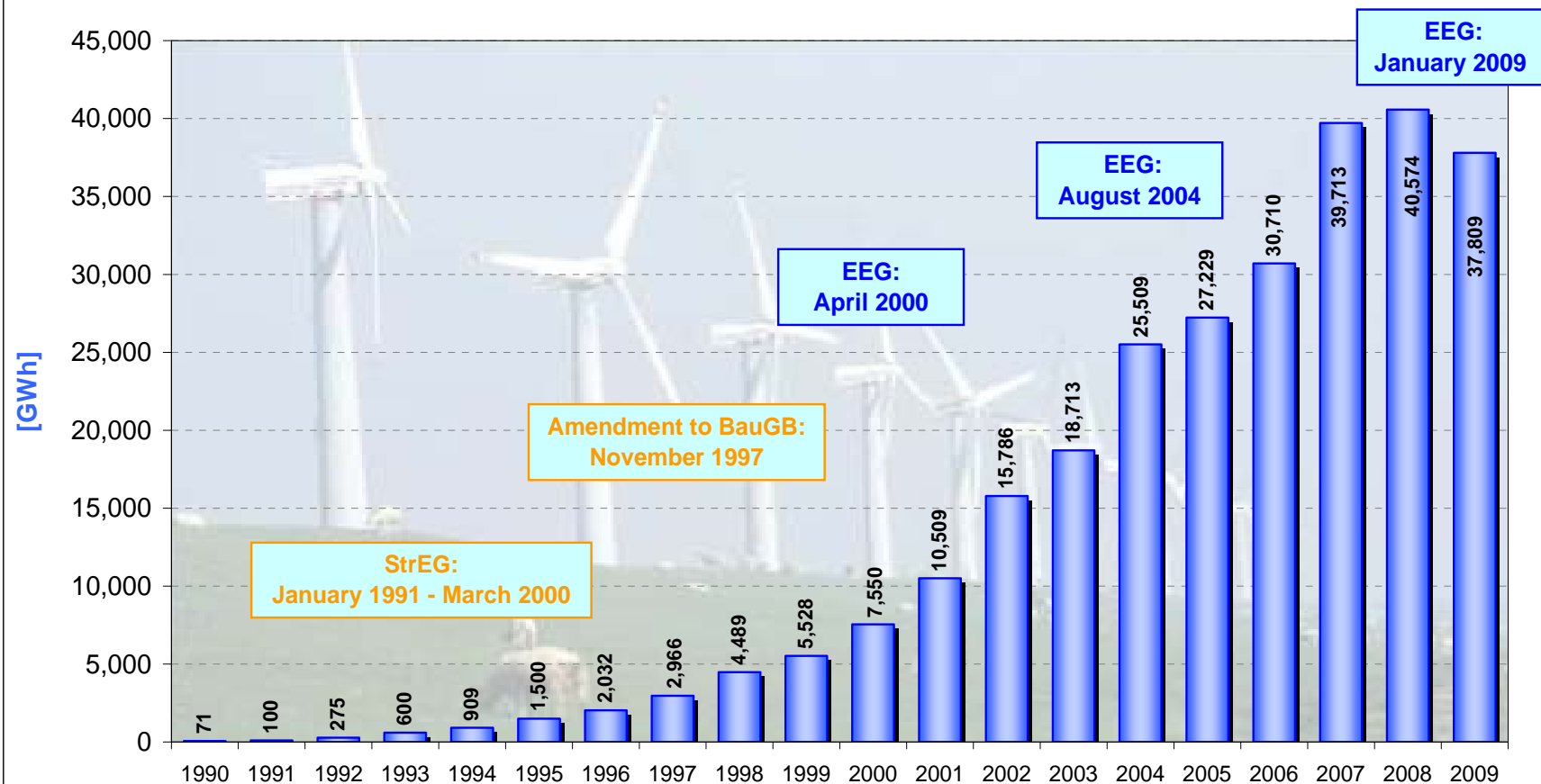
Structure of electricity supply from renewable energy sources in Germany 2009



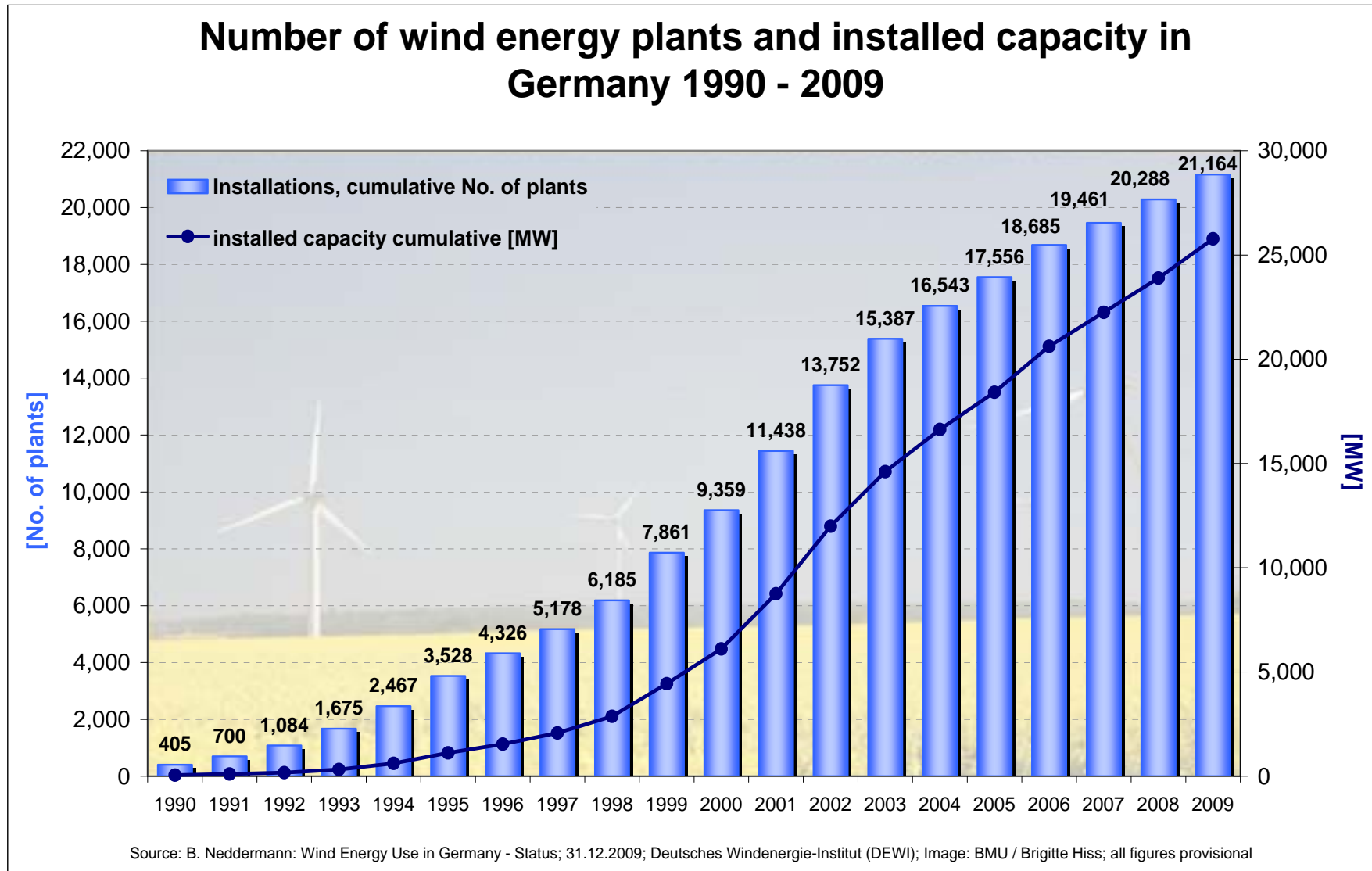
* Solid, liquid, gaseous biomass, biogenic share of waste, landfill and sewage gas; Deviations in the totals are due to rounding;
 Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); all figures provisional



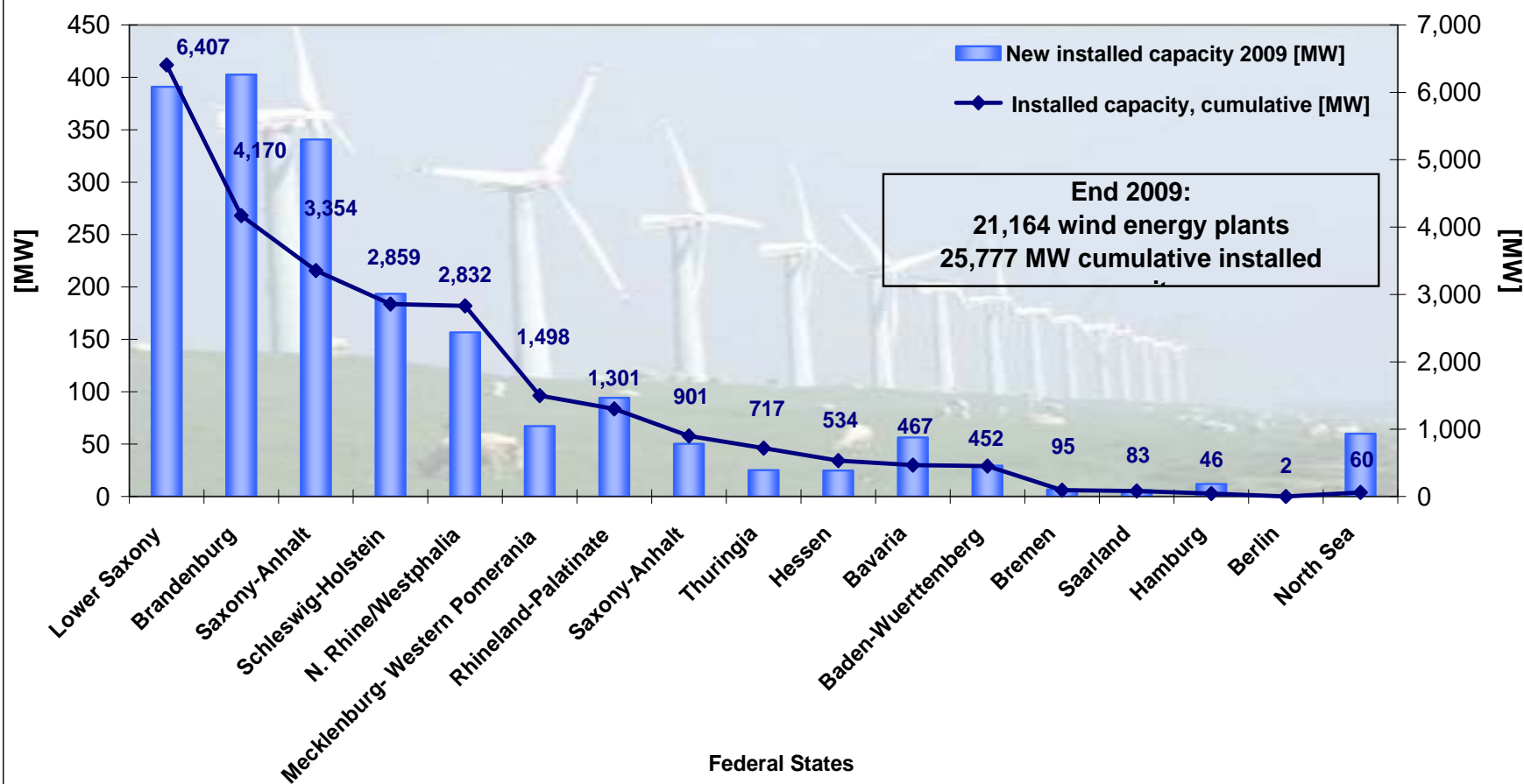
Development of wind energy use in Germany 1990 - 2009



StrEG: Act on the Sale of Electricity to the Grid; BauGB: Construction Code; EEG: Renewable Energy Sources Act;
Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); Image: H. G. Oed; all figures provisional



Regional distribution of installed wind energy capacity in Germany 2009

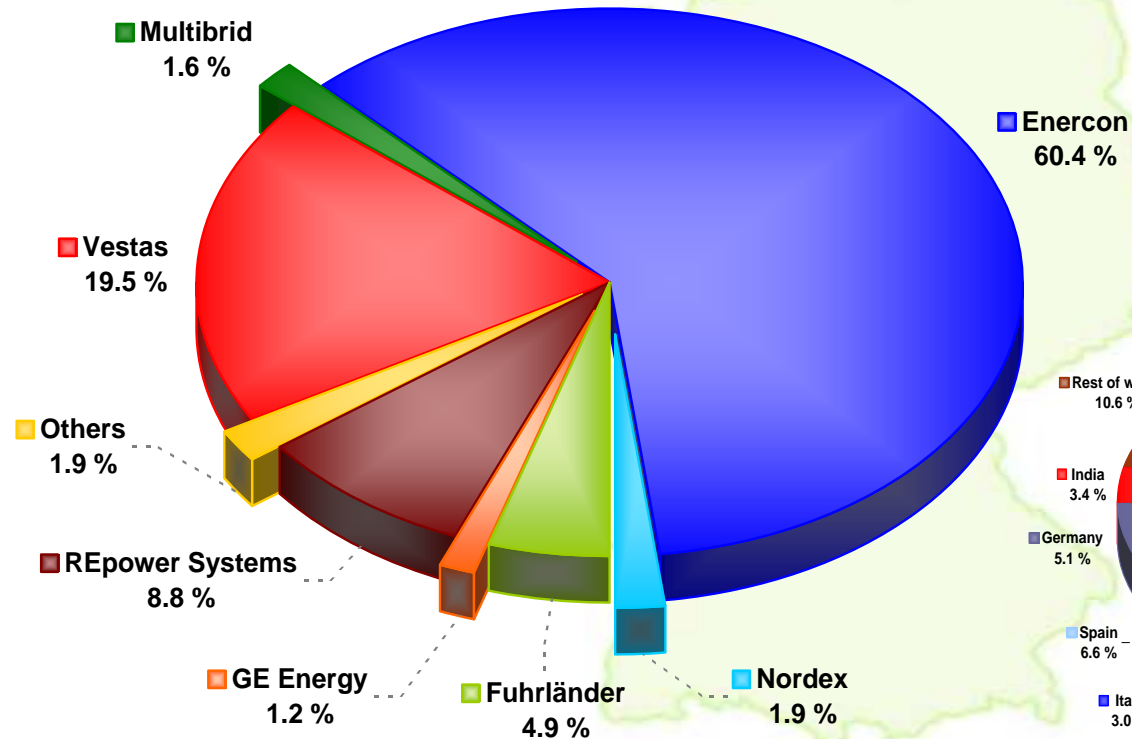


Source: B. Neddermann: Wind Energy Use in Germany; Version: 31.12.2009 ; Deutsches Windenergie-Institut (DEWI); Image: H. G. Oed; all figures provisional



Share of providers of wind energy installations in newly installed capacity in Germany up to end of 2009

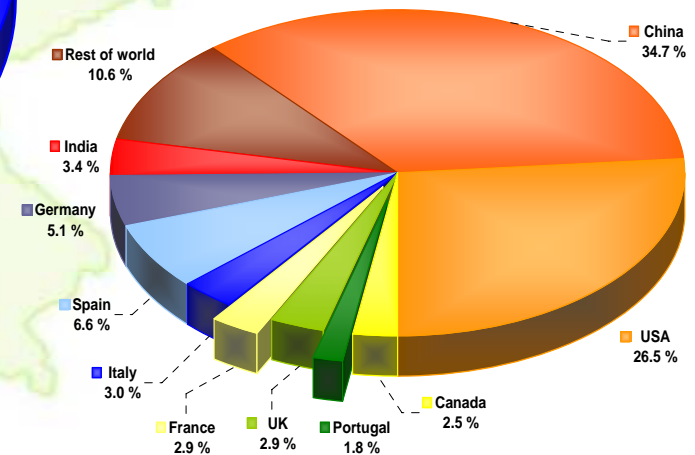
New installed capacity (total): 1,917 MW



Deviations in the totals are due to rounding;
Source: B. Neddermann: Wind Energy Use in Germany; Version: 31.12.2009;
Deutsches Windenergie-Institut (DEWI); all figures provisional

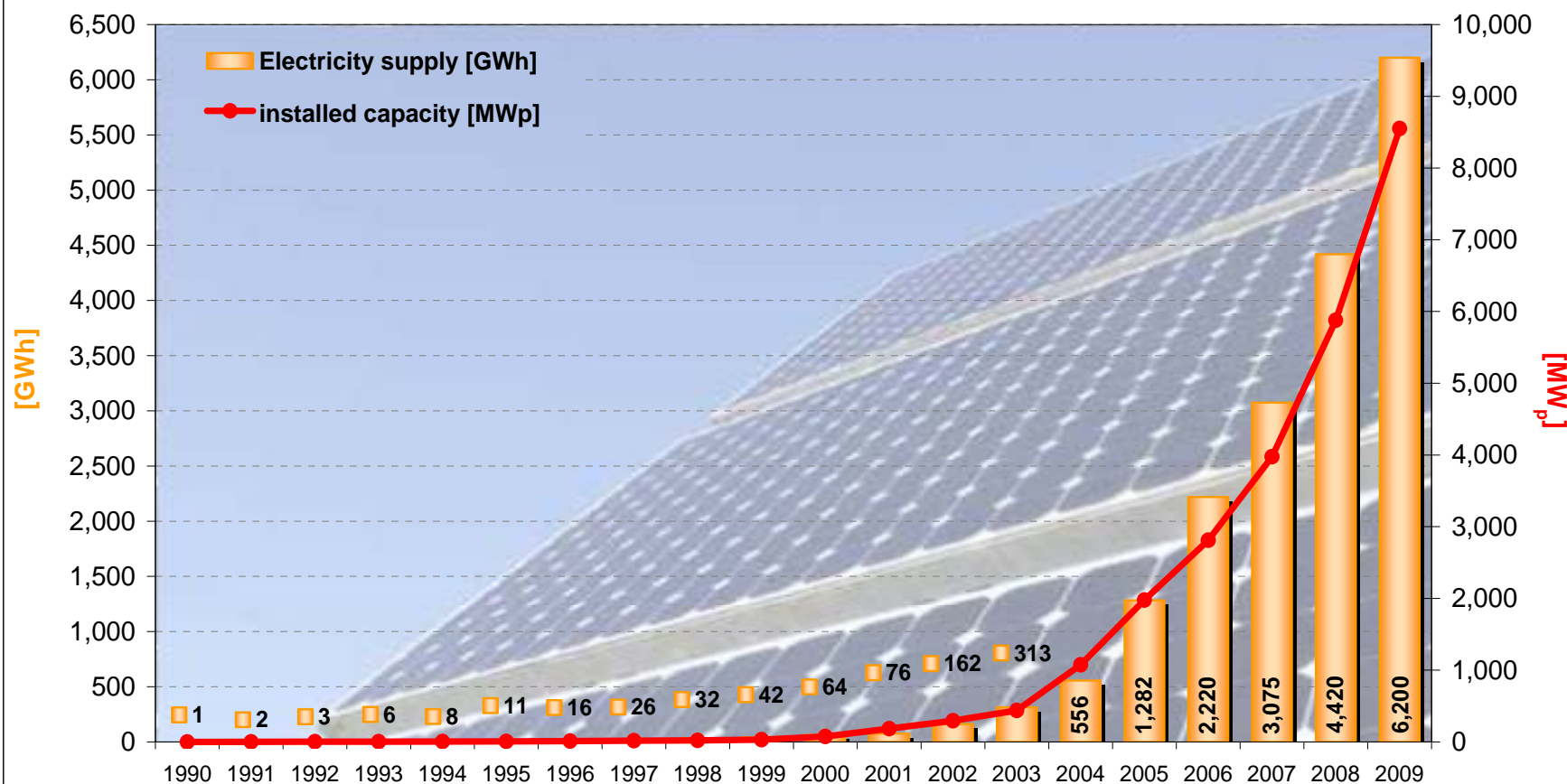
Global wind energy capacity 2009

New total installation: 37,446 MW



Source: Global Wind Energy Council (GWEC); press release; March 2010; all figures provisional

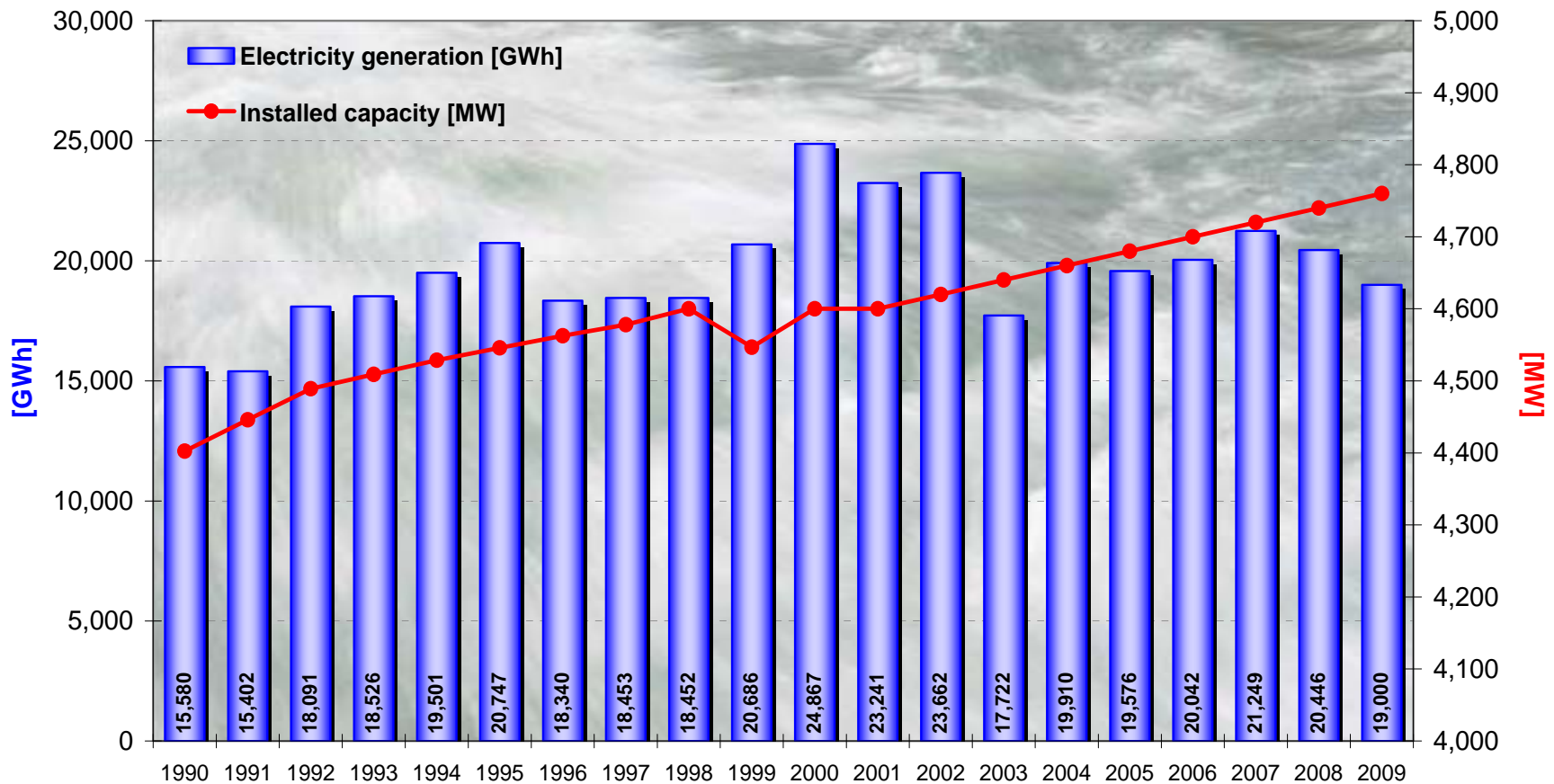
Installed capacity and energy supply from photovoltaic installations in Germany 1990 - 2009



Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); Image: BMU / Bernd Müller; all figures provisional

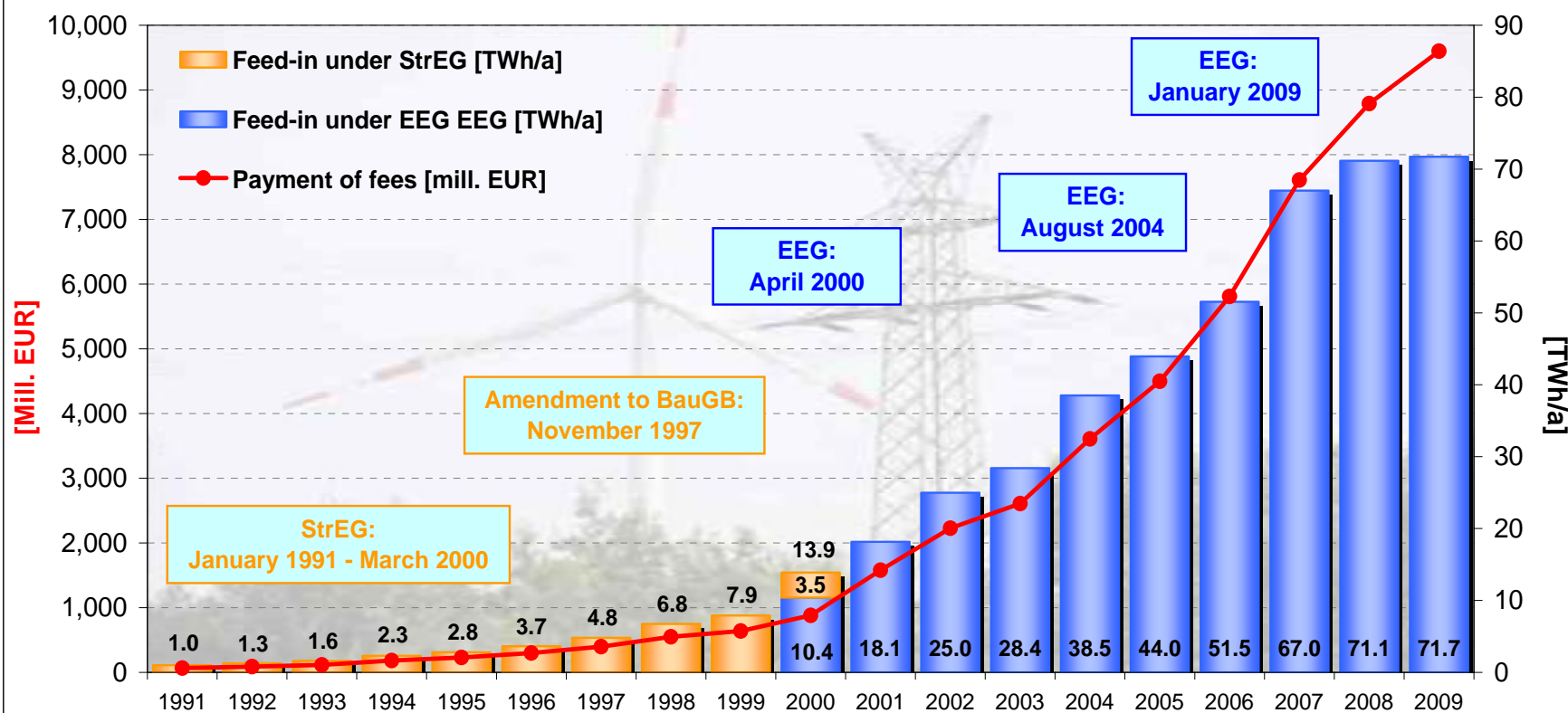


Development of hydropower use in Germany 1990 - 2009



Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); Image: BMU / Bernd Müller; all figures provisional

Feed-in and payment under the Electricity Feed Act (StrEG) and the Renewable Energy Sources Act (EEG) in Germany 1991 - 2009



StrEG: Act on the Sale of Electricity to the Grid; BauGB: Construction Code; EEG: Renewable Energy Sources Act;
 Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); Image: BMU / Christoph Edelhoff; all figures provisional

Contribution of renewable energy sources to heat supply in Germany 1990 - 2009

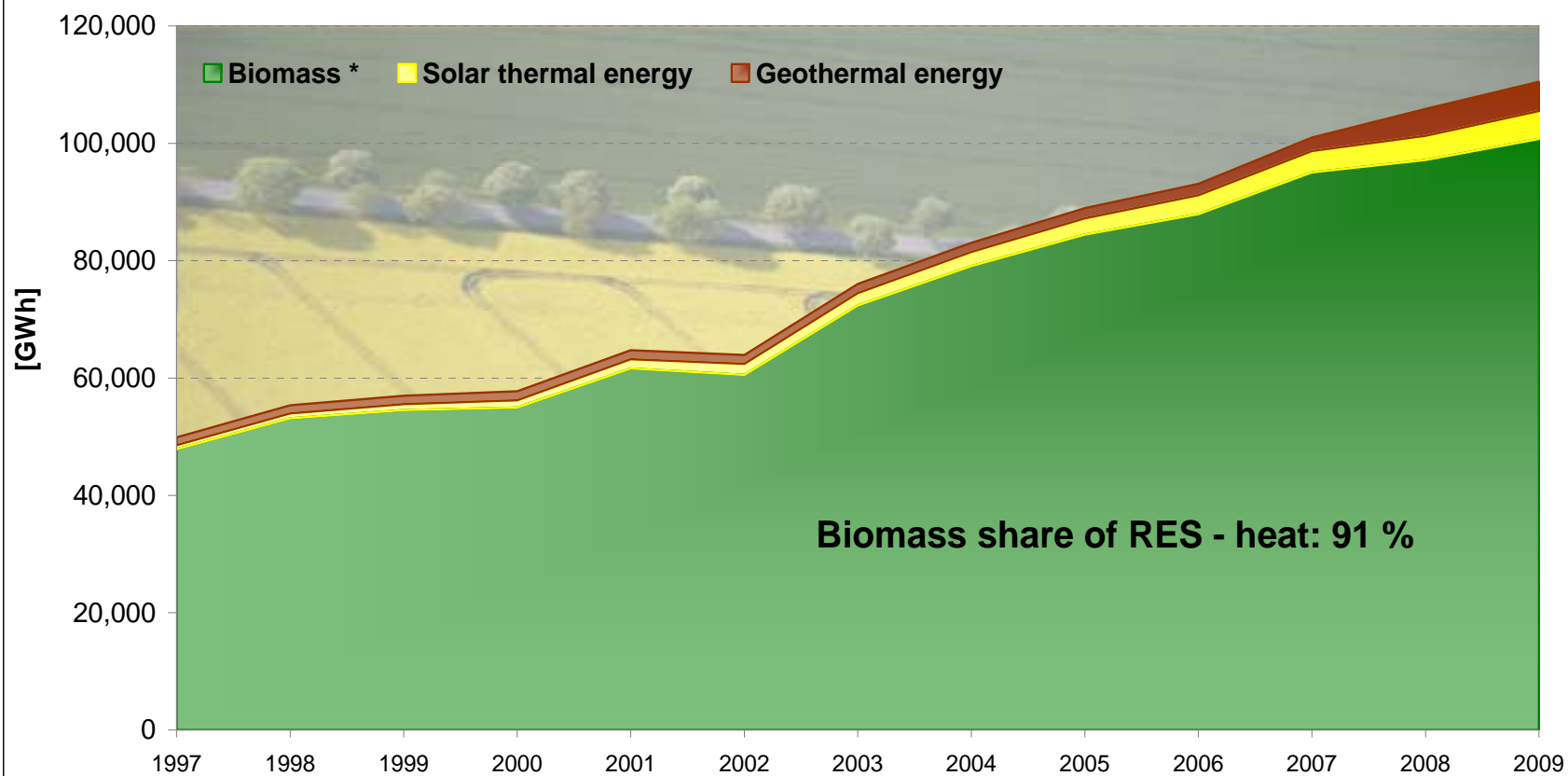
	Biomass ¹⁾	Biogenic share of waste ²⁾	Solar thermal energy	Geothermal energy	Total heat generation	Share of heat consumption
	[GWh]	[GWh]	[GWh]	[GWh]	[GWh]	[%]
1990	28,265	2,308	127	1,664	32,363	2.1
1991	28,360	2,308	163	1,608	32,439	2.1
1992	28,361	2,308	215	1,600	32,484	2.1
1993	28,368	2,308	273	1,531	32,480	2.1
1994	28,375	2,308	348	1,475	32,505	2.1
1995	28,386	2,308	431	1,425	32,550	2.1
1996	28,277	2,538	540	1,383	32,738	2.0
1997	45,591	2,290	680	1,335	49,896	3.2
1998	49,740	3,405	837	1,384	55,366	3.6
1999	50,858	3,674	1,020	1,429	56,981	3.8
2000	51,419	3,548	1,255	1,513	57,735	3.9
2001	58,220	3,421	1,581	1,525	64,748	4.2
2002	57,242	3,295	1,878	1,522	63,937	4.3
2003	69,182	3,169	2,137	1,550	76,039	5.0
2004	75,375	3,690	2,437	1,559	83,060	5.5
2005	79,746	4,692	2,771	1,739	88,948	5.9
2006	83,024	4,911	3,211	1,938	93,083	6.1
2007	90,255	4,783	3,630	2,299	100,967	7.6
2008	92,122	5,020	4,126	4,597	105,865	7.4
2009	95,650	5,100	4,743	4,991	110,484	8.4

¹⁾ Solid, liquid, gaseous biomass,
landfill and sewage gas;

²⁾ Biogenic waste share in waste
incineration plants estimated at 50 %;

Source: BMU-KI III 1 according to
Working Group on Renewable
Energies-Statistics (AGEE-Stat);
all figures provisional

Contribution of renewable energy sources to heat supply in Germany 1997 - 2009

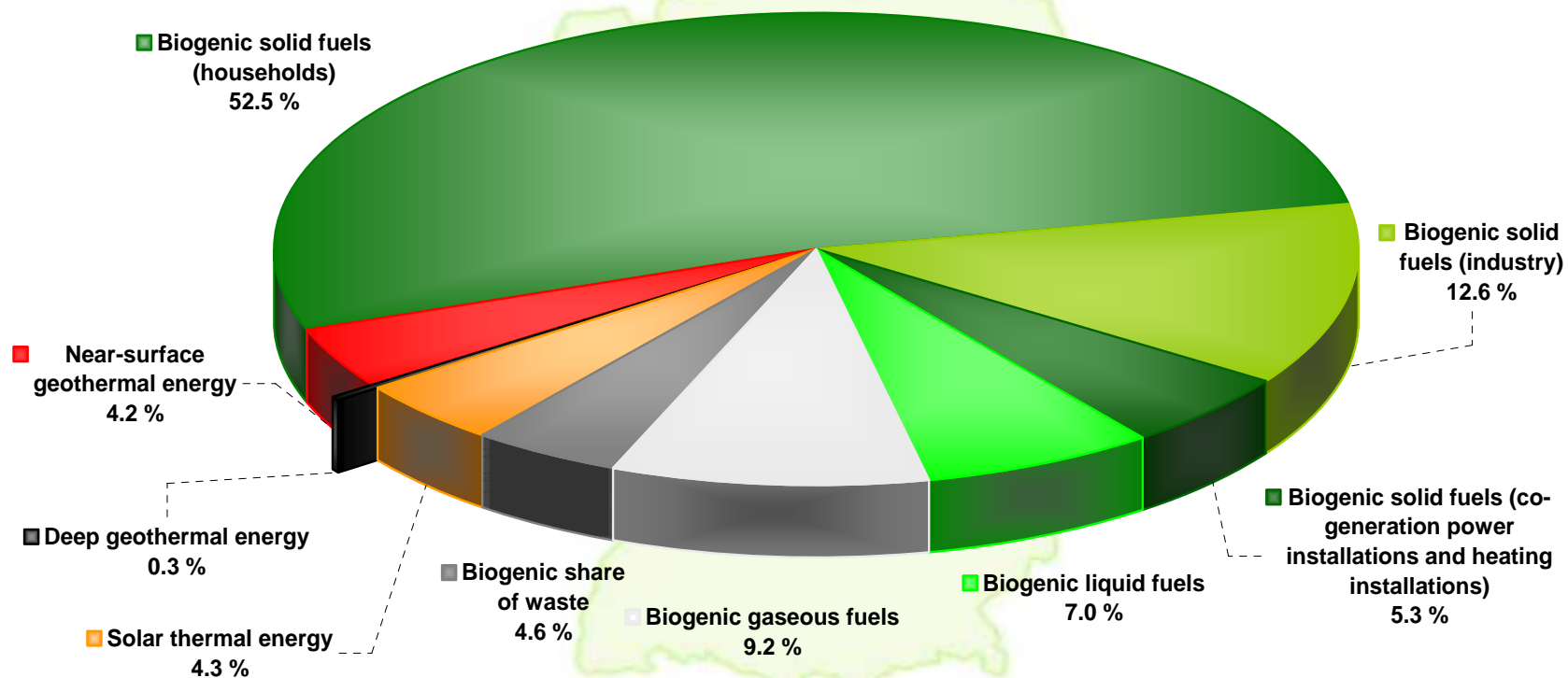


* Solid, liquid, gaseous biomass, biogenic share of waste, landfill and sewage gas;

Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); Image: BMU / Brigitte Hiss; all figures provisional

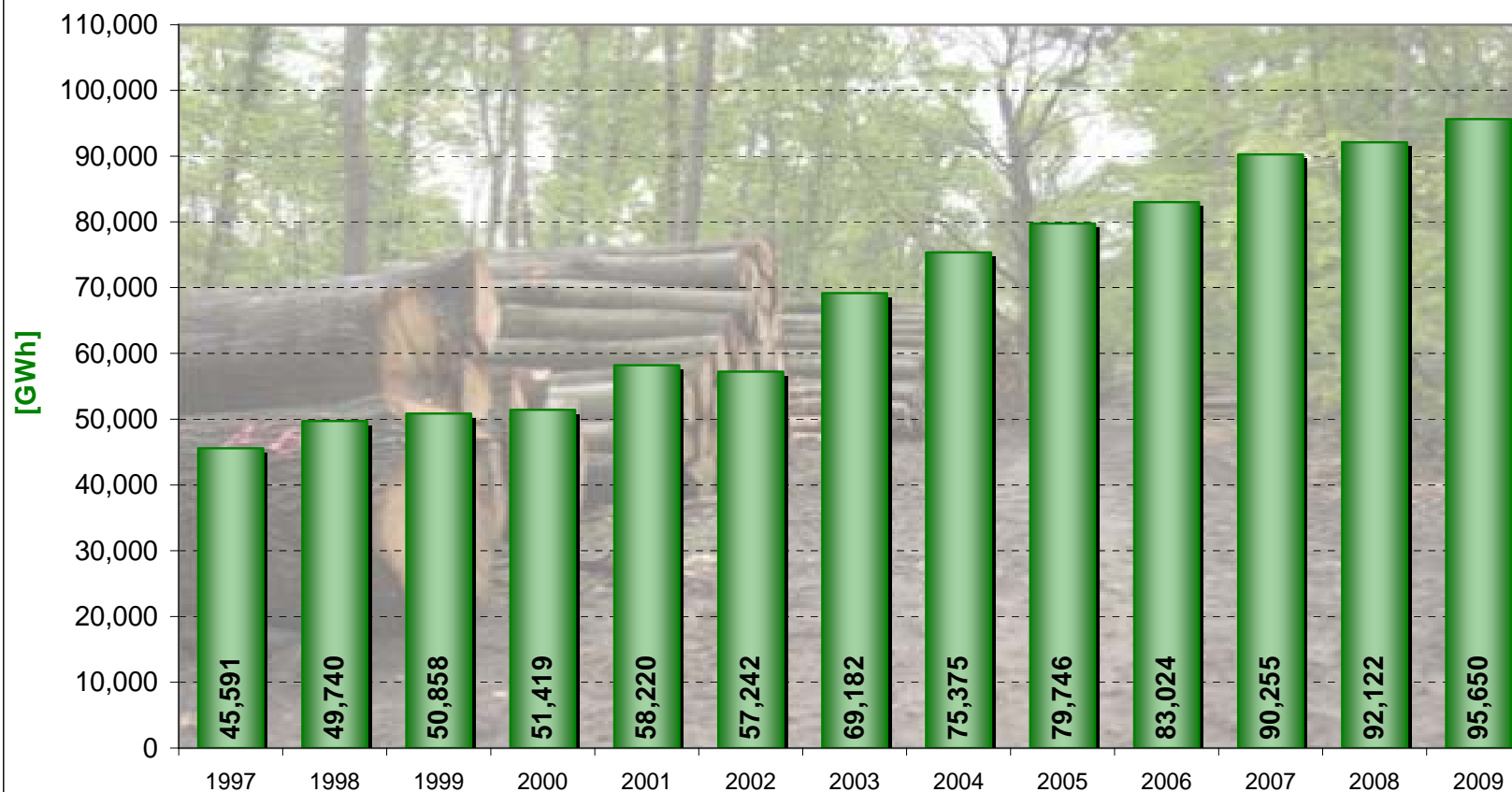
Structure of heat supply from renewable energy sources in Germany 2009

Total: 110.5 TWh



Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); all figures provisional

Development of biomass* use for heat supply in Germany 1997 - 2009

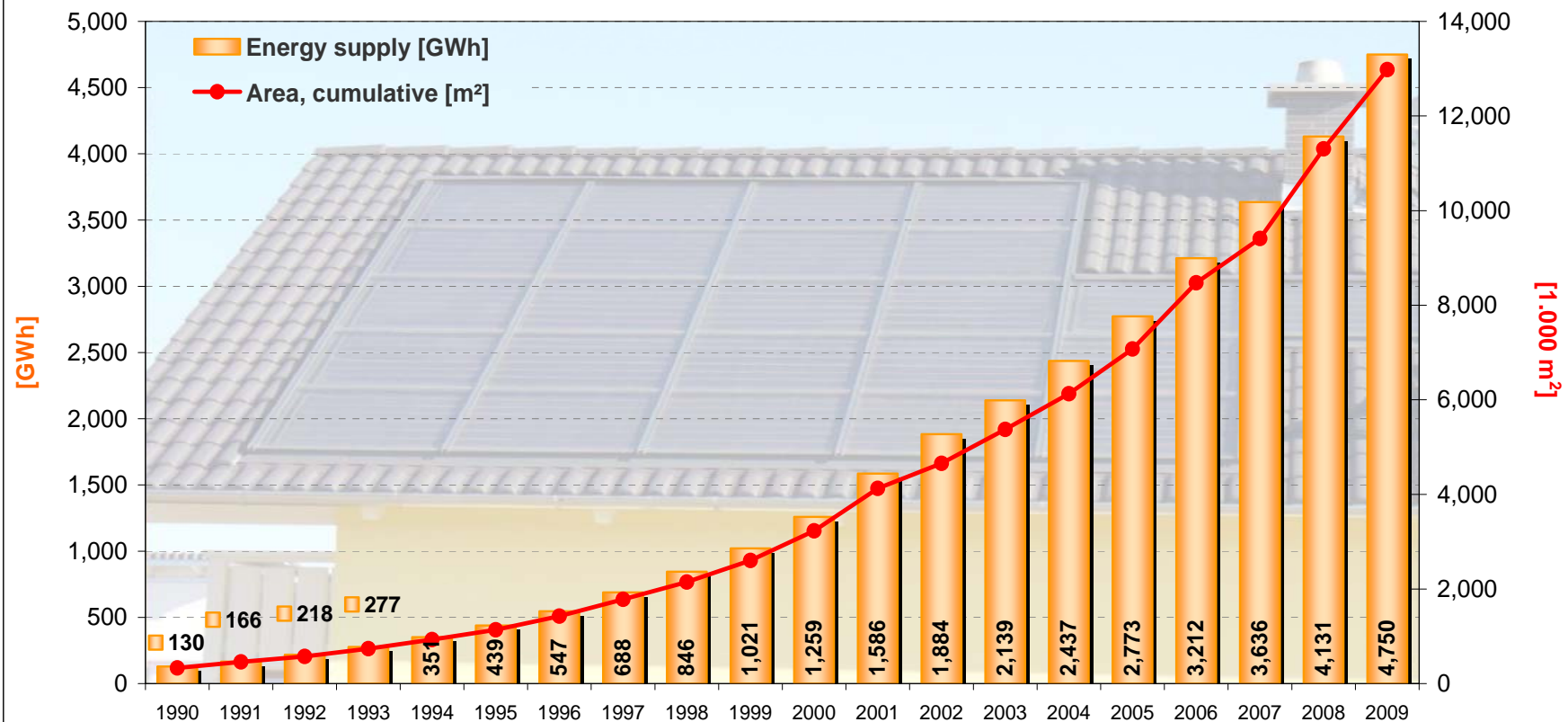


* Solid, liquid, gaseous biomass;

Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); Image: BMU / Brigitte Hiss; all figures provisional



Development of collector area and energy supply of solar thermal installations for heat supply in Germany 1990 - 2009



Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); Image: ZSW / Ulrike Zimmer; all figures provisional

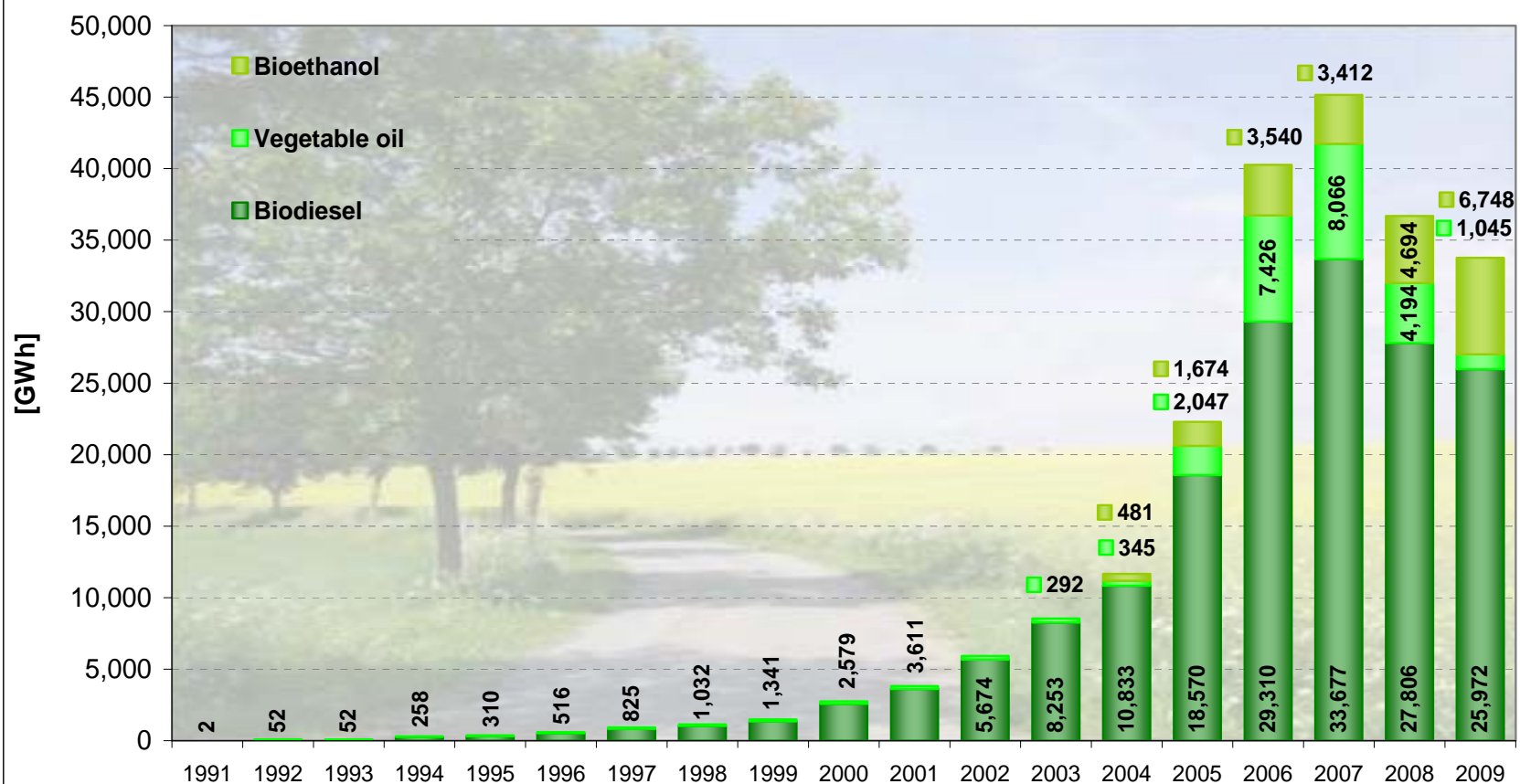
Contribution of renewable energy sources to fuel supply in Germany 1991 - 2009

	Biodiesel	Vegetable oil	Bioethanol	Total biofuels generation	Share of biofuels consumption
	[GWh]	[GWh]	[GWh]	[GWh]	[%]
1990	0	N/A	0	0	0.0
1991	2	N/A	0	2	0.0
1992	52	21	0	72	0.01
1993	52	31	0	83	0.01
1994	258	42	0	300	0.05
1995	310	63	0	372	0.06
1996	516	84	0	599	0.09
1997	825	94	0	919	0.1
1998	1,032	115	0	1,147	0.2
1999	1,341	146	0	1,487	0.2
2000	2,579	167	0	2,746	0.4
2001	3,611	209	0	3,820	0.6
2002	5,674	251	0	5,925	0.9
2003	8,253	292	0	8,546	1.4
2004	10,833	345	481	11,659	1.8
2005	18,570	2,047	1,674	22,291	3.7
2006	29,310	7,426	3,540	40,276	6.3
2007	33,677	8,066	3,412	45,154	7.2
2008	27,806	4,194	4,694	36,694	5.9
2009	25,972	1,045	6,748	33,765	5.5

Source: BMU-KI III 1 according to
Working Group on Renewable
Energies-Statistics (AGEE-Stat);

N/A = not available;
all figures provisional

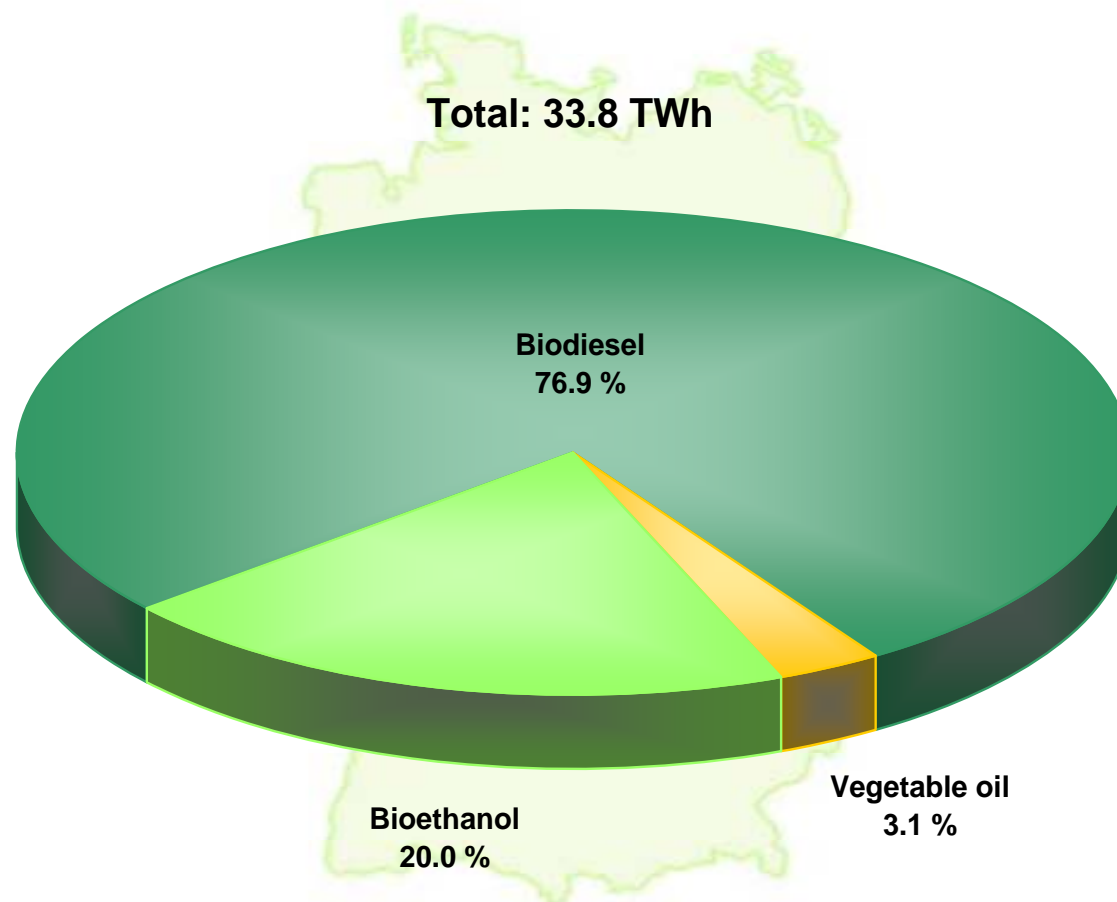
Contribution of renewable energy sources to fuel supply in Germany 1991 - 2009



Vegetable oil as a part of biogenic fuels used since 1992, Bioethanol since 2004;

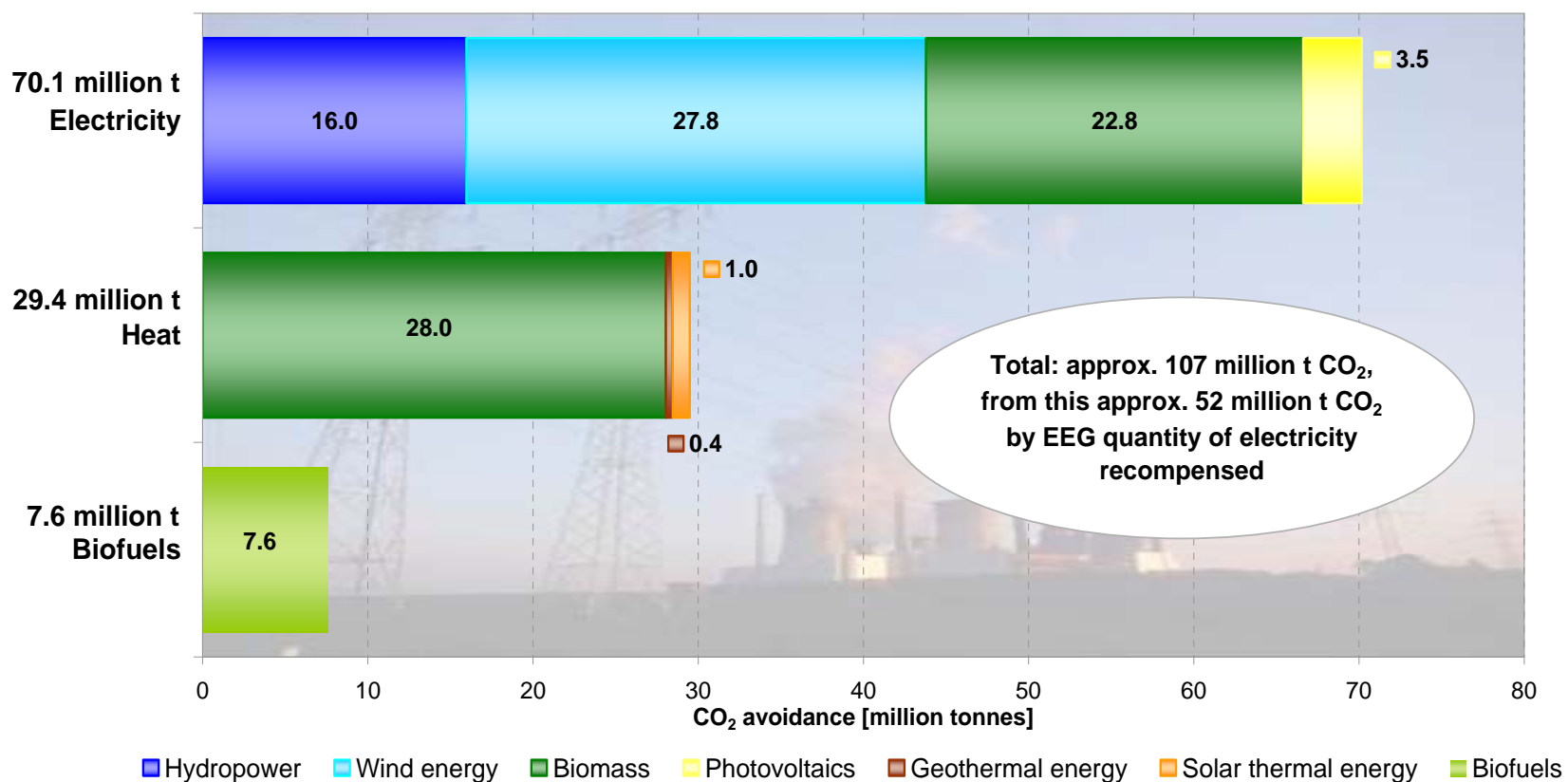
Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); Image: BMU / Dieter Böhme; all figures provisional

Structure of biogenic fuels in Germany 2009



Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); all figures provisional

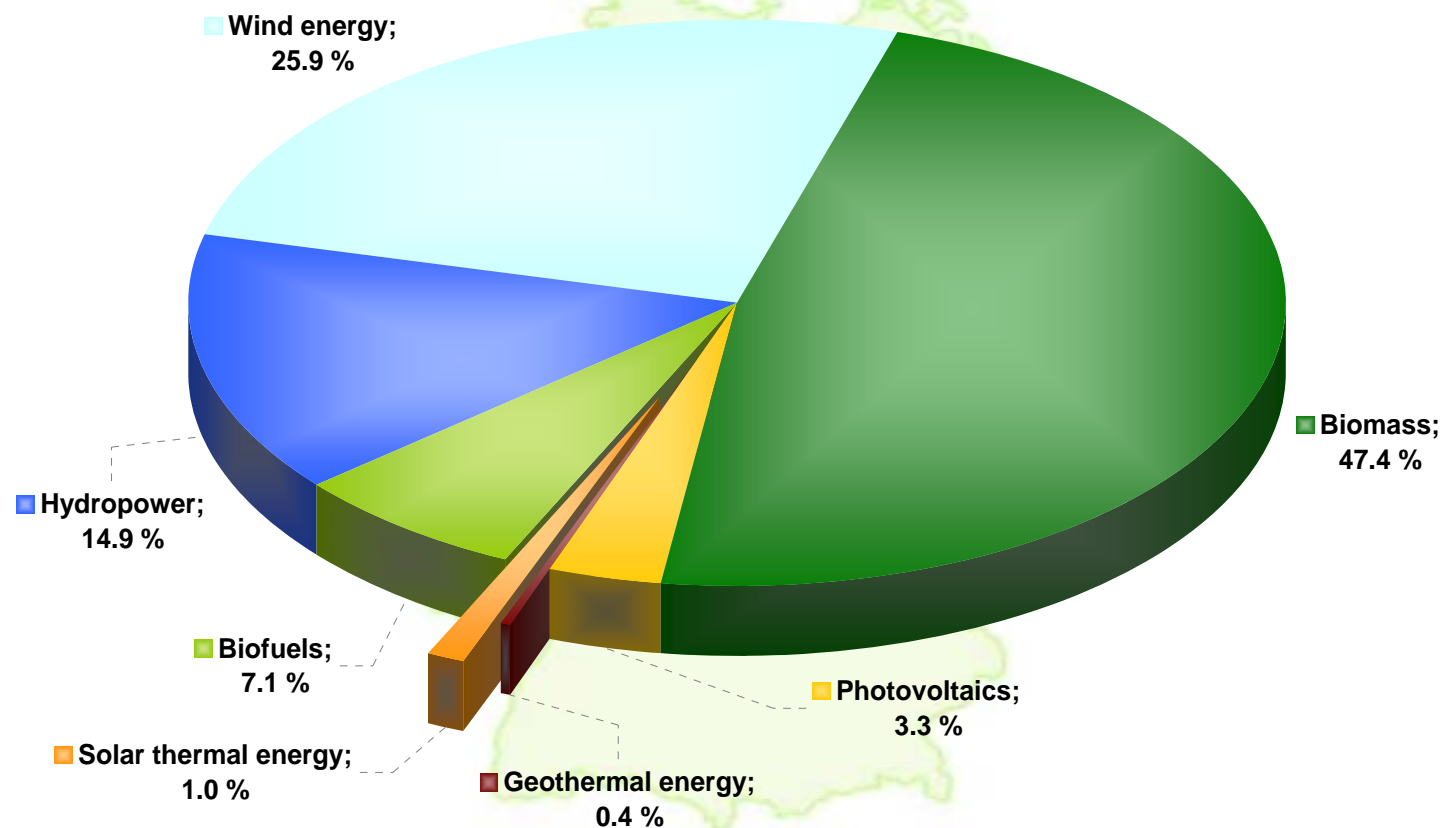
Total CO₂ avoidance via the use of renewable energy sources in Germany 2009



EEG: Renewable Energy Sources Act; Deviations in the totals are due to rounding;
 Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); Image: H. G. Oed; all figures provisional

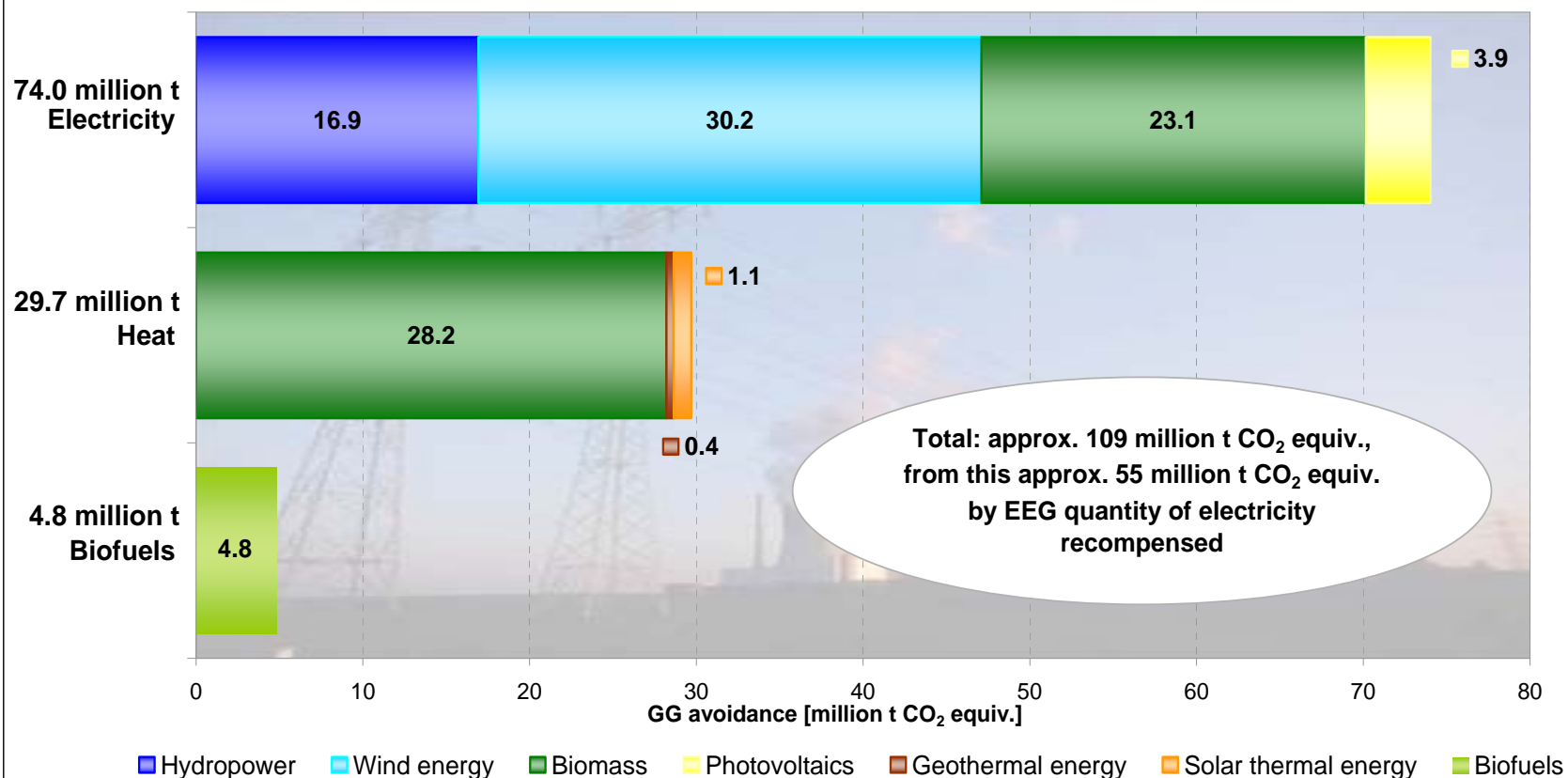
Structure of CO₂ avoidance

approx. 107 million t CO₂



Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); all figures provisional

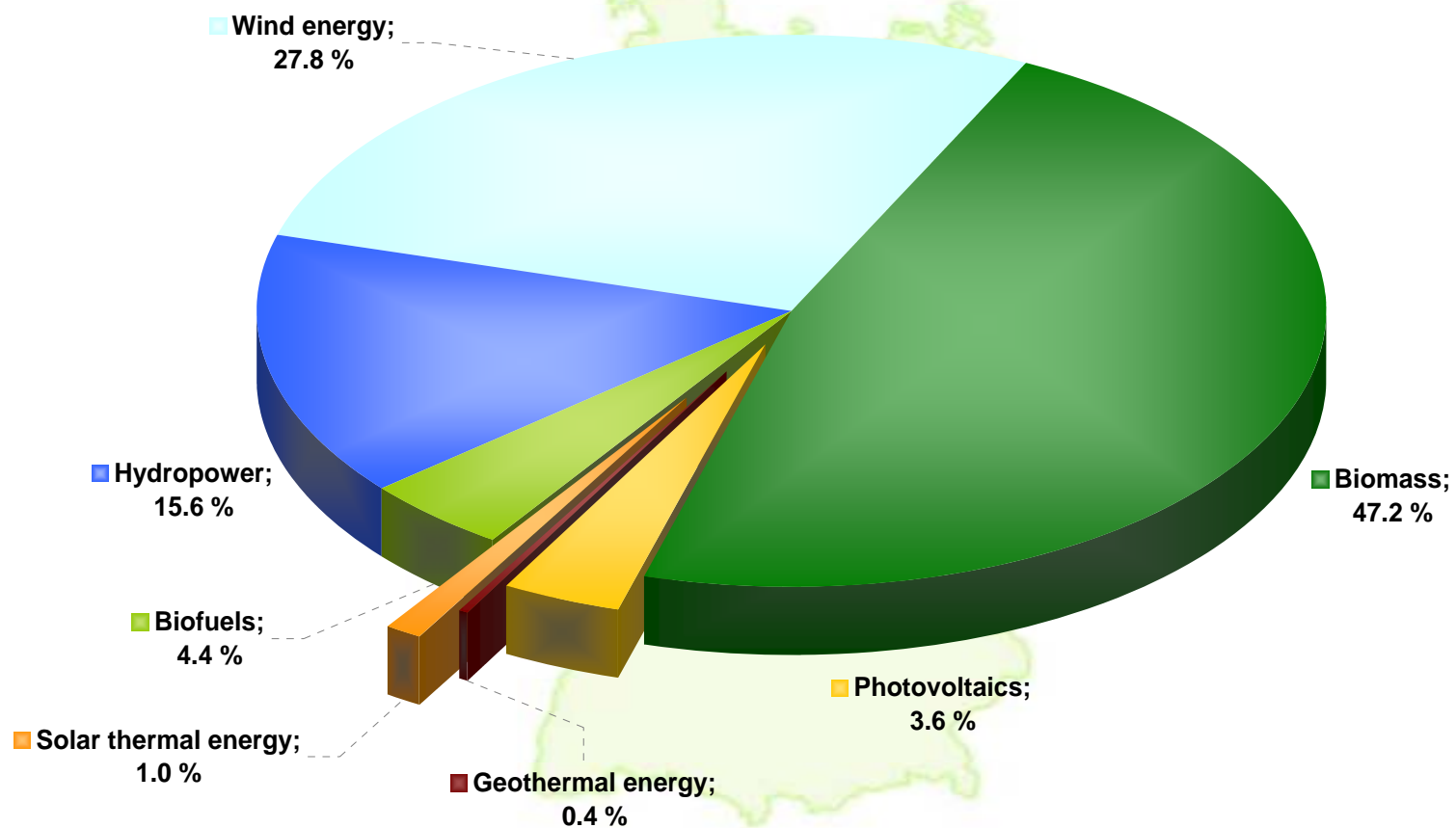
Total Greenhouse-Gas (CO₂ equiv.) avoidance via the use of renewable energy sources in Germany 2009



GG: Greenhouse-Gas; Deviations in the totals are due to rounding;
 Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); Image: H. G. Oed; all figures provisional

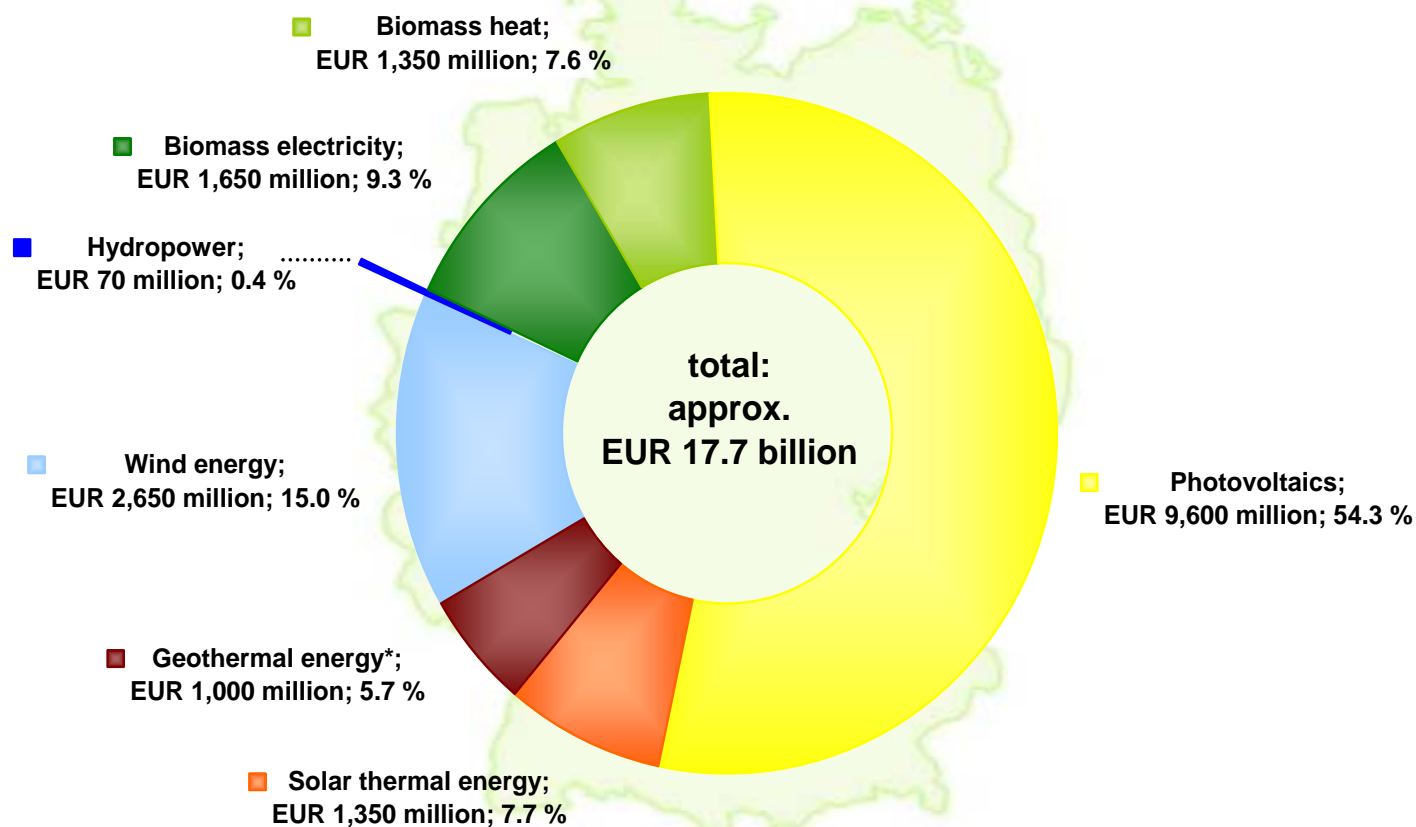
Structure of Greenhouse-Gas (CO₂ equiv.) avoidance

approx. 109 million t CO₂ equivalent



Source: BMU-KI III 1 according to Working Group on Renewable Energies-Statistics (AGEE-Stat); all figures provisional

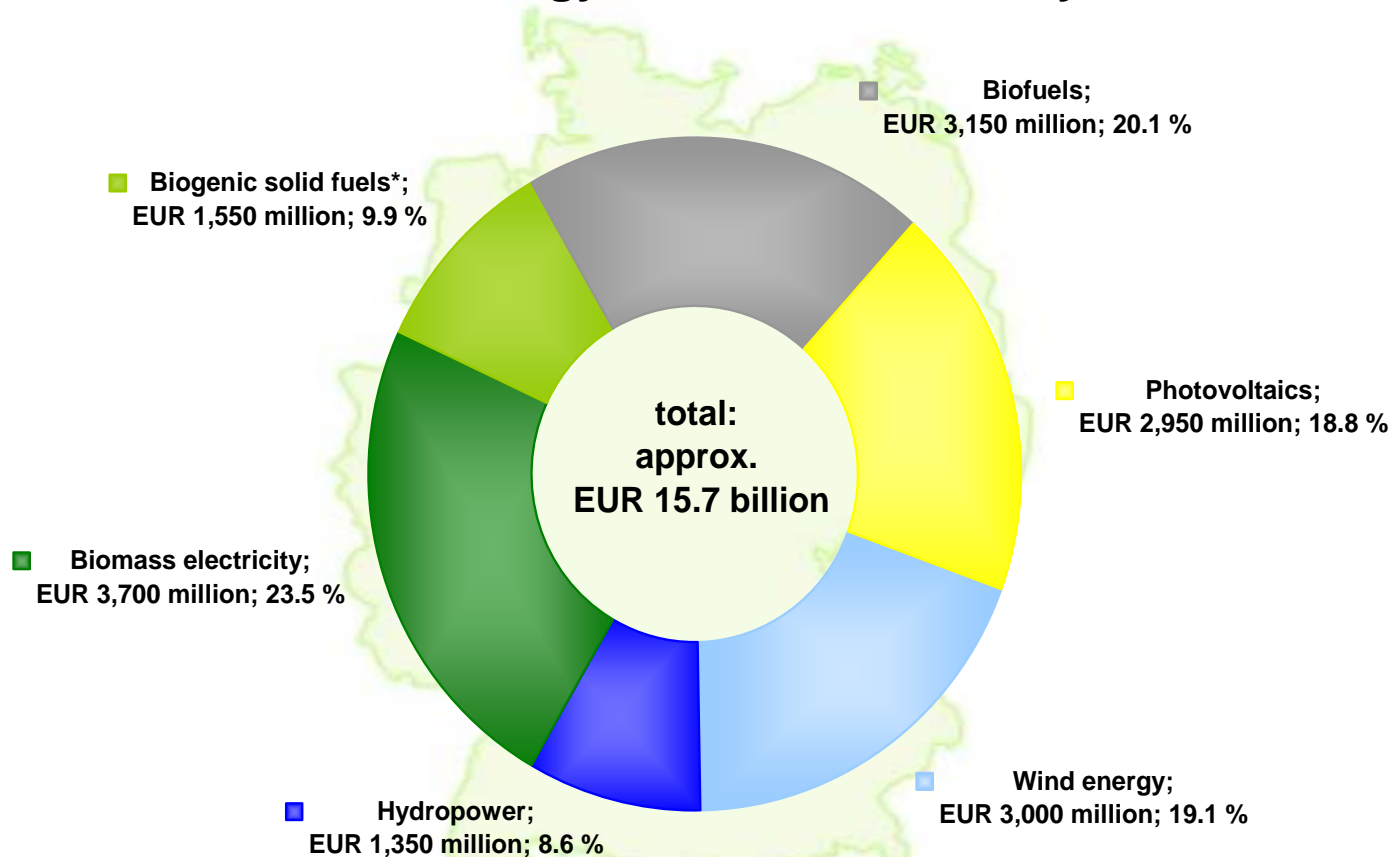
Turnover from the construction of plants for the use of renewable energy sources in Germany 2009



* Large plants and heat pumps; Deviations in the totals are due to rounding;

Source: BMU-KI III 1 according to the Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW); all figures provisional

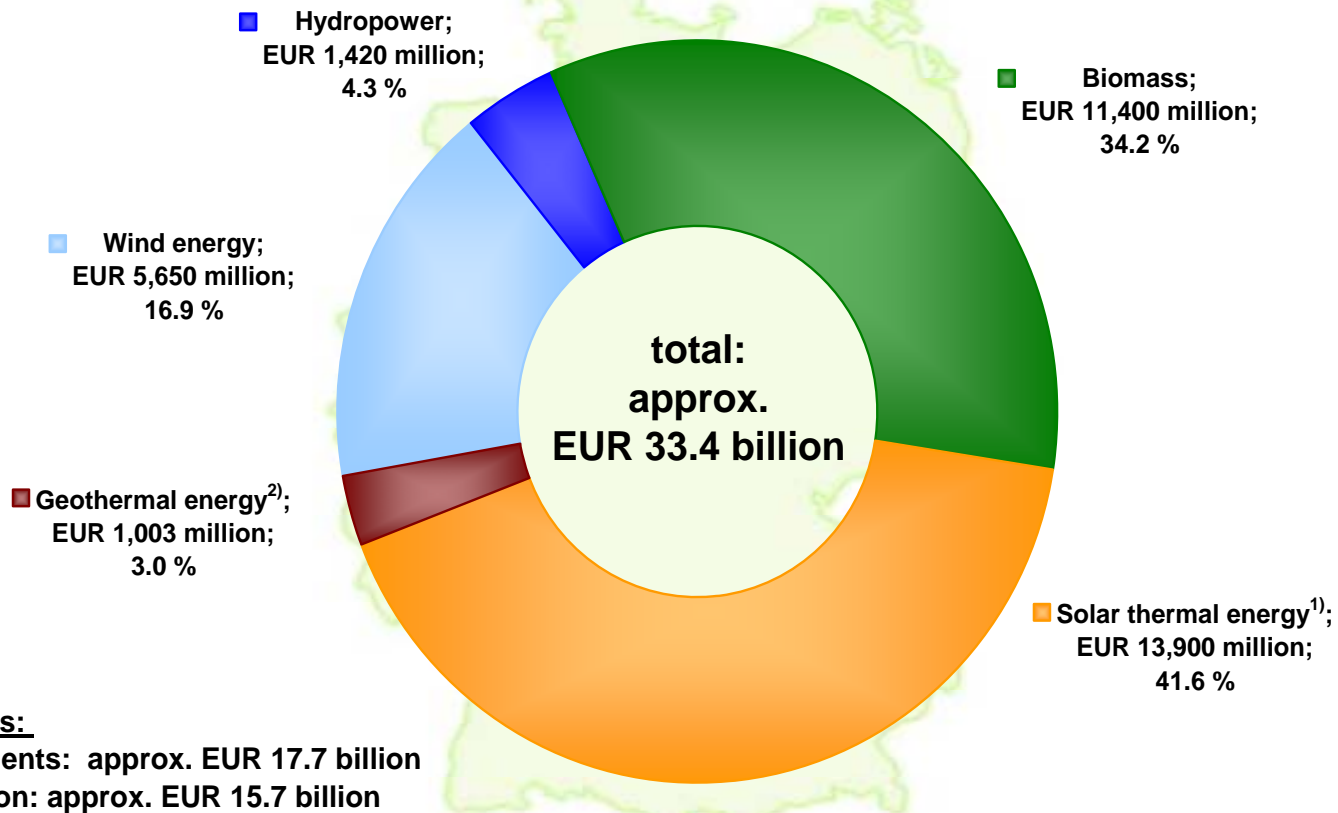
Turnover from the operation of plants for the use of renewable energy sources in Germany 2009



* Only fuels used exclusively to supply heat;
Geothermal energy is not shown in this figure, because of the small turnover by operation (EUR 3.0 million); Deviations in the totals are due to rounding;
Source: BMU-KI III 1 according to the Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW); all figures provisional

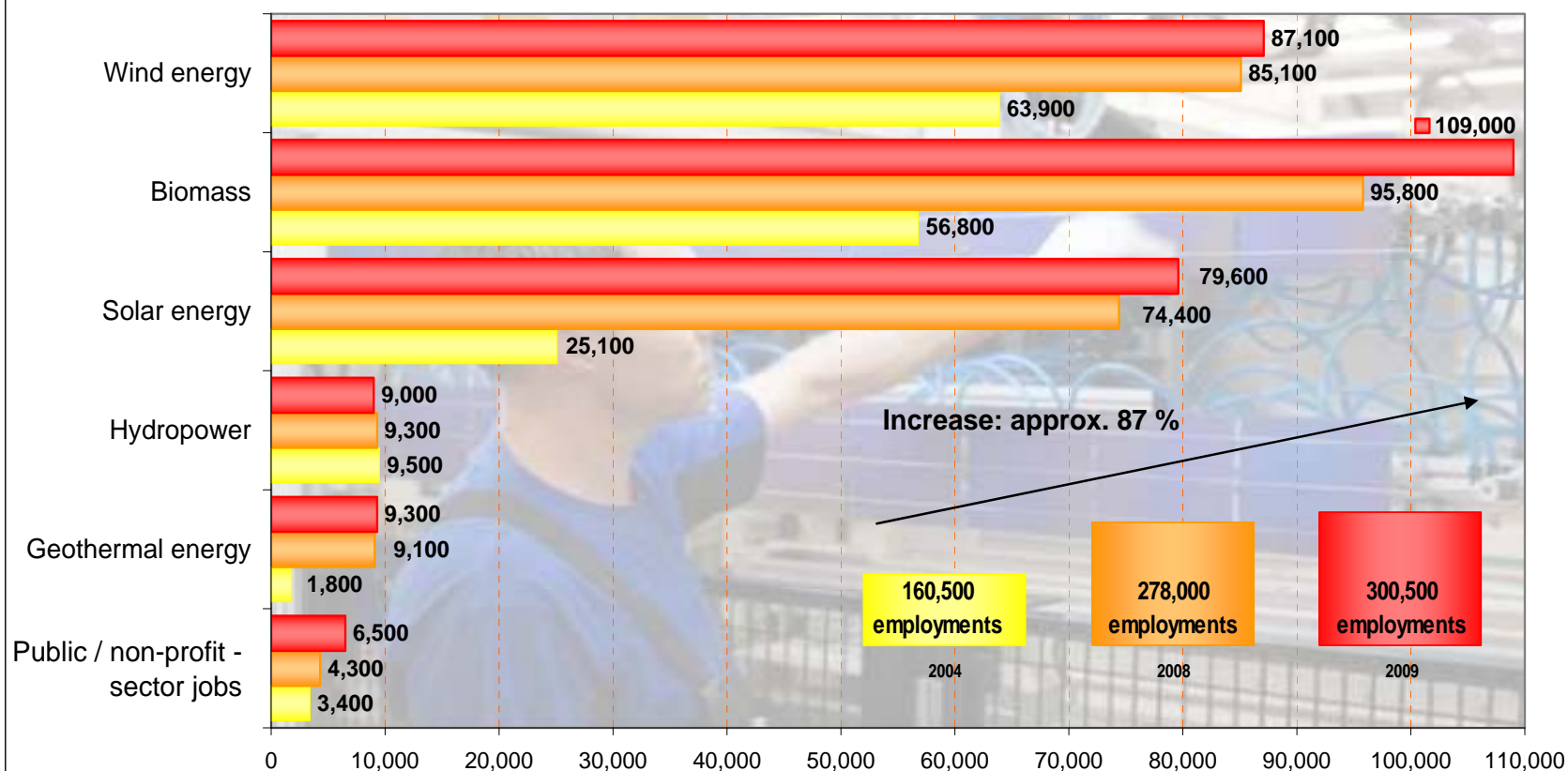


Total turnover from renewable energy sources in Germany 2009 (investments and operation)




¹⁾ Photovoltaics and solar thermal energy; ²⁾ Large plants and heat pumps; Deviations in the totals are due to rounding;
Source: BMU-KI III 1 according to the Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW); all figures provisional

Jobs in the renewable energy sector in Germany 2004, 2008 und 2009



Figures for 2008 and 2009 are provisional estimate;
 Source: BMU-KI III Projekt "Gross employment from renewable energy in Germany in the year 2009, a first estimate"; Image: BMU / Christoph Busse / transit


More information under: www.erneuerbare-energien.de/inhalt/3860




Federal Ministry for the
Environment, Nature Conservation
and Nuclear Safety

Renewable Energy

Deutsch | www.bmu.de | Contact | ok




Home



INTERNATIONAL
RENEWABLE
ENERGY AGENCY

IRENA

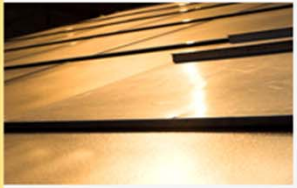
RENEWABLE ENERGIES / 


Way cleared for IRENA Centre of Innovation in Bonn

With its decisions on the 2010 work programme and budget, the third meeting of the Preparatory Commission for the International Renewable Energy Agency (IRENA) in Abu Dhabi has cleared the way for setting up the IRENA Secretariat in Abu Dhabi and the IRENA Centre of Innovation and Technology in Bonn. [[more](#)]

► www.erneuerbare-energien.de/english/irena


▼ www.irena.org




AFRICA / SOLAR THERMAL POWER PLANTS 

Business initiative on solar thermal power plants in desert regions

Federal Ministry of Environment has welcomed the business initiative for the construction of solar thermal power plants in desert regions. [[more](#)]




RENEWABLE ENERGY 

German cabinet has approved national biomass action plan

The German cabinet has approved the National Biomass Action Plan (Energy) on 29.04.2009. With this plan the Federal Government is supporting the EU Commission which, in its Biomass Action Plan published in 2005, called upon the EU member states to draw up national action plans for the energy use of biomass. [[more](#)]

RENEWABLE ENERGY SOURCES ACT 2009




Renewable Energy Sources Act (EEG) ► [more](#)

LEAD STUDY 2008

Further development of the 'Strategy to increase the use of renewable energies' ► [more](#)

BMU BROCHURE



Renewable energy sources in figures - national and international development ► [more](#)

PUBLICATIONS

► Electricity from Renewable Energy Sources: What does it cost us?

REPORT

Press / Speeches

Downloads

Publications

Links

Note

Contact

Sitemap

Legal Information

Sources:

Working-Group on Renewable Energies-Statistics (AGEE-Stat)	Institut für neue Energien (IfnE, Teltow)
Centre for Solar Energy and Hydrogen Research Baden-Wuerttemberg (ZSW)	Institut für Solare Energieversorgungstechnik (ISET Kassel)
Federal Environment Agency (UBA)	Institute for Applied Ecology
Federal Statistical Office (StBA)	Bundesverband Solarwirtschaft e.V. (BSW)
Federal Office of Economics and Export Control (BAFA)	Bundesverband Wärmepumpe e.V. (BWP)
Working-Group on Energy Balances (AGEB)	Bundesverband der Energie- und Wasserwirtschaft e.V. (BDEW)
Deutsches Biomasseforschungszentrum gGmbH (DBFZ)	Deutscher Energie-Pellet-Verband e.V. (DEPV)
Deutsches Institut für Wirtschaftsforschung e.V. Berlin (DIW Berlin)	Deutsches Windenergie-Institut (DEWI GmbH)
Fraunhofer Institute for Systems and Innovation Research (ISI)	Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)
Institute for Economic Structures Research (GWS)	German Wind Energy Association (BWE)
	Global Wind Energy Council (GWEC)

Imprint:

Published by:	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit <i>Federal Ministry for the Environment, Nature Conservation and Nuclear Safety</i> General und Fundamental Issues relating to Renewable Energies (KI III 1) – 11055 Berlin E-Mail: KI1111@bmu.bund.de
Editors:	Dipl.-Ing. (FH) Dieter Böhme, BMU, Division KI III 1 (General und Fundamental Issues relating to Renewable Energies)
Expert Contributors:	Dipl.-Ing. (FH) Marion Ottmüller, Dipl.-Ing. Thomas Nieder (Centre for Solar Energy and Hydrogen Research Baden-Wuerttemberg (ZSW) Stuttgart)
Published:	March 2010