



Federal Ministry  
for Economic Affairs  
and Climate Action



# Time series for the development of renewable energy sources in Germany

based on statistical data from the  
Working Group on Renewable Energy-Statistics (AGEE-Stat)  
(Status: February 2023)

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The Working Group on Renewable Energy Statistics (AGEE-Stat) was established in February 2004 in order to place statistics and data relating to renewable energy sources on a comprehensive, up-to-date and coordinated basis (more information on: [www.erneuerbare-energien.de/EE/ee-in-zahlen-arbeitsgruppe](http://www.erneuerbare-energien.de/EE/ee-in-zahlen-arbeitsgruppe)).

With the increasing share of renewable energy sources in the energy system and increasing national and international reporting obligations the demand on reliable data concerning the development of all renewable energy sources in Germany has been growing. Therefore, the coordination office of the Working Group engages in various research projects to improve the data basis and the scientific calculation methods- supported by the working group members (ministries, federal offices and academic institutions).

To analyze the historic development of the renewable energy sources in Germany since 1990 several data sources were evaluated and supplemented by (model-based) calculations. Wherever possible official data were used. Partially missing values were extrapolated from existing data. Single data gaps were closed by estimations, which is why the data are governed by a certain degree of uncertainties.

In some cases data are not available before a specific point of time and previous years could not be estimated reliable, but if new information allow conclusions to be drawn on historic values these data will be complemented or corrected. In addition, changes of the data collection methods or categories may result in breaks in time series, but only in cases in which a retrospective amendment is not possible and reasonable. Rounding may also cause discrepancies in the totals. Therefore the published data are partially preliminary and can differ in comparison to previous issues.

Detailed background information on data sources and methodology of the time series of the gross electricity production and installed electrical capacity can be found on:  
[www.umweltbundesamt.de/publikationen/datenquellen-methodik-der-agee-stat-zeitreihen-zur](http://www.umweltbundesamt.de/publikationen/datenquellen-methodik-der-agee-stat-zeitreihen-zur) (available in German only).

Beside these time tables the AGEE-Stat publishes monthly and quarterly reports.

These can be found on:

[www.umweltbundesamt.de/themen/klima-energie/erneuerbare-energien/erneuerbare-energien-in-zahlen/monats-quartalsberichte-der-agee-stat](http://www.umweltbundesamt.de/themen/klima-energie/erneuerbare-energien/erneuerbare-energien-in-zahlen/monats-quartalsberichte-der-agee-stat)

Further enquiries to the data and methodology can be addressed on

Federal Environment Agency  
Section V 1.5 - Energy data,  
Coordination office of the Working Group on Renewable Energy Statistics (AGEE-Stat)  
Wörlitzer Platz 1  
06844 Dessau-Roßlau  
E-Mail: [AGEE-stat@uba.de](mailto:AGEE-stat@uba.de)

Table 1: Development of renewable energy sources 1990 to 2022

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Figures in [GWh]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross final energy consumption <sup>1</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	166.329	187.745	227.531	261.487	267.545	264.046	305.310	316.273	351.286	363.819	359.113	387.617	389.422	421.201	435.338	457.142	473.173	469.995	491.123
Gross electricity production	18.934	16.465	19.240	20.128	22.739	25.327	26.140	22.673	25.087	28.902	36.227	38.744	45.440	46.677	57.968	63.426	72.554	89.430	94.368	96.071	105.415	124.429	143.407	151.949	161.917	188.136	189.129	215.684	223.341	241.573	251.480	234.037	253.962
Production of district heating	-	-	-	-	-	-	-	-	-	-	-	-	-	4.681	5.713	6.892	7.899	8.261	9.744	10.575	11.565	12.640	14.885	16.035	16.428	17.989	18.528	18.791	21.347	22.131	22.347	24.264	23.568
Final energy consumption for heating and cooling (including district heat) <sup>2</sup>	32.516	32.671	32.754	32.836	32.951	33.089	33.371	50.612	56.049	57.723	58.363	65.365	64.517	88.228	97.317	102.442	115.298	127.142	137.797	136.542	165.399	157.744	171.964	178.920	163.036	167.630	168.147	172.960	177.962	182.229	180.416	199.178	200.549
Final energy consumption for heating and cooling (without secondary energy carriers electricity and district heat) <sup>3</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	83.928	92.104	96.168	108.128	119.603	128.903	126.906	154.802	146.364	158.650	164.630	148.664	151.818	151.946	156.522	159.549	162.576	160.575	177.532	179.626
thereof in: Households	-	-	-	-	-	-	-	-	-	-	-	-	-	58.456	57.370	57.238	67.598	71.733	82.974	76.189	91.757	86.240	98.935	103.210	88.505	90.067	88.049	91.380	94.760	96.480	93.800	106.761	111.729
thereof in: TCS	-	-	-	-	-	-	-	-	-	-	-	-	-	10.355	13.436	14.385	16.665	19.303	23.926	26.170	31.592	26.381	28.838	30.790	28.561	31.289	31.634	33.070	33.358	34.780	35.698	37.948	36.724
thereof in: Industry	-	-	-	-	-	-	-	-	-	-	-	-	-	15.117	21.298	24.545	23.865	28.567	22.003	24.547	31.453	33.743	30.877	30.630	31.598	30.462	32.263	32.072	31.431	31.316	31.077	32.823	31.173
Final energy consumption in the transport sector <sup>4</sup>	465	477	609	653	982	1.175	1.398	1.725	1.872	2.312	3.752	4.908	7.181	8.998	11.765	22.627	40.456	45.956	36.215	32.430	35.611	35.337	37.199	34.253	35.325	33.273	33.619	34.599	35.970	36.017	44.302	39.772	40.440
Figures in [GWh]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross final energy consumption EU-Directive <sup>5</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	165.660	188.845	228.684	256.732	268.055	271.024	311.664	316.610	350.697	364.737	362.140	382.324	388.572	407.407	432.464	446.382	465.380	479.955	494.131
Final energy consumption in the transport sector EU-Directive <sup>6</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.607	24.364	41.883	45.902	37.879	34.606	38.281	39.049	43.940	44.730	42.864	41.415	45.194	46.141	50.341	48.885	59.074	46.169	53.639
Figures in [PJ]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Primary energy consumption <sup>6</sup>	196	197	207	228	253	275	270	345	379	403	417	432	455	561	650	769	939	1.117	1.147	1.201	1.413	1.463	1.385	1.499	1.519	1.672	1.677	1.790	1.826	1.903	1.970	1.949	2.024

differences in the totals may occur due to roundings

1) according to the German government's Energy Concept

2) sectoral local consumption of energy for application purposes of heating and cooling, without electricity, including district heat

3) sectoral local consumption of energy for application purposes of heating and cooling, without secondary energy carriers electricity and district heat

4) consumption of biogenic fuels and renewables-based electricity in the transport sector (excluding consumption in agriculture, forestry and military)

5) till 2020 according to the European Directive 2009/28/EC, since 2021 according to the European Directive (EU) 2018/2001

6) till 2002 by Working Group on Energy Balances (AGEB), calculated according to the "physical energy content" principle, since 2003 by AGEE-Stat based on JAQ-REN

Sources: AGEE-Stat based on AGEB [1]; Eurostat [18]; IEA [22]; EP/ER [16], [17] and further sources see table 3, 5 und 6; partially preliminary data

Table 2: Shares of renewable energy sources 1990 to 2022

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Figures in [%]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
of gross final energy consumption <sup>1</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,2	7,1	8,4	10,2	10,1	10,6	11,4	12,5	13,6	13,7	14,3	15,1	14,9	16,0	16,8	17,7	19,4	18,8	20,3
of gross national electricity consumption	3,4	3,1	3,6	3,8	4,3	4,7	4,7	4,1	4,5	5,2	6,3	6,6	7,7	7,7	9,4	10,3	11,7	14,3	15,2	16,5	17,1	20,4	23,6	25,1	27,3	31,4	31,6	36,0	37,7	42,0	45,2	41,2	46,2
of district heat production <sup>2</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	3,5	4,1	4,9	5,6	6,2	7,1	7,8	7,8	9,4	10,7	11,8	13,5	14,2	14,2	14,4	16,7	17,4	19,0	17,6	20,1
of final energy consumption for heating and cooling (including district heat) <sup>3</sup>	2,1	2,2	2,3	2,3	2,4	2,3	2,2	3,5	3,9	4,3	4,4	4,7	4,8	6,5	7,3	7,9	8,6	10,5	10,4	11,3	12,3	12,7	13,7	13,8	14,0	13,9	13,7	14,0	14,9	15,1	15,3	15,8	17,4
of final energy consumption for heating and cooling (without secondary energy carriers electricity and district heat) <sup>4</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	6,8	7,6	8,2	8,9	11,0	10,7	11,6	12,7	13,0	14,0	14,0	14,0	13,8	13,6	13,9	14,7	14,9	14,9	15,6	17,1
thereof in: Households	-	-	-	-	-	-	-	-	-	-	-	-	-	10,0	10,5	10,6	12,2	15,6	15,2	15,1	16,6	18,2	19,4	19,1	19,7	19,1	18,4	19,3	20,0	19,5	19,3	21,8	23,8
thereof in: TCS	-	-	-	-	-	-	-	-	-	-	-	-	-	5,1	6,7	7,2	7,2	10,4	11,1	13,1	14,6	13,7	15,4	14,8	15,0	15,8	16,1	17,2	19,3	19,8	19,2	19,8	20,3
thereof in: Industry	-	-	-	-	-	-	-	-	-	-	-	-	-	3,3	4,6	5,7	5,6	6,5	5,0	6,3	7,0	7,4	7,1	7,1	7,5	7,1	7,3	7,0	7,2	7,4	7,6	7,2	7,8
of final energy consumption in the transport sector	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,3	0,3	0,3	0,5	0,7	1,1	1,4	1,8	3,6	6,4	7,3	5,9	5,3	5,8	5,7	6,0	5,4	5,6	5,2	5,2	5,3	5,6	5,6	7,6	6,8	6,8
Figures in [%]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
of gross final energy consumption EU-Directive <sup>5</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,2	7,2	8,5	10,0	10,1	10,9	11,7	12,5	13,5	13,8	14,4	14,9	14,9	15,5	16,7	17,3	19,1	19,2	20,4
of final energy consumption in the transport sector EU-Directive <sup>5</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,1	4,0	6,7	7,5	6,3	5,9	6,4	6,5	7,3	7,3	6,9	6,6	7,0	7,0	7,9	7,6	10,0	8,0	8,8
Figures in [%]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
of primary energy consumption	1,3	1,3	1,4	1,6	1,8	1,9	1,8	2,4	2,6	2,8	2,9	2,9	3,2	3,8	4,5	5,3	6,3	7,9	8,0	8,9	9,9	10,8	10,3	10,8	11,5	12,6	12,4	13,2	13,9	14,9	16,6	15,7	17,2

1) according to the German government's Energy Concept

2) Net heat production, including grid losses

3) sectoral local consumption of energy for application purposes of heating and cooling, without electricity, including district heat

4) sectoral local consumption of energy for application purposes of heating and cooling, without secondary energy carriers electricity and district heat

5) till 2020 according to the European Directive 2009/28/EC, since 2021 according to the European Directive (EU) 2018/2001

Sources: see table 1 and 7; partially preliminary data

**Table 3: Gross electricity production from renewable energy sources 1990 to 2022**

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Figures in [GWh]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Hydropower <sup>1</sup>	17.426	14.891	17.397	17.878	19.930	21.780	21.957	17.357	17.216	19.647	21.732	22.733	23.124	18.322	20.745	19.638	20.031	21.170	20.443	19.031	20.953	17.671	21.755	22.998	19.587	18.977	20.546	20.150	18.098	20.135	18.721	19.657	17.462
Wind energy onshore	72	102	281	612	927	1.530	2.073	3.025	4.579	5.639	9.703	10.719	16.102	19.087	26.019	27.774	31.324	40.507	41.385	39.382	38.371	49.280	50.948	51.819	57.026	72.340	67.650	88.018	90.484	101.150	104.796	90.272	100.164
Wind energy offshore	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	176	577	732	918	1.471	8.284	12.274	17.675	19.467	24.744	27.306	24.375	25.123
Solar Photovoltaic	1	1	4	3	7	7	12	18	36	31	61	78	166	320	568	1.308	2.265	3.137	4.508	6.715	11.963	19.991	26.744	30.621	35.448	38.076	37.556	38.761	44.320	45.221	49.496	49.340	60.787
Solid biofuels <sup>2</sup>	4	9	14	32	51	85	118	179	210	246	925	1.112	1.485	3.392	5.162	7.478	8.819	8.699	9.296	9.746	10.351	10.516	10.693	10.555	10.798	11.034	10.797	10.644	11.068	11.038	11.306	11.028	11.187
Liquid biofuels	0	0	0	0	0	0	0	0	0	0	0	15	20	52	136	116	719	948	1.088	1.632	1.278	382	246	288	334	426	489	437	382	330	307	202	175
Biogas	1	2	3	4	6	18	31	44	118	145	445	745	1.046	1.518	1.111	1.696	3.346	8.386	10.957	13.188	15.300	18.754	24.383	25.839	26.917	28.302	28.904	29.245	28.471	28.225	28.757	28.189	28.471
Biomethane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	44	78	372	576	1.080	1.625	2.398	3.011	3.010	2.837	2.850	2.859	2.914	3.133	2.964
Sewage gas	29	25	20	24	27	34	41	48	633	727	705	735	777	955	986	1.096	1.057	1.033	1.094	1.131	1.203	1.280	1.314	1.308	1.336	1.389	1.440	1.460	1.555	1.581	1.579	1.576	1.575
Landfill gas	188	224	259	372	485	525	565	605	677	727	812	748	771	793	988	1.068	1.092	1.009	864	788	674	628	536	483	435	396	358	338	305	287	247	229	202
Biogenic fraction of waste <sup>3</sup>	1.213	1.211	1.262	1.203	1.306	1.348	1.343	1.397	1.618	1.740	1.844	1.859	1.949	2.238	2.253	3.252	3.901	4.521	4.671	4.323	4.746	4.755	4.951	5.415	6.069	5.768	5.930	5.956	6.163	5.806	5.820	5.792	5.607
Geothermal energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0,2	0,2	0,4	0,4	18	19	28	19	25	80	98	133	175	163	178	197	231	244	245
<b>Total</b>	<b>18.934</b>	<b>16.465</b>	<b>19.240</b>	<b>20.128</b>	<b>22.739</b>	<b>25.327</b>	<b>26.140</b>	<b>22.673</b>	<b>25.087</b>	<b>28.902</b>	<b>36.227</b>	<b>38.744</b>	<b>45.440</b>	<b>46.677</b>	<b>57.968</b>	<b>63.426</b>	<b>72.554</b>	<b>89.430</b>	<b>94.368</b>	<b>96.071</b>	<b>105.415</b>	<b>124.429</b>	<b>143.407</b>	<b>151.949</b>	<b>161.917</b>	<b>188.136</b>	<b>189.129</b>	<b>215.684</b>	<b>223.341</b>	<b>241.573</b>	<b>251.480</b>	<b>234.037</b>	<b>253.962</b>
for information: amount of electricity under the EEG <sup>4</sup>	-	-	-	-	-	-	-	-	-	-	10.391	18.145	24.970	28.417	38.511	43.967	51.545	67.010	71.148	75.377	82.332	103.136	118.330	125.693	136.936	162.730	162.348	188.300	196.306	212.765	221.956	203.362	-

1) river and storage power plants including pumped storage plants with natural inflow

2) including sewage sludge

3) biogenic fraction of waste in waste incineration plants estimated at 50 %, from 2008 only municipal waste

4) fixed remuneration, market premium (since 2012), "green electricity privilege" and other direct marketing as well as the amount of remunerated self consumed electricity of photovoltaic plants under the EEG regulations between 2009-2012, including mine gas  
annual statement of account for the EEG of the transmission system operators: [www.netztransparenz.de](http://www.netztransparenz.de)

Sources: AGEE-Stat based on StBA [26], [27]; BNetzA [8]; ÜNB; ZSW; DENA [24]; BDEW; VDEW [20]; AGEb [1]; DBFZ [13]; IE [21]; partially preliminary data

**Table 3.1: Net electricity production from renewable energy sources 2003 to 2022**

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Figures in [GWh]	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Hydropower <sup>1</sup>	18.075	20.494	19.344	19.718	20.811	20.134	18.743	20.682	17.326	21.332	22.660	19.310	18.665	20.215	19.985	17.926	19.957	18.546	19.483	17.296
Wind energy onshore	18.713	25.509	27.229	30.710	39.713	40.574	38.610	37.619	48.314	49.949	50.803	55.908	70.922	66.324	86.293	88.710	99.166	102.741	88.502	98.200
Wind energy offshore	0	0	0	0	0	0	38	174	568	722	905	1.449	8.162	12.092	17.414	19.179	24.379	26.903	24.015	24.751
Solar Photovoltaic	313	557	1.282	2.220	3.075	4.420	6.583	11.729	19.599	26.220	30.020	34.753	37.330	36.820	38.001	43.451	44.334	48.525	48.373	59.596
Solid biofuels <sup>2</sup>	3.016	4.512	6.721	7.913	7.824	8.285	8.733	9.247	9.395	9.509	9.392	9.657	9.855	9.673	9.542	9.807	9.790	10.002	9.703	9.831
Liquid biofuels	49	128	110	678	909	1.050	1.546	1.197	338	208	264	308	392	442	388	328	297	280	180	154
Biogas	1.424	1.042	1.572	3.042	7.900	10.449	12.641	14.874	18.288	23.640	24.934	26.121	27.354	28.087	28.519	27.403	27.293	27.794	26.856	27.234
Biomethane	0	0	0	0	19	42	75	362	562	1.047	1.586	2.329	2.934	2.935	2.753	2.793	2.800	2.859	3.078	2.909
Sewage gas	923	947	1.057	1.023	999	1.033	1.042	1.093	1.179	1.217	1.215	1.283	1.308	1.331	1.357	1.551	1.578	1.576	1.572	1.572
Landfill gas	741	967	1.040	1.046	962	826	713	600	595	512	461	416	384	343	324	279	262	233	215	189
Biogenic fraction of waste <sup>3</sup>	1.649	1.647	2.422	2.965	3.519	3.667	3.352	3.755	3.795	3.971	4.305	4.838	4.565	4.746	4.802	4.932	4.626	4.638	4.575	4.434
Geothermal energy	0	0	0	0	0	12	13	20	19	25	69	67	91	164	157	126	144	173	174	175
<b>Total</b>	<b>44.903</b>	<b>55.803</b>	<b>60.777</b>	<b>69.315</b>	<b>85.731</b>	<b>90.492</b>	<b>92.089</b>	<b>101.352</b>	<b>119.978</b>	<b>138.352</b>	<b>146.614</b>	<b>156.439</b>	<b>181.962</b>	<b>183.172</b>	<b>209.535</b>	<b>216.485</b>	<b>234.626</b>	<b>244.270</b>	<b>226.726</b>	<b>246.341</b>

1) river and storage power plants including pumped storage plants with natural inflow

2) including sewage sludge

3) biogenic fraction of waste in waste incineration plants estimated at 50 %, from 2008 only municipal waste

annual statement of account for the EEG of the transmission system operators: [www.netztransparenz.de](http://www.netztransparenz.de)

Sources: AGEE-Stat based on StBA [26], [27]; BNetzA [8]; ÜNB; ZSW; DENA [24]; BDEW; VDEW [20]; AGEb [1]; DBFZ [13]; IE [21]; partially preliminary data

**Table 4: Installed electrical capacity of renewable energy plants 1990 to 2022**

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Figures in [MW]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Hydropower <sup>1</sup>	3.982	4.033	4.049	4.117	4.211	4.348	4.305	4.296	4.369	4.547	4.831	4.831	4.937	4.953	5.186	5.210	5.193	5.137	5.164	5.340	5.407	5.625	5.607	5.590	5.580	5.589	5.629	5.627	5.347	5.396	5.454	5.489	5.539
Wind energy onshore	55	106	174	326	618	1.121	1.549	2.089	2.877	4.435	6.097	8.738	11.976	14.381	16.419	18.248	20.474	22.116	22.794	25.697	26.823	28.524	30.711	32.969	37.620	41.297	45.283	50.174	52.328	53.187	54.326	55.958	58.077
Wind energy offshore <sup>2</sup>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	80	188	268	508	994	3.283	4.152	5.406	6.393	7.555	7.787	7.787	8.129
Solar Photovoltaic	2	2	6	9	12	18	28	42	54	70	114	176	296	435	1.105	2.056	2.899	4.170	6.120	10.566	18.006	25.916	34.077	36.710	37.900	39.224	40.679	42.293	45.158	48.864	54.403	60.108	67.399
Solid biofuels	64	64	65	72	80	80	93	115	135	194	304	384	523	859	1.020	1.218	1.411	1.431	1.457	1.470	1.502	1.554	1.558	1.623	1.589	1.592	1.600	1.601	1.567	1.568	1.571	1.566	1.561
Liquid biofuels	0	0	0	0	0	0	0	0	0	0	0	5	6	18	21	60	177	295	341	412	410	345	277	263	232	232	231	230	230	231	231	230	228
Biogas <sup>3</sup>	1	2	2	3	4	9	15	19	43	49	78	111	160	190	249	665	1.000	1.226	1.419	2.520	3.015	3.837	4.212	4.317	4.380	4.601	4.780	5.173	5.610	5.951	6.343	6.450	6.507
Biomethane <sup>3</sup>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	16	18	96	218	256	383	603	614	653	567	602	603	621	654	659
Sewage gas <sup>4</sup>	5	5	4	4	5	6	8	9	115	132	128	134	141	149	157	161	170	177	186	192	200	233	236	240	245	245	245	242	421	396	374	374	374
Landfill gas	59	64	68	95	119	132	145	158	168	173	193	193	200	212	240	248	252	257	268	261	237	232	214	210	211	183	172	165	169	162	156	137	134
Geothermal energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	8	8	8	19	30	33	34	38	38	42	47	47	54	59
Biogenic fraction of waste <sup>5</sup>	275	275	275	282	250	255	276	264	270	278	293	293	293	451	472	587	637	614	684	720	762	743	714	930	944	962	978	1.004	1.063	1.084	1.024	1.040	1.040
<b>Total</b>	<b>4.443</b>	<b>4.551</b>	<b>4.643</b>	<b>4.908</b>	<b>5.299</b>	<b>5.969</b>	<b>6.419</b>	<b>6.992</b>	<b>8.031</b>	<b>9.878</b>	<b>12.038</b>	<b>14.865</b>	<b>18.532</b>	<b>21.648</b>	<b>24.869</b>	<b>28.453</b>	<b>32.213</b>	<b>35.432</b>	<b>38.452</b>	<b>47.239</b>	<b>56.546</b>	<b>67.423</b>	<b>78.149</b>	<b>83.773</b>	<b>90.331</b>	<b>97.856</b>	<b>104.440</b>	<b>112.520</b>	<b>118.930</b>	<b>125.044</b>	<b>132.337</b>	<b>139.847</b>	<b>149.706</b>

1) river and storage power plants including pumped storage plants with natural inflow

2) installed capacity of offshore wind energy plants connected to the network

3) since 2013 including additional capacity for increased flexibility of electricity production

4) till 2014 calculated based on the electricity production and full-load hours specific to the energy source, since 2015 net additions according to registry data of the Federal Network Agency (BNetzA), since 2018 based on StBA

5) the stated values represent an amount of 50% of the total installed capacity of thermal waste combustion plants using renewable and fossil municipal waste. For the whole time series 50% of the total capacity is considered as renewable.

Sources: AGEE-Stat based on BNetzA [8]; StBA [27]; ZSW, DENA [24]; BDEW; VDEW [20]; DBFZ [13]; DEWI [14]; IE [21]; partially preliminary data



**Table 5: Final energy consumption from renewable sources for heating and cooling 1990 to 2022**

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Figures in [GWh]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Solid biofuels (households) <sup>1</sup>	25.355	25.448	25.448	25.448	25.448	25.448	25.448	42.740	44.369	45.590	45.834	52.307	50.963	54.279	53.044	52.222	61.496	64.092	74.020	65.220	79.304	71.904	83.015	85.941	69.484	69.477	66.289	68.393	70.192	71.154	66.874	78.559	80.021	
Solid biofuels (TCS sector) <sup>2</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	6.972	9.581	9.695	11.120	11.443	16.046	16.476	21.236	15.813	17.437	18.696	14.945	17.137	16.731	17.450	17.812	19.219	19.101	22.086	20.671	
Solid biofuels (industry) <sup>3</sup>	2.909	2.909	2.909	2.909	2.909	2.909	2.788	2.788	3.959	3.917	3.898	4.161	4.273	12.442	18.462	21.266	20.319	22.367	20.156	22.972	28.088	29.089	27.793	25.600	26.530	25.108	27.031	26.326	24.522	23.784	23.279	24.820	23.171	
Solid biofuels (HP/CHP) <sup>4</sup>	1	3	5	11	18	30	41	63	74	86	324	389	520	994	1.797	2.043	2.104	2.225	2.759	3.581	4.057	4.665	5.776	5.532	5.465	5.957	6.259	6.193	5.740	6.121	6.296	6.831	6.588	
Liquid biofuels <sup>5</sup>	0	0	0	0	0	0	0	0	3	2	8	10	48	701	819	1.219	1.778	2.834	3.409	3.660	3.366	2.562	2.104	2.196	2.372	2.189	2.188	2.194	2.298	2.383	3.217	2.601	2.455	
Biogas	-	-	-	-	-	-	-	-	-	-	-	-	-	297	441	813	1.334	3.638	3.478	5.060	7.472	8.972	8.422	9.257	10.451	11.342	12.108	12.816	12.883	13.295	13.603	13.393	13.611	
Biomethane	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	21	65	131	490	739	1.286	2.059	2.789	3.451	3.548	3.261	3.630	3.765	4.023	4.751	4.761	
Sewage gas	-	-	-	-	-	-	-	-	-	-	-	-	-	1.830	1.968	2.082	1.852	1.858	1.972	1.977	1.999	2.059	2.017	1.805	1.801	2.001	2.050	2.141	2.500	2.402	2.378	2.368	2.412	
Landfill gas	-	-	-	-	-	-	-	-	-	-	-	-	-	176	165	231	227	210	154	155	117	101	94	93	98	120	116	107	110	107	95	85	83	
Gaseous biofuels	-	-	-	-	-	-	-	-	1.335	1.263	1.355	1.353	1.438	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Biogenic fraction of waste <sup>6</sup>	2.308	2.308	2.308	2.308	2.308	2.308	2.538	2.290	3.405	3.674	3.548	3.421	3.295	5.642	6.034	7.199	8.433	10.747	6.662	6.530	7.260	8.140	9.033	11.645	11.380	11.807	11.669	12.669	14.508	15.308	15.060	15.650	15.073	
Solarthermal energy	131	168	219	263	334	417	521	656	785	1.036	1.226	1.540	1.814	2.389	2.421	2.857	3.363	3.746	4.293	5.061	5.383	6.160	6.416	6.500	7.026	7.562	7.604	7.834	8.955	8.667	9.014	8.551	9.733	
Geothermal energy <sup>7</sup>	100	100	100	100	100	100	111	111	113	113	113	114	114	445	464	532	525	524	550	623	689	722	805	864	1.052	969	1.146	1.168	1.308	1.369	1.427	1.578	1.505	
Near-surface geothermal energy, ambient heat <sup>8</sup>	1.712	1.735	1.765	1.797	1.834	1.877	1.924	1.964	2.006	2.042	2.057	2.070	2.052	2.061	2.121	2.283	2.747	3.437	4.233	5.096	5.938	6.818	7.766	8.732	9.643	10.510	11.408	12.408	13.504	14.655	16.049	17.905	20.465	
<b>Total</b>	<b>32.516</b>	<b>32.671</b>	<b>32.754</b>	<b>32.836</b>	<b>32.951</b>	<b>33.089</b>	<b>33.371</b>	<b>50.612</b>	<b>56.049</b>	<b>57.723</b>	<b>58.363</b>	<b>65.365</b>	<b>64.517</b>	<b>88.228</b>	<b>97.317</b>	<b>102.442</b>	<b>115.298</b>	<b>127.142</b>	<b>137.797</b>	<b>136.542</b>	<b>165.399</b>	<b>157.744</b>	<b>171.964</b>	<b>178.920</b>	<b>163.036</b>	<b>167.630</b>	<b>168.147</b>	<b>172.960</b>	<b>177.962</b>	<b>182.229</b>	<b>180.416</b>	<b>199.178</b>	<b>200.549</b>	

1) till 2004 according to the Working Group on Energy Balances (AGEB); since 2005 according to Thünen Institute; including charcoal

2) TCS = trade, commerce and service sector; Final energy consumption for heat only production according to Thünen Institute plus fuel input for heat production in decentralised CHP plants; including charcoal; since 2018 including sewage sludge

3) in accordance with Section 8 Energy Statistics Act; including sewage sludge

4) in accordance with Section 3 and 5 Energy Statistics Act, including sewage sludge; HP = heating plants, CHP plant = combined heat and power plant

5) including consumption of biodiesel in agriculture, forestry and military; since 2010 including blended bioethanol

6) biogenic fraction of waste in waste incineration plants estimated at 50 %, since 2008 municipal waste only, decrease 2008 due to first-time inclusion of newly available data (statistical adjustment)

7) before 2003 balneological plants are not taken into account

8) Based on GZB, renewable heat from heat pumps (air-water, water-water, brine-water, process water and gas heat pumps)

Sources: AGEE-Stat based on StBA [26], [28]; ZSW; AGEB [1]; TI [23], [29], [31]; FNR [19]; Uni HH [15]; DENA [24]; DBFZ; LIAG; GZB [2]; BDH; BSW; DEPV; BWP; partially preliminary data

**Table 5.1: Renewable energy sources in the production of district heating 2003 to 2022**

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Figures in [GWh]	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Biogenic fraction of waste <sup>1</sup>	3.454	3.577	4.378	5.304	5.482	6.373	6.105	6.563	6.728	7.414	8.371	8.225	8.412	8.518	8.993	10.010	10.133	9.628	10.541	9.937
Solid biofuels <sup>2</sup>	1.082	1.968	2.242	2.314	2.438	3.028	3.929	4.428	5.184	6.467	6.210	6.250	6.783	7.169	7.084	6.657	6.895	7.091	7.666	7.425
Gaseous and liquid biofuels <sup>3</sup>	145	168	272	281	341	343	541	574	728	1.004	869	915	1.127	1.147	1.130	2.348	2.590	2.840	3.099	3.318
Biomethane	-	-	-	-	-	-	-	-	-	-	524	951	1490	1471	1404	1960	2028	2235	2401	2362
Geothermal energy, ambient heat, solarthermal energy	-	-	-	-	-	-	-	-	-	-	61	87	177	223	180	372	485	553	557	526
<b>Total</b>	<b>4.681</b>	<b>5.713</b>	<b>6.892</b>	<b>7.899</b>	<b>8.261</b>	<b>9.744</b>	<b>10.575</b>	<b>11.565</b>	<b>12.640</b>	<b>14.885</b>	<b>16.035</b>	<b>16.428</b>	<b>17.989</b>	<b>18.528</b>	<b>18.791</b>	<b>21.347</b>	<b>22.131</b>	<b>22.347</b>	<b>24.264</b>	<b>23.568</b>

  

Figures in [%]	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
for information: share of grid losses and consumption in the transformation sector <sup>4</sup>	8,1	8,7	8,9	9,1	8,7	8,9	8,9	8,4	10,0	10,7	10,9	12,6	12,2	12,7	12,6	13,8	11,2	11,2	10,9	11,3

Grid losses are not taken into account

1) biogenic fraction of waste in waste incineration plants estimated at 50 %, from 2008 only municipal waste

2) including sewage sludge

3) sum of gaseous and liquid biomasses: biogas, biomethane, sewage gas, landfill gas and liquid biofuels; including geothermal energy, near-surface geothermal energy, ambient heat and biomethane; reported separately as of 2013

4) share of grid losses including consumption in the transformation sector, with reference to the total district heat production (renewable and fossil energy sources)

Sources: AGEE-Stat based on StBA [26]

**Table 5.2: Final energy consumption from renewable sources for heating and cooling by sectors 2003 to 2022**  
sectoral local consumption of energy for application purposes of heating and cooling, without secondary energy carriers electricity and district heat

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	Figures in [GWh]																				
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
<b>Total</b>																					
Solid biofuels <sup>1</sup>	73.690	81.081	83.183	92.935	97.902	110.221	104.669	128.630	116.806	128.244	130.237	110.957	111.723	110.051	112.169	112.526	114.157	109.255	125.465	123.863	
Gaseous and liquid biofuels <sup>2</sup>	2.879	3.264	4.138	4.985	8.288	8.816	10.555	12.980	13.788	13.035	12.578	13.927	14.667	15.463	16.283	15.761	15.881	16.766	15.664	15.608	
Biomethane	-	-	-	-	-	-	-	-	-	-	-	1.592	1.958	2.143	2.263	2.034	1.940	1.965	2.040	2.611	2.665
Biogenic fraction of waste <sup>3</sup>	2.467	2.768	3.210	3.611	5.743	855	966	1.245	2.086	2.411	4.188	4.188	4.419	4.233	4.807	5.877	6.314	6.513	6.256	6.256	
Geothermal energy, ambient heat, solarthermal energy	4.892	4.991	5.637	6.597	7.670	9.011	10.716	11.947	13.684	14.960	16.035	17.634	18.866	19.936	21.229	23.445	24.259	26.001	27.537	31.234	
<b>Total</b>	<b>83.928</b>	<b>92.104</b>	<b>96.168</b>	<b>108.128</b>	<b>119.603</b>	<b>128.903</b>	<b>126.906</b>	<b>154.802</b>	<b>146.364</b>	<b>158.650</b>	<b>164.630</b>	<b>148.664</b>	<b>151.818</b>	<b>151.946</b>	<b>156.522</b>	<b>159.549</b>	<b>162.576</b>	<b>160.575</b>	<b>177.532</b>	<b>179.626</b>	

	Figures in [GWh]																				
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
<b>Households</b>																					
Solid biofuels <sup>1</sup>	54.276	53.038	52.222	61.496	64.093	74.020	65.220	79.304	71.904	83.014	85.941	69.483	69.477	66.289	68.393	70.192	71.154	66.874	78.559	80.021	
Gaseous and liquid biofuels <sup>2</sup>	39	65	144	337	865	872	1.322	1.653	1.944	2.321	2.223	2.540	2.756	2.954	3.132	2.880	2.883	2.911	2.770	2.788	
Biomethane	-	-	-	-	-	-	-	-	-	-	-	436	524	533	574	539	505	520	529	563	604
Solarthermal energy	2.189	2.234	2.649	3.138	3.504	4.032	4.772	5.090	5.840	6.094	6.184	6.696	7.218	7.265	7.491	8.566	8.293	8.621	8.174	9.307	
Geothermal energy <sup>4</sup>	18	44	82	50	47	67	95	164	184	245	253	236	267	346	323	267	294	281	441	413	
Near-surface geothermal energy, ambient heat	1.934	1.989	2.141	2.577	3.224	3.983	4.780	5.546	6.368	7.261	8.173	9.026	9.816	10.621	11.502	12.350	13.336	14.584	16.254	18.596	
<b>Total</b>	<b>58.456</b>	<b>57.370</b>	<b>57.238</b>	<b>67.598</b>	<b>71.733</b>	<b>82.974</b>	<b>76.189</b>	<b>91.757</b>	<b>86.240</b>	<b>98.935</b>	<b>103.210</b>	<b>88.505</b>	<b>90.067</b>	<b>88.049</b>	<b>91.380</b>	<b>94.760</b>	<b>96.480</b>	<b>93.800</b>	<b>106.761</b>	<b>111.729</b>	

	Figures in [GWh]																			
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
<b>TCS sector</b>																				
Solid biofuels <sup>1</sup>	6.972	9.581	9.695	11.120	11.443	16.046	16.476	21.237	15.813	17.437	18.696	14.945	17.137	16.731	17.450	17.812	19.219	19.101	22.086	20.671
Gaseous biofuels <sup>5</sup>	1.994	2.152	2.469	2.728	4.089	4.156	5.311	6.276	7.159	8.119	7.662	8.508	9.257	9.820	10.395	10.044	9.912	9.940	9.561	9.617
Liquid biofuels, biodiesel in agriculture and forestry	520	773	1.104	1.649	2.563	2.559	3.076	2.690	2.098	1.922	1.910	2.066	1.912	1.894	1.935	2.096	2.146	3.009	2.426	2.297
Biomethane	-	-	-	-	-	-	-	-	-	-	1.097	1.366	1.418	1.485	1.377	1.270	1.296	1.263	1.348	1.361
Solarthermal energy	199	187	208	226	242	261	289	293	319	319	312	327	343	338	341	385	369	381	358	403
Geothermal energy <sup>4</sup>	424	406	416	436	440	418	464	462	523	536	554	732	528	579	666	721	647	666	659	647
Near-surface geothermal energy, ambient heat	128	131	141	170	213	250	316	392	450	505	559	617	694	787	906	1.030	1.191	1.338	1.510	1.728
<b>Total <sup>6</sup></b>	<b>10.355</b>	<b>13.436</b>	<b>14.385</b>	<b>16.665</b>	<b>19.303</b>	<b>23.926</b>	<b>26.170</b>	<b>31.592</b>	<b>26.381</b>	<b>28.838</b>	<b>30.790</b>	<b>28.561</b>	<b>31.289</b>	<b>31.634</b>	<b>33.070</b>	<b>33.368</b>	<b>34.780</b>	<b>35.698</b>	<b>37.948</b>	<b>36.724</b>

	Figures in [GWh]																			
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
<b>Industry</b>																				
Solid biofuels <sup>1</sup>	12.442	18.462	21.266	20.319	22.366	20.155	22.973	28.089	29.089	27.793	25.600	26.529	25.109	27.031	26.326	24.522	23.784	23.280	24.820	23.171
Gaseous and liquid biofuels <sup>2</sup>	326	274	421	271	771	1.229	846	2.361	2.587	673	783	813	742	795	821	741	940	906	907	906
Biomethane	-	-	-	-	-	-	-	-	-	-	59	68	192	204	118	165	149	248	700	700
Biogenic fraction of waste <sup>3</sup>	2.349	2.562	2.858	3.275	5.430	619	728	1.003	2.067	2.411	4.188	4.188	4.419	4.233	4.807	5.877	6.314	6.513	6.256	6.256
Geothermal energy, ambient heat, solarthermal energy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	126	129	130	140	140
<b>Total</b>	<b>15.117</b>	<b>21.298</b>	<b>24.545</b>	<b>23.865</b>	<b>28.567</b>	<b>22.003</b>	<b>24.547</b>	<b>31.453</b>	<b>33.743</b>	<b>30.877</b>	<b>30.630</b>	<b>31.598</b>	<b>30.462</b>	<b>32.263</b>	<b>32.072</b>	<b>31.431</b>	<b>31.316</b>	<b>31.077</b>	<b>32.823</b>	<b>31.173</b>

1) including sewage sludge  
2) sum of gaseous and liquid biomasses: biogas, biomethane, sewage gas, landfill gas and liquid biofuels; since 2013 biomethane depicted separately  
3) biogenic fraction of waste in waste incineration plants estimated at 50 %, from 2008 only municipal waste  
4) before 2003 balneological plants are not taken into account  
5) sum of biogas, biomethane, sewage gas and landfill gas; biomethane since 2013 depicted separately  
6) Based on GZB, renewable heat from heat pumps (air-water, water-water, brine-water, process water and gas heat pumps)  
7) includes low amounts of energy from the biogenic fraction of waste of the TCS sector

**Table 6: Final energy consumption from renewable sources in the transport sector 1990 to 2022**

Status: February 2023

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Figures in [GWh]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Biodiesel <sup>1</sup>	0	2	52	52	289	362	568	930	1.033	1.343	2.583	3.617	5.683	7.919	9.942	17.666	27.938	32.282	25.873	22.966	24.359	23.556	24.628	21.945	22.676	20.829	20.896	21.354	22.329	22.109	30.170	25.072	24.518
Vegetable oil	0	0	21	31	31	52	52	104	115	146	167	209	251	73	125	1.828	7.206	8.533	4.042	961	574	188	251	0	52	10	31	31	10	21	21	21	21
Bioethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	486	1.780	3.828	3.391	4.608	6.576	8.537	9.031	9.149	8.832	9.002	8.589	8.604	8.464	8.685	8.353	8.014	8.412	8.692
Biomethane <sup>2</sup>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	13	75	92	333	483	449	345	379	445	389	660	884	965	1.061
RE electricity consumption in transport <sup>3</sup>	465	475	536	570	662	761	778	691	724	823	1.002	1.082	1.247	1.006	1.212	1.353	1.484	1.750	1.688	1.914	2.066	2.470	2.838	2.993	3.146	3.500	3.709	4.305	4.557	4.874	5.213	5.302	6.148
<b>Total</b>	<b>465</b>	<b>477</b>	<b>609</b>	<b>653</b>	<b>982</b>	<b>1.175</b>	<b>1.398</b>	<b>1.725</b>	<b>1.872</b>	<b>2.312</b>	<b>3.752</b>	<b>4.908</b>	<b>7.181</b>	<b>8.998</b>	<b>11.765</b>	<b>22.627</b>	<b>40.456</b>	<b>45.956</b>	<b>36.215</b>	<b>32.430</b>	<b>35.611</b>	<b>35.337</b>	<b>37.199</b>	<b>34.253</b>	<b>35.325</b>	<b>33.273</b>	<b>33.619</b>	<b>34.599</b>	<b>35.970</b>	<b>36.017</b>	<b>44.302</b>	<b>39.772</b>	<b>40.440</b>

Figures in [1.000 t]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Biodiesel <sup>1</sup>	0	0,2	5	5	28	35	55	90	100	130	250	350	550	771	968	1.720	2.720	3.143	2.519	2.236	2.361	2.258	2.322	2.059	2.148	1.998	2.005	2.073	2.169	2.145	2.805	2.378	2.336
Vegetable oil	0	0	2	3	3	5	5	10	11	14	16	20	24	7	12	175	690	817	387	92	55	18	24	0	5	1	3	3	1	2	2	2	2
Bioethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65	238	512	460	625	892	1.158	1.225	1.241	1.198	1.221	1.165	1.167	1.148	1.178	1.133	1.087	1.141	1.179
Biomethane <sup>2</sup>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	7	25	36	33	25	28	33	29	49	65	71	78
<b>Total</b>	<b>0</b>	<b>0,2</b>	<b>7</b>	<b>8</b>	<b>31</b>	<b>40</b>	<b>60</b>	<b>100</b>	<b>111</b>	<b>144</b>	<b>266</b>	<b>370</b>	<b>574</b>	<b>778</b>	<b>1.045</b>	<b>2.133</b>	<b>3.922</b>	<b>4.420</b>	<b>3.531</b>	<b>3.221</b>	<b>3.580</b>	<b>3.508</b>	<b>3.612</b>	<b>3.293</b>	<b>3.407</b>	<b>3.189</b>	<b>3.203</b>	<b>3.257</b>	<b>3.377</b>	<b>3.329</b>	<b>3.959</b>	<b>3.592</b>	<b>3.595</b>

1) consumption of biodiesel (including HVO) in the transport sector (excluding consumption in agriculture, forestry and military)

2) based on the net calorific value, relation of gross to net calorific value according to a convention of BDEW/AGEB

3) calculated on the share of renewables-based electricity generation in gross electricity consumption in each year

Sources: AGEE-Stat based on BAFA [5]; BLE [3], [4]; BMF [6]; BReg [9], [10], [11], [12]; StBA [25]; FNR; ZSW; DBFZ; AGQM; UFOP; partially preliminary data

Table 7: Development of energy consumption in Germany 1990 to 2022

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Figures in [TWh]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Gross electricity consumption <sup>1</sup>	549,9	538,7	531,6	526,6	531,1	541,8	550,4	547,7	555,4	557,1	578,0	588,9	592,7	605,5	614,9	618,0	622,5	624,1	620,7	583,5	617,7	609,2	608,4	605,5	592,7	598,7	598,6	599,8	592,7	575,5	555,8	568,6	549,6	
Production of district heating						115,7	108,2	100,0	101,2	94,2	87,1	87,6	87,9	133,8	140,4	141,3	141,2	134,0	137,3	135,7	148,5	134,9	139,5	135,6	121,8	127,1	130,3	130,5	128,2	127,2	117,7	137,8	117,2	
Final energy consumption for heating and cooling (including district heat) <sup>2</sup>	1.529,0	1.493,9	1.404,5	1.418,1	1.391,1	1.421,7	1.513,1	1.462,0	1.421,0	1.349,7	1.322,5	1.399,4	1.336,5	1.359,0	1.331,6	1.296,8	1.341,5	1.206,1	1.322,9	1.213,3	1.346,4	1.238,4	1.253,9	1.298,4	1.168,6	1.208,8	1.229,9	1.238,6	1.191,3	1.205,5	1.183,0	1.258,0	1.154,8	
Final energy consumption for heating and cooling (without secondary energy carriers electricity and district heat) <sup>3</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.240,0	1.207,0	1.171,7	1.216,6	1.087,2	1.201,8	1.094,4	1.215,4	1.121,7	1.134,3	1.177,7	1.062,2	1.097,2	1.116,1	1.124,6	1.081,8	1.093,5	1.079,0	1.136,3	1.051,2
thereof in: Households	-	-	-	-	-	-	-	-	-	-	-	-	-	-	583,4	547,8	537,7	555,4	460,0	544,1	505,5	551,7	474,0	509,5	540,1	448,2	470,9	478,9	474,6	473,1	493,9	486,2	489,8	468,7
thereof in: TCS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	203,4	200,4	199,7	231,5	185,2	216,4	200,1	216,3	192,3	187,7	207,9	190,9	198,6	195,9	192,8	172,6	175,9	186,1	191,9	180,7
thereof in: Industry	-	-	-	-	-	-	-	-	-	-	-	-	-	-	453,2	458,8	434,3	429,7	442,0	441,3	388,8	447,4	455,4	437,1	429,7	423,1	427,7	441,3	457,2	436,1	423,7	406,7	454,6	401,8
Final energy consumption in the transport sector <sup>4</sup>	615,8	630,0	651,8	668,7	654,4	669,2	669,5	672,6	684,0	703,9	691,6	678,3	671,5	650,4	652,3	632,4	635,6	628,3	618,9	613,3	619,3	625,3	616,0	629,1	634,3	635,0	646,7	657,5	637,1	643,3	583,6	585,1	597,1	
<b>Figures in [PJ]</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	
Gross final energy consumption EU-Directive <sup>5</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.608	9.486	9.724	9.206	9.581	8.991	9.617	9.140	9.318	9.543	9.063	9.234	9.395	9.477	9.345	9.308	8.776	9.014	8.703	
Final energy consumption in the transport sector EU-Directive <sup>5</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.293	2.219	2.250	2.194	2.159	2.120	2.149	2.176	2.160	2.206	2.237	2.270	2.320	2.363	2.282	2.307	2.125	2.085	2.185	
<b>Figures in [PJ]</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	
Primary energy consumption <sup>6</sup>	14.905	14.610	14.320	14.309	14.185	14.269	14.746	14.614	14.521	14.323	14.401	14.679	14.427	14.600	14.591	14.558	14.837	14.197	14.380	13.531	14.217	13.599	13.447	13.822	13.180	13.289	13.492	13.516	13.152	12.803	11.893	12.440	11.769	

1) gross electricity production by fossil fuels accounting to AGEb status September 2022, data on electricity trade according to SIBA

2) sectoral local consumption of energy for application purposes of heating and cooling, without electricity consumption, including district heat; calculation based on Working Group on Energy Balances (AGEB) and AGEE-Stat, status Februar 2023

3) sectoral local consumption of energy for application purposes of heating and cooling, without secondary energy carriers electricity and district heat; calculation based on Working Group on Energy Balances (AGEB) and AGEE-Stat, status Februar 2023

4) calculation based on Working Group on Energy Balances (AGEB) and AGEE-Stat, without energy consumption for international aviation, status Februar 2023

5) till 2020 according to the European Directive 2009/28/EC, since 2021 according to the European Directive (EU) 2018/2001

6) calculation based on Working Group on Energy Balances (AGEB) and AGEE-Stat, calculated by the "physical energy content" principle, status Februar 2023

Sources: AGEE-Stat based on AGEb [1]; SIBA [30]; Eurostat [18]; IEA [22]; EP/ER [16], [17]; partially preliminary data

Table 8.1: Greenhouse gas emissions avoided through the use of renewable energy sources 1990 to 2022

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Figures in [1.000 t CO <sub>2</sub> -eq.]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
by RE gross electricity production	21.284	18.370	21.449	22.263	25.000	27.541	27.319	22.402	23.749	28.029	33.903	36.776	43.267	43.093	52.890	55.933	55.507	65.595	64.399	66.911	72.956	90.060	90.998	93.933	110.917	127.277	127.060	140.051	146.512	173.887	180.218	165.995	180.119
by RE final energy consumption for heating and cooling	7.081	7.117	7.115	7.130	7.152	7.177	7.176	10.912	12.221	12.431	12.557	14.081	13.830	19.665	22.191	20.404	22.420	24.958	27.186	27.819	32.741	31.791	34.108	34.921	32.607	34.135	34.469	34.639	36.899	37.724	37.699	41.692	41.955
by RE final energy consumption in the transport sector <sup>1 2</sup>	0	0,4	14	16	62	80	121	202	225	293	537	746	1.151	1.654	2.155	4.247	7.685	8.728	6.914	6.117	6.663	6.540	7.078	6.478	6.747	6.359	6.972	7.456	7.783	7.569	11.117	9.873	9.835
<b>Total avoided GHG-emissions</b>	<b>28.365</b>	<b>25.487</b>	<b>28.578</b>	<b>29.409</b>	<b>32.214</b>	<b>34.798</b>	<b>34.616</b>	<b>33.516</b>	<b>36.195</b>	<b>40.753</b>	<b>46.997</b>	<b>51.603</b>	<b>58.248</b>	<b>64.412</b>	<b>77.236</b>	<b>80.584</b>	<b>85.612</b>	<b>99.281</b>	<b>98.499</b>	<b>100.847</b>	<b>112.360</b>	<b>128.391</b>	<b>132.184</b>	<b>135.332</b>	<b>150.271</b>	<b>167.771</b>	<b>168.501</b>	<b>182.146</b>	<b>191.194</b>	<b>219.180</b>	<b>229.034</b>	<b>217.560</b>	<b>231.909</b>

Figures in [g CO <sub>2</sub> -eq./kWh]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Avoidance factor of RE gross electricity production	1.124	1.116	1.115	1.106	1.099	1.087	1.045	988	947	970	936	949	952	923	912	882	765	733	682	696	692	724	635	618	685	677	672	649	656	720	717	709	709
Avoidance factor of RE final energy consumption for heating and cooling	218	218	217	217	217	217	215	216	218	215	220	220	219	227	232	202	197	199	200	207	201	204	201	198	203	206	207	203	210	209	211	211	210
Avoidance factor of RE final energy consumption in the transport sector <sup>1 2</sup>	-	193	190	189	193	193	194	195	196	196	195	195	194	207	204	200	197	197	200	200	199	199	206	207	210	214	233	246	248	243	284	286	287

1) consumption of biogenic fuels in the transport sector (excluding consumption in agriculture, forestry and military and excluding electricity consumption in the transport sector)

2) based on data of the Federal Office for Agriculture and Food (BLE) for the year 2021 and the fossil reference values according § 3 and § 10 of 38. BImSchV

Source: UBA [30] based on sources quoted there; partially preliminary data

**Table 8.2: CO<sub>2</sub>-emissions avoided through the use of renewable energy sources 1990 to 2022**

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Figures in [1.000 t CO <sub>2</sub> ]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
by RE gross electricity production	21.102	18.213	21.263	22.072	24.784	27.291	27.063	22.162	23.470	27.624	33.174	35.935	41.889	41.377	50.364	53.873	52.244	61.746	61.256	64.498	70.709	86.532	88.477	91.688	107.448	127.658	128.271	139.906	145.519	170.401	177.365	162.860	176.088
by RE final energy consumption for heating and cooling	6.973	7.009	7.007	7.020	7.042	7.065	7.047	10.821	12.081	12.252	12.358	13.889	13.613	19.107	21.469	19.962	21.941	24.661	27.002	27.681	33.191	32.294	34.606	35.600	33.398	35.570	35.983	36.186	37.657	38.509	38.685	42.626	42.950
by RE final energy consumption in the transport sector <sup>1</sup>	0	0,5	17	19	74	96	143	239	266	346	634	881	1.361	1.957	2.553	5.063	9.259	10.581	8.285	7.244	7.876	7.588	8.061	7.357	7.632	7.148	7.646	8.100	8.384	8.198	11.965	10.547	10.501
<b>Total avoided CO<sub>2</sub>-emissions</b>	<b>28.075</b>	<b>25.223</b>	<b>28.287</b>	<b>29.111</b>	<b>31.900</b>	<b>34.452</b>	<b>34.253</b>	<b>33.222</b>	<b>35.817</b>	<b>40.222</b>	<b>46.166</b>	<b>50.705</b>	<b>56.863</b>	<b>62.441</b>	<b>74.386</b>	<b>78.898</b>	<b>83.444</b>	<b>96.988</b>	<b>96.543</b>	<b>99.423</b>	<b>111.776</b>	<b>126.414</b>	<b>131.144</b>	<b>134.645</b>	<b>148.478</b>	<b>170.376</b>	<b>171.900</b>	<b>184.192</b>	<b>191.560</b>	<b>217.108</b>	<b>228.015</b>	<b>216.033</b>	<b>229.539</b>

Figures in [g CO <sub>2</sub> /kWh]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Avoidance factor of RE gross electricity production	1.115	1.106	1.105	1.097	1.090	1.078	1.035	977	936	956	916	927	922	886	869	849	720	690	649	671	671	695	617	603	664	679	678	649	652	705	705	696	693
Avoidance factor of RE final energy consumption for heating and cooling	214	215	214	214	214	214	211	214	216	212	217	217	216	220	224	198	193	197	198	206	203	208	204	201	208	215	216	212	214	214	216	215	215
Avoidance factor of RE final energy consumption in the transport sector <sup>1</sup>	-	228	233	234	230	231	231	231	232	232	231	230	229	245	242	238	238	239	240	237	235	231	235	235	237	240	256	267	267	263	306	306	306

<sup>1</sup>) consumption of biogenic fuels in the transport sector (excluding consumption in agriculture, forestry and military and excluding electricity consumption in the transport sector)

Source: UBA [30] based on sources quoted there; partially preliminary data

**Table 8.3: Acidifying emissions avoided through the use of renewable energy sources 1990 to 2022 <sup>2</sup>**

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Figures in [1.000 t SO <sub>2</sub> -eq.]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
by RE gross electricity production	123,4	105,6	123,6	127,9	143,1	156,7	128,5	83,0	62,9	55,7	41,3	41,3	43,3	33,3	37,1	33,8	26,4	25,0	25,1	23,1	24,7	34,1	23,6	21,8	32,4	99,5	85,1	102,6	112,7	127,4	125,4	116,0	129,4
by RE final energy consumption for heating and cooling	7,6	7,6	7,7	7,7	7,7	7,7	6,5	10,0	9,1	7,7	6,2	6,8	6,1	7,9	7,0	-1,4	-2,4	-3,67	1,7	-0,9	-4,3	-4,6	-6,8	-11,0	-8,8	-12,5	-13,0	-20,2	-20,3	-20,8	-24,1	-24,9	-24,2
by RE final energy consumption in the transport sector <sup>1</sup>	0	0,00002	0,003	0,004	0,01	0,01	0,01	0,03	0,03	0,04	0,1	0,1	0,1	0,1	-0,2	-1,2	-3,6	-11,9	-7,8	-4,8	-7,0	-4,6	-6,0	-6,9	-4,8	-3,7	-3,6	-1,8	-1,9	-2,9	5,9	4,7	4,6
<b>Total avoided acidifying agents <sup>2</sup></b>	<b>131,0</b>	<b>113,2</b>	<b>131,3</b>	<b>135,6</b>	<b>150,8</b>	<b>164,4</b>	<b>135,0</b>	<b>93,0</b>	<b>72,0</b>	<b>63,4</b>	<b>47,6</b>	<b>48,2</b>	<b>49,5</b>	<b>41,3</b>	<b>43,9</b>	<b>31,2</b>	<b>20,4</b>	<b>9,4</b>	<b>19,0</b>	<b>17,4</b>	<b>13,4</b>	<b>24,9</b>	<b>10,8</b>	<b>3,9</b>	<b>18,8</b>	<b>83,3</b>	<b>68,5</b>	<b>80,6</b>	<b>90,5</b>	<b>103,7</b>	<b>107,2</b>	<b>95,8</b>	<b>109,8</b>

Figures in [g SO <sub>2</sub> -eq./kWh]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Avoidance factor of RE gross electricity production	6,52	6,41	6,42	6,35	6,29	6,19	4,92	3,66	2,51	1,93	1,14	1,07	0,95	0,71	0,64	0,53	0,36	0,28	0,27	0,24	0,23	0,27	0,16	0,14	0,20	0,53	0,45	0,48	0,50	0,53	0,50	0,50	0,51
Avoidance factor of RE final energy consumption for heating and cooling	0,23	0,23	0,23	0,23	0,23	0,23	0,20	0,20	0,16	0,13	0,11	0,11	0,10	0,09	0,07	-0,01	-0,02	-0,03	0,01	-0,01	-0,03	-0,03	-0,04	-0,06	-0,05	-0,08	-0,08	-0,12	-0,12	-0,12	-0,13	-0,13	-0,12
Avoidance factor of RE final energy consumption in the transport sector <sup>1</sup>	-	0,01	0,04	0,05	0,02	0,03	0,02	0,03	0,03	0,03	0,02	0,02	0,02	0,01	-0,02	-0,06	-0,09	-0,27	-0,22	-0,16	-0,21	-0,14	-0,17	-0,22	-0,15	-0,12	-0,12	-0,06	-0,06	-0,09	0,15	0,14	0,13

1) consumption of biogenic fuels in the transport sector (excluding consumption in agriculture, forestry and military and excluding electricity consumption in the transport sector)

2) as acidifying emissions only SO<sub>2</sub> and Nox are taking into account

Source: UBA [30] based on sources quoted there; partially preliminary data



**Table 9.1: Investments in construction of renewable energy plants 2000 to 2022**

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Figures in [million euro] <sup>1</sup>	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Hydropower	520	340	120	170	210	240	220	330	370	500	350	300	200	130	90	80	60	60	120	110	100	70	60
Wind energy onshore	1.920	3.070	3.930	3.360	2.710	2.490	3.220	2.470	2.540	2.800	2.110	2.860	3.550	4.490	7.060	5.370	6.910	7.450	3.390	1.560	2.080	2.840	3.600
Wind energy offshore	-	-	-	-	-	-	-	30	170	470	450	610	2.440	4.270	3.940	3.680	3.370	3.400	4.100	2.130	80	290	1.250
Solar Photovoltaic	260	360	680	760	3.530	4.840	4.010	5.330	7.970	13.570	19.580	15.860	11.980	3.380	1.450	1.480	1.570	1.660	2.580	3.370	4.220	5.210	7.720
Solar thermal energy	440	610	370	480	470	630	990	760	1.700	1.490	990	1.060	950	860	790	800	700	540	490	440	530	530	590
Geothermal energy, ambient heat	130	180	190	210	290	410	940	920	1.230	1.140	960	990	1.060	1.090	1.080	1.010	1.210	1.320	1.520	1.410	1.930	2.390	3.570
Biomass electricity	530	800	770	1.340	1.640	1.910	2.270	2.280	1.980	2.020	2.240	3.120	790	700	670	220	270	280	390	350	320	220	170
Biomass heat	900	920	900	1.080	1.100	1.510	2.300	1.500	1.760	1.610	1.210	1.320	1.500	1.560	1.320	1.290	1.230	1.230	1.240	1.260	1.940	2.470	2.950
<b>Total</b>	<b>4.700</b>	<b>6.280</b>	<b>6.960</b>	<b>7.400</b>	<b>9.950</b>	<b>12.030</b>	<b>13.950</b>	<b>13.620</b>	<b>17.720</b>	<b>23.600</b>	<b>27.890</b>	<b>26.120</b>	<b>22.470</b>	<b>16.480</b>	<b>16.400</b>	<b>13.930</b>	<b>15.320</b>	<b>15.940</b>	<b>13.830</b>	<b>10.630</b>	<b>11.200</b>	<b>14.020</b>	<b>19.910</b>

1) differences in the totals may occur due to roundings

Source: ZSW [32]; partially preliminary data

**Table 9.2: Economic stimuli from the operation of renewable energy plants 2000 to 2022**

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Figures in [million euro] <sup>1</sup>	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Hydropower	100	110	110	120	120	130	130	140	150	160	170	190	190	200	200	200	210	210	210	220	230	230	230
Wind energy onshore	160	220	310	400	480	550	630	710	790	870	970	1.060	1.200	1.360	1.550	1.730	1.890	2.080	2.230	2.300	2.300	2.310	2.290
Wind energy offshore	-	-	-	-	-	-	-	-	-	10	20	30	60	130	210	280	350	420	500	560	600	620	650
Solar Photovoltaic	10	10	20	30	70	130	190	260	360	530	770	1.040	1.250	1.360	1.400	1.420	1.440	1.470	1.500	1.540	1.590	1.660	1.750
Solar thermal energy	-	10	20	30	40	50	70	90	110	140	170	190	210	230	240	260	270	290	300	310	320	330	340
Geothermal energy, ambient heat	170	180	190	200	220	240	290	360	440	530	620	730	820	900	1.000	1.090	1.180	1.280	1.390	1.510	1.650	1.840	2.100
Biomass electricity	160	220	280	430	520	710	1.080	1.620	1.930	2.340	2.770	3.180	3.870	4.020	4.300	4.440	4.430	4.450	4.470	4.560	4.580	4.320	4.580
Biomass heat	1.130	1.160	1.180	1.210	1.250	1.460	1.740	1.960	2.150	2.450	2.880	2.870	3.120	3.320	3.030	3.190	3.390	3.410	3.430	3.450	3.470	3.870	5.130
Biomass fuels	210	300	460	670	880	1.790	3.150	3.750	3.530	2.390	2.920	3.690	3.720	3.050	2.640	2.440	2.560	2.710	2.700	2.830	3.540	4.980	6.680
<b>Total</b>	<b>1.940</b>	<b>2.210</b>	<b>2.570</b>	<b>3.090</b>	<b>3.580</b>	<b>5.060</b>	<b>7.280</b>	<b>8.890</b>	<b>9.460</b>	<b>9.420</b>	<b>11.290</b>	<b>12.980</b>	<b>14.440</b>	<b>14.570</b>	<b>14.570</b>	<b>15.050</b>	<b>15.720</b>	<b>16.320</b>	<b>16.730</b>	<b>17.280</b>	<b>18.280</b>	<b>20.160</b>	<b>23.750</b>

1) differences in the totals may occur due to roundings

Source: ZSW [32]; partially preliminary data



## Renewable energy sources in the year 1990

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	RE 1990 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	17.426	3,2	20.329
	Wind energy onshore	72	0,01	35
	Wind energy offshore	0	0	0
	Solar Photovoltaic	1	0,0002	0,5
	Solid biofuels	4	0,001	2
	Liquid biofuels	0	0	0
	Biogas	1	0,0002	0,1
	Sewage gas	29	0,005	29
	Landfill gas	188	0,03	190
	Biogenic fraction of waste	1.213	0,2	699
	Geothermal energy	0	0	0
	<b>Total</b>	<b>18.934</b>	<b>3,4</b>	<b>21.284</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.355	1,7	5.499
	Solid biofuels (industry)	2.909	0,2	903
	Solid biofuels (HP/CHP)	1	0,0001	0,3
	Liquid biofuels	0	0	0
	Gaseous biofuels	0	0	0
	Biogenic fraction of waste	2.308	0,2	550
	Solar thermal energy	131	0,01	39
	Deep geothermal energy	100	0,01	30
	Near-surface geothermal energy & ambient heat	1.712	0,1	60
	<b>Total</b>	<b>32.516</b>	<b>2,1</b>	<b>7.082</b>
Final energy consumption transport	Biodiesel	0	0	0
	Vegetable oil	0	0	0
	Bioethanol	0	0	0
	RE electricity consumption transport	465	0,1	
	<b>Total</b>	<b>465</b>	<b>0,1</b>	<b>0</b>



## Renewable energy sources in the year 1991

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	RE 1991 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	14.891	2,8	17.367
	Wind energy onshore	102	0,02	49
	Wind energy offshore	0	0	0
	Solar Photovoltaic	1	0,0002	0,5
	Solid biofuels	9	0,002	4
	Liquid biofuels	0	0	0
	Biogas	2	0,0004	0,2
	Sewage gas	25	0,005	25
	Landfill gas	224	0,04	226
	Biogenic fraction of waste	1.211	0,2	697
	Geothermal energy	0	0	0
	<b>Total</b>	<b>16.465</b>	<b>3,1</b>	<b>18.370</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,7	5.524
	Solid biofuels (industry)	2.909	0,2	903
	Solid biofuels (HP/CHP)	3	0,0002	0,8
	Liquid biofuels	0	0	0
	Gaseous biofuels	0	0	0
	Biogenic fraction of waste	2.308	0,2	550
	Solar thermal energy	168	0,01	50
	Deep geothermal energy	100	0,01	30
	Near-surface geothermal energy & ambient heat	1.735	0,1	60
	<b>Total</b>	<b>32.671</b>	<b>2,2</b>	<b>7.118</b>
Final energy consumption transport	Biodiesel	2	0,0003	0,4
	Vegetable oil	0	0	0
	Bioethanol	0	0	0
	RE electricity consumption transport	475	0,1	
	<b>Total</b>	<b>477</b>	<b>0,1</b>	<b>0,4</b>



## Renewable energy sources in the year 1992

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		RE 1992	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	17.397	3,3	20.296
	Wind energy onshore	281	0,1	134
	Wind energy offshore	0	0	0
	Solar Photovoltaic	4	0,001	1,9
	Solid biofuels	14	0,003	7
	Liquid biofuels	0	0	0
	Biogas	3	0,001	0,4
	Sewage gas	20	0,004	20
	Landfill gas	259	0,05	263
	Biogenic fraction of waste	1.262	0,2	727
	Geothermal energy	0	0	0
	<b>Total</b>	<b>19.240</b>	<b>3,6</b>	<b>21.449</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,8	5.483
	Solid biofuels (industry)	2.909	0,2	905
	Solid biofuels (HP/CHP)	5	0,0004	1,3
	Liquid biofuels	0	0	0
	Gaseous biofuels	0	0	0
	Biogenic fraction of waste	2.308	0,2	550
	Solar thermal energy	219	0,02	65
	Deep geothermal energy	100	0,01	30
	Near-surface geothermal energy & ambient heat	1.765	0,1	81
	<b>Total</b>	<b>32.754</b>	<b>2,3</b>	<b>7.115</b>
Final energy consumption transport	Biodiesel	52	0,01	10,0
	Vegetable oil	21	0,003	3,8
	Bioethanol	0	0	0
	RE electricity consumption transport	536	0,1	
	<b>Total</b>	<b>609</b>	<b>0,1</b>	<b>14</b>

## Renewable energy sources in the year 1993

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		RE 1993	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	17.878	3,4	20.858
	Wind energy onshore	612	0,1	293
	Wind energy offshore	0	0	0
	Solar Photovoltaic	3	0,001	1,4
	Solid biofuels	32	0,01	16
	Liquid biofuels	0	0	0
	Biogas	4	0,001	0,5
	Sewage gas	24	0,005	24
	Landfill gas	372	0,1	377
	Biogenic fraction of waste	1.203	0,2	693
	Geothermal energy	0	0	0
	<b>Total</b>	<b>20.128</b>	<b>3,8</b>	<b>22.263</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,8	5.480
	Solid biofuels (industry)	2.909	0,2	905
	Solid biofuels (HP/CHP)	11	0,001	3
	Liquid biofuels	0	0	0
	Gaseous biofuels	0	0	0
	Biogenic fraction of waste	2.308	0,2	550
	Solar thermal energy	263	0,02	77
	Deep geothermal energy	100	0,01	30
	Near-surface geothermal energy & ambient heat	1.797	0,1	84
	<b>Total</b>	<b>32.836</b>	<b>2,3</b>	<b>7.130</b>
Final energy consumption transport	Biodiesel	52	0,01	10
	Vegetable oil	31	0,005	6
	Bioethanol	0	0	0
	RE electricity consumption transport	570	0,1	
	<b>Total</b>	<b>653</b>	<b>0,1</b>	<b>16</b>

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		RE 1994	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	19.930	3,8	23.256
	Wind energy onshore	927	0,2	443
	Wind energy offshore	0	0	0
	Solar Photovoltaic	7	0,001	3
	Solid biofuels	51	0,01	25
	Liquid biofuels	0	0	0
	Biogas	6	0,001	0,8
	Sewage gas	27	0,01	27
	Landfill gas	485	0,1	492
	Biogenic fraction of waste	1.306	0,2	752
	Geothermal energy	0	0	0
	<b>Total</b>	<b>22.739</b>	<b>4,3</b>	<b>25.000</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,8	5.475
	Solid biofuels (industry)	2.909	0,2	905
	Solid biofuels (HP/CHP)	18	0,001	5
	Liquid biofuels	0	0	0
	Gaseous biofuels	0	0	0
	Biogenic fraction of waste	2.308	0,2	550
	Solar thermal energy	334	0,02	98
	Deep geothermal energy	100	0,01	30
	Near-surface geothermal energy & ambient heat	1.834	0,1	89
	<b>Total</b>	<b>32.951</b>	<b>2,4</b>	<b>7.152</b>
Final energy consumption transport	Biodiesel	289	0,04	56
	Vegetable oil	31	0,005	6
	Bioethanol	0	0	0
	RE electricity consumption transport	662	0,1	
	<b>Total</b>	<b>982</b>	<b>0,2</b>	<b>62</b>



## Renewable energy sources in the year 1995

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		RE 1995	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	21.780	4,0	25.417
	Wind energy onshore	1.530	0,3	732
	Wind energy offshore	0	0	0
	Solar Photovoltaic	7	0,001	3
	Solid biofuels	85	0,02	42
	Liquid biofuels	0	0	0
	Biogas	18	0,003	2,5
	Sewage gas	34	0,01	34
	Landfill gas	525	0,1	533
	Biogenic fraction of waste	1.348	0,2	776
	Geothermal energy	0	0	0
	<b>Total</b>	<b>25.327</b>	<b>4,7</b>	<b>27.541</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,8	5.465
	Solid biofuels (industry)	2.909	0,2	905
	Solid biofuels (HP/CHP)	30	0,002	8
	Liquid biofuels	0	0	0
	Gaseous biofuels	0	0	0
	Biogenic fraction of waste	2.308	0,2	550
	Solar thermal energy	417	0,03	122
	Deep geothermal energy	100	0,01	30
	Near-surface geothermal energy & ambient heat	1.877	0,1	96
	<b>Total</b>	<b>33.089</b>	<b>2,3</b>	<b>7.177</b>
Final energy consumption transport	Biodiesel	362	0,1	71
	Vegetable oil	52	0,01	9
	Bioethanol	0	0	0
	RE electricity consumption transport	761	0,1	
	<b>Total</b>	<b>1.175</b>	<b>0,2</b>	<b>80</b>





## Renewable energy sources in the year 1996

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		RE 1996	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	21.957	4,0	24.948
	Wind energy onshore	2.073	0,4	971
	Wind energy offshore	0	0	0
	Solar Photovoltaic	12	0,002	5
	Solid biofuels	118	0,02	55
	Liquid biofuels	0	0	0
	Biogas	31	0,01	3,7
	Sewage gas	41	0,01	40
	Landfill gas	565	0,1	558
	Biogenic fraction of waste	1.343	0,2	737
	Geothermal energy	0	0	0
	<b>Total</b>	<b>26.140</b>	<b>4,7</b>	<b>27.319</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,7	5.409
	Solid biofuels (industry)	2.788	0,2	862
	Solid biofuels (HP/CHP)	41	0,003	10
	Liquid biofuels	0	0	0
	Gaseous biofuels	0	0	0
	Biogenic fraction of waste	2.538	0,2	596
	Solar thermal energy	521	0,03	152
	Deep geothermal energy	111	0,01	33
	Near-surface geothermal energy & ambient heat	1.924	0,1	114
	<b>Total</b>	<b>33.371</b>	<b>2,2</b>	<b>7.176</b>
Final energy consumption transport	Biodiesel	568	0,1	111
	Vegetable oil	52	0,01	9
	Bioethanol	0	0	0
	RE electricity consumption transport	778	0,1	
	<b>Total</b>	<b>1.398</b>	<b>0,2</b>	<b>121</b>

## Renewable energy sources in the year 1997

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		RE 1997	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	17.357	3,2	19.548
	Wind energy onshore	3.025	0,6	1.377
	Wind energy offshore	0	0	0
	Solar Photovoltaic	18	0,003	8
	Solid biofuels	179	0,03	81
	Liquid biofuels	0	0	0
	Biogas	44	0,01	4,7
	Sewage gas	48	0,01	47
	Landfill gas	605	0,1	592
	Biogenic fraction of waste	1.397	0,3	745
	Geothermal energy	0	0	0
	<b>Total</b>	<b>22.673</b>	<b>4,1</b>	<b>22.402</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	42.740	2,9	9.126
	Solid biofuels (industry)	2.788	0,2	872
	Solid biofuels (HP/CHP)	63	0,004	16
	Liquid biofuels	0	0	0
	Gaseous biofuels	0	0	0
	Biogenic fraction of waste	2.290	0,2	536
	Solar thermal energy	656	0,04	190
	Deep geothermal energy	111	0,01	33
	Near-surface geothermal energy & ambient heat	1.964	0,1	139
	<b>Total</b>	<b>50.612</b>	<b>3,5</b>	<b>10.912</b>
Final energy consumption transport	Biodiesel	930	0,1	183
	Vegetable oil	104	0,02	19
	Bioethanol	0	0	0
	RE electricity consumption transport	691	0,1	
	<b>Total</b>	<b>1.725</b>	<b>0,3</b>	<b>202</b>



## Renewable energy sources in the year 1998

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		RE 1998	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	17.216	3,1	19.091
	Wind energy onshore	4.579	0,8	2.310
	Wind energy offshore	0	0	0
	Solar Photovoltaic	36	0,01	15
	Solid biofuels	210	0,04	107
	Liquid biofuels	0	0	0
	Biogas	118	0,02	17
	Sewage gas	633	0	608
	Landfill gas	677	0,1	651
	Biogenic fraction of waste	1.618	0,3	951
	Geothermal energy	0	0	0
	<b>Total</b>	<b>25.087</b>	<b>4,5</b>	<b>23.749</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	44.369	3,1	9.437
	Solid biofuels (industry)	3.959	0,3	1.221
	Solid biofuels (HP/CHP)	74	0,01	19
	Liquid biofuels	3	0,0002	0,6
	Gaseous biofuels	1.335	0,1	347
	Biogenic fraction of waste	3.405	0,2	799
	Solar thermal energy	785	0,1	227
	Deep geothermal energy	113	0,01	34
	Near-surface geothermal energy & ambient heat	2.006	0,1	137
	<b>Total</b>	<b>56.049</b>	<b>3,9</b>	<b>12.221</b>
Final energy consumption transport	Biodiesel	1.033	0,2	204
	Vegetable oil	115	0,0	21
	Bioethanol	0	0,0	0
	RE electricity consumption transport	724	0,1	
	<b>Total</b>	<b>1.872</b>	<b>0,3</b>	<b>225</b>

## Renewable energy sources in the year 1999

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		RE 1999	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	19.647	3,5	22.040
	Wind energy onshore	5.639	1,0	3.229
	Wind energy offshore	0	0	0
	Solar Photovoltaic	31	0,01	13
	Solid biofuels	246	0,04	144
	Liquid biofuels	0	0	0
	Biogas	145	0,03	29
	Sewage gas	727	0,1	710
	Landfill gas	727	0,1	710
	Biogenic fraction of waste	1.740	0,3	1.155
	Geothermal energy	0	0	0
	<b>Total</b>	<b>28.902</b>	<b>5,2</b>	<b>28.029</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	45.590	3,4	9.551
	Solid biofuels (industry)	3.917	0,3	1.189
	Solid biofuels (HP/CHP)	86	0,01	21
	Liquid biofuels	2	0,0001	0,4
	Gaseous biofuels	1.263	0,1	330
	Biogenic fraction of waste	3.674	0,3	856
	Solar thermal energy	1.036	0,1	298
	Deep geothermal energy	113	0,01	34
	Near-surface geothermal energy & ambient heat	2.042	0,2	151
	<b>Total</b>	<b>57.723</b>	<b>4,3</b>	<b>12.431</b>
Final energy consumption transport	Biodiesel	1.343	0,2	266
	Vegetable oil	146	0,02	26
	Bioethanol	0	0	0
	RE electricity consumption transport	823	0,1	
	<b>Total</b>	<b>2.312</b>	<b>0,3</b>	<b>293</b>

## Renewable energy sources in the year 2000

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		RE 2000	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	21.732	3,8	23.800
	Wind energy onshore	9.703	1,7	6.458
	Wind energy offshore	0	0	0
	Solar Photovoltaic	61	0,01	29
	Solid biofuels	925	0,2	635
	Liquid biofuels	0	0	0
	Biogas	445	0,1	128
	Sewage gas	705	0,1	669
	Landfill gas	812	0,1	772
	Biogenic fraction of waste	1.844	0,3	1.411
	Geothermal energy	0	0	0
	<b>Total</b>	<b>36.227</b>	<b>6,3</b>	<b>33.903</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	45.834	3,5	9.580
	Solid biofuels (industry)	3.898	0,3	1.177
	Solid biofuels (HP/CHP)	324	0,02	81
	Liquid biofuels	8	0,001	2
	Gaseous biofuels	1.355	0,1	348
	Biogenic fraction of waste	3.548	0,3	829
	Solar thermal energy	1.226	0,1	351
	Deep geothermal energy	113	0,01	34
	Near-surface geothermal energy & ambient heat	2.057	0,2	157
	<b>Total</b>	<b>58.363</b>	<b>4,4</b>	<b>12.557</b>
Final energy consumption transport	Biodiesel	2.583	0,4	507
	Vegetable oil	167	0,02	30
	Bioethanol	0	0	0
	RE electricity consumption transport	1.002	0,1	
	<b>Total</b>	<b>3.752</b>	<b>0,5</b>	<b>537</b>

## Renewable energy sources in the year 2001

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	RE 2001 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	22.733	3,9	25.119
	Wind energy onshore	10.719	1,8	7.644
	Wind energy offshore	0	0	0
	Solar Photovoltaic	78	0,01	34
	Solid biofuels	1.112	0,2	814
	Liquid biofuels	15	0,003	8
	Biogas	745	0,1	226
	Sewage gas	735	0,1	704
	Landfill gas	748	0,1	717
	Biogenic fraction of waste	1.859	0,3	1.509
	Geothermal energy	0	0	0
	<b>Total</b>	<b>38.744</b>	<b>6,6</b>	<b>36.776</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	52.307	3,7	10.992
	Solid biofuels (industry)	4.161	0,3	1.228
	Solid biofuels (HP/CHP)	389	0,03	97
	Liquid biofuels	10	0,001	2
	Gaseous biofuels	1.353	0,1	333
	Biogenic fraction of waste	3.421	0,2	798
	Solar thermal energy	1.540	0,1	439
	Deep geothermal energy	114	0,01	34
	Near-surface geothermal energy & ambient heat	2.070	0,1	158
	<b>Total</b>	<b>65.365</b>	<b>4,7</b>	<b>14.081</b>
Final energy consumption transport	Biodiesel	3.617	0,5	708
	Vegetable oil	209	0,03	38
	Bioethanol	0	0	0
	RE electricity consumption transport	1.082	0,2	
	<b>Total</b>	<b>4.908</b>	<b>0,7</b>	<b>746</b>



## Renewable energy sources in the year 2002

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		RE 2002	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	23.124	3,9	25.620
	Wind energy onshore	16.102	2,7	12.725
	Wind energy offshore	0	0	0
	Solar Photovoltaic	166	0,03	73
	Solid biofuels	1.485	0,3	1.215
	Liquid biofuels	20	0,003	13
	Biogas	1.046	0,2	382
	Sewage gas	777	0,1	747
	Landfill gas	771	0,1	742
	Biogenic fraction of waste	1.949	0,3	1.749
	Geothermal energy	0	0	0
	<b>Total</b>	<b>45.440</b>	<b>7,7</b>	<b>43.267</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	50.963	3,8	10.623
	Solid biofuels (industry)	4.273	0,3	1.264
	Solid biofuels (HP/CHP)	520	0,04	129
	Liquid biofuels	48	0,004	8
	Gaseous biofuels	1.438	0,1	332
	Biogenic fraction of waste	3.295	0,2	765
	Solar thermal energy	1.814	0,1	515
	Deep geothermal energy	114	0,01	34
	Near-surface geothermal energy & ambient heat	2.052	0,2	159
	<b>Total</b>	<b>64.517</b>	<b>4,8</b>	<b>13.830</b>
Final energy consumption transport	Biodiesel	5.683	0,8	1.105
	Vegetable oil	251	0,04	45
	Bioethanol	0	0	0
	RE electricity consumption transport	1.247	0,2	
	<b>Total</b>	<b>7.181</b>	<b>1,1</b>	<b>1.151</b>
			<b>Total</b>	

## Renewable energy sources in the year 2003

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	RE 2003 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	18.322	3,0	19.837
	Wind energy onshore	19.087	3,2	15.793
	Wind energy offshore	0	0	0
	Solar Photovoltaic	320	0,1	148
	Solid biofuels & sewage sludge	3.392	0,6	2.928
	Liquid biofuels	52	0,01	36
	Biogas	1.518	0,3	599
	Sewage gas	955	0,2	897
	Landfill gas	793	0,1	745
	Biogenic fraction of waste	2.238	0,4	2.110
	Geothermal energy	0	0	0
	<b>Total</b>	<b>46.677</b>	<b>7,7</b>	<b>43.093</b>
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	54.279	4,0	10.952
	Solid biofuels & charcoal (TCS sector)	6.972	0,5	1.825
	Solid biofuels & sewage sludge (industry)	12.442	0,9	3.628
	Solid biofuels & sewage sludge (HP/CHP)	994	0,1	248
	Liquid biofuels	701	0,05	152
	Biogas	297	0,02	48
	Sewage gas	1.830	0,1	448
	Landfill gas	176	0,01	54
	Biogenic fraction of waste	5.642	0,4	1.329
	Solar thermal energy	2.389	0,2	675
	Deep geothermal energy	445	0,03	134
	Near-surface geothermal energy & ambient heat	2.061	0,2	174
<b>Total</b>	<b>88.228</b>	<b>6,5</b>	<b>19.665</b>	
<b>Final energy consumption transport</b>	Biodiesel	7.919	1,2	1.601
	Vegetable oil	73	0,01	53
	Bioethanol	0	0	0
	RE electricity consumption transport	1.006	0,2	
	<b>Total</b>	<b>8.998</b>	<b>1,4</b>	<b>1.654</b>





## Renewable energy sources in the year 2004

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	RE 2004 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	20.745	3,4	22.219
	Wind energy onshore	26.019	4,2	21.476
	Wind energy offshore	0	0	0
	Solar Photovoltaic	568	0,1	262
	Solid biofuels & sewage sludge	5.162	0,8	4.445
	Liquid biofuels	136	0,02	94
	Biogas	1.111	0,2	442
	Sewage gas	986	0,2	916
	Landfill gas	988	0,2	919
	Biogenic fraction of waste	2.253	0,4	2.117
	Geothermal energy	0,2	0,00003	0,1
	<b>Total</b>	<b>57.968</b>	<b>9,4</b>	<b>52.890</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	53.044	4,0	10.594
	Solid biofuels & charcoal (TCS sector)	9.581	0,7	2.497
	Solid biofuels & sewage sludge (industry)	18.462	1,4	5.464
	Solid biofuels & sewage sludge (HP/CHP)	1.797	0,1	447
	Liquid biofuels	819	0,06	186
	Biogas	441	0,03	72
	Sewage gas	1.968	0,1	477
	Landfill gas	165	0,01	50
	Biogenic fraction of waste	6.034	0,5	1.448
	Solar thermal energy	2.421	0,2	681
	Deep geothermal energy	464	0,03	144
	Near-surface geothermal energy & ambient heat	2.121	0,2	130
<b>Total</b>	<b>97.317</b>	<b>7,3</b>	<b>22.191</b>	
Final energy consumption transport	Biodiesel	9.942	1,5	1.987
	Vegetable oil	125	0,0	62
	Bioethanol	486	0,1	106
	RE electricity consumption transport	1.212	0,2	
	<b>Total</b>	<b>11.765</b>	<b>1,8</b>	<b>2.155</b>



## Renewable energy sources in the year 2005

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	RE 2005 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	19.638	3,2	20.793
	Wind energy onshore	27.774	4,5	22.485
	Wind energy offshore	0	0	0
	Solar Photovoltaic	1.308	0,2	601
	Solid biofuels & sewage sludge	7.478	1,2	6.329
	Liquid biofuels	116	0,02	78
	Biogas	1.696	0,3	658
	Sewage gas	1.096	0,2	1.007
	Landfill gas	1.068	0,2	981
	Biogenic fraction of waste	3.252	0,5	3.000
	Geothermal energy	0,2	0,00003	0,1
	<b>Total</b>	<b>63.426</b>	<b>10,3</b>	<b>55.933</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	52.222	4,0	7.462
	Solid biofuels & charcoal (TCS sector)	9.695	0,7	2.449
	Solid biofuels & sewage sludge (industry)	21.266	1,6	6.241
	Solid biofuels & sewage sludge (HP/CHP)	2.043	0,2	497
	Liquid biofuels	1.219	0,1	268
	Biogas	813	0,1	134
	Sewage gas	2.082	0,2	505
	Landfill gas	231	0,02	71
	Biogenic fraction of waste	7.199	0,6	1.647
	Solar thermal energy	2.857	0,2	791
	Deep geothermal energy	532	0,04	157
	Near-surface geothermal energy & ambient heat	2.283	0,2	183
<b>Total</b>	<b>102.442</b>	<b>7,9</b>	<b>20.404</b>	
Final energy consumption transport	Biodiesel	17.666	2,8	3.480
	Vegetable oil	1.828	0,3	374
	Bioethanol	1.780	0,3	394
	RE electricity consumption transport	1.353	0,2	
	<b>Total</b>	<b>22.627</b>	<b>3,6</b>	<b>4.247</b>

## Renewable energy sources in the year 2006

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	RE 2006 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	20.031	3,2	17.363
	Wind energy onshore	31.324	5,0	23.492
	Wind energy offshore	0	0	0
	Solar Photovoltaic	2.265	0,4	1.344
	Solid biofuels & sewage sludge	8.819	1,4	6.827
	Liquid biofuels	719	0,1	398
	Biogas	3.346	0,5	1.346
	Sewage gas	1.057	0,2	696
	Landfill gas	1.092	0,2	720
	Biogenic fraction of waste	3.901	0,6	3.320
	Geothermal energy	0,4	0,0001	0,2
	<b>Total</b>	<b>72.554</b>	<b>11,7</b>	<b>55.507</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	61.496	4,6	8.833
	Solid biofuels & charcoal (TCS sector)	11.120	0,8	2.844
	Solid biofuels & sewage sludge (industry)	20.319	1,5	5.877
	Solid biofuels & sewage sludge (HP/CHP)	2.104	0,2	484
	Liquid biofuels	1.778	0,1	398
	Biogas	1.334	0,1	220
	Sewage gas	1.852	0,1	446
	Landfill gas	227	0,02	69
	Biogenic fraction of waste	8.433	0,6	1.926
	Solar thermal energy	3.363	0,3	928
	Deep geothermal energy	525	0,04	155
	Near-surface geothermal energy & ambient heat	2.747	0,2	241
<b>Total</b>	<b>115.298</b>	<b>8,6</b>	<b>22.420</b>	
Final energy consumption transport	Biodiesel	27.938	4,4	5.462
	Vegetable oil	7.206	1,1	1.366
	Bioethanol	3.828	0,6	856
	RE electricity consumption transport	1.484	0,2	
	<b>Total</b>	<b>40.456</b>	<b>6,4</b>	<b>7.685</b>

## Renewable energy sources in the year 2007

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	RE 2007 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	21.170	3,4	17.845
	Wind energy onshore	40.507	6,5	30.227
	Wind energy offshore	0	0	0
	Solar Photovoltaic	3.137	0,5	1.855
	Solid biofuels & sewage sludge	8.699	1,4	6.618
	Liquid biofuels	948	0,2	523
	Biogas	8.386	1,3	3.386
	Biomethane	20	0,003	10
	Sewage gas	1.033	0,2	678
	Landfill gas	1.009	0,2	662
	Biogenic fraction of waste	4.521	0,7	3.792
	Geothermal energy	0,4	0,0001	0,3
<b>Total</b>	<b>89.430</b>	<b>14,3</b>	<b>65.595</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	64.092	5,3	9.379
	Solid biofuels & charcoal (TCS sector)	11.443	0,9	2.938
	Solid biofuels & sewage sludge (industry)	22.367	1,9	6.469
	Solid biofuels & sewage sludge (HP/CHP)	2.225	0,2	532
	Liquid biofuels	2.834	0,2	633
	Biogas	3.638	0,3	605
	Biomethane	21	0,002	3
	Sewage gas	1.858	0,2	445
	Landfill gas	210	0,02	64
	Biogenic fraction of waste	10.747	0,9	2.404
	Solar thermal energy	3.746	0,3	1.028
	Deep geothermal energy	524	0,04	150
	Near-surface geothermal energy & ambient heat	3.437	0,3	308
<b>Total</b>	<b>127.142</b>	<b>10,5</b>	<b>24.958</b>	
<b>Final energy consumption transport</b>	Biodiesel	32.282	5,1	6.357
	Vegetable oil	8.533	1,4	1.598
	Bioethanol	3.391	0,5	773
	RE electricity consumption transport	1.750	0,3	
	<b>Total</b>	<b>45.956</b>	<b>7,3</b>	<b>8.728</b>

## Renewable energy sources in the year 2008

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	RE 2008 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	20.443	3,3	16.134
	Wind energy onshore	41.385	6,7	28.801
	Wind energy offshore	0	0	0
	Solar Photovoltaic	4.508	0,7	3.049
	Solid biofuels & sewage sludge	9.296	1,5	6.470
	Liquid biofuels	1.088	0,2	589
	Biogas	10.957	1,8	4.378
	Biomethane	44	0,01	21
	Sewage gas	1.094	0,2	710
	Landfill gas	864	0,1	560
	Biogenic fraction of waste	4.671	0,8	3.677
	Geothermal energy	18	0,003	10
<b>Total</b>	<b>94.368</b>	<b>15,2</b>	<b>64.399</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	74.020	5,6	11.035
	Solid biofuels & charcoal (TCS sector)	16.046	1,2	4.082
	Solid biofuels & sewage sludge (industry)	20.156	1,5	6.187
	Solid biofuels & sewage sludge (HP/CHP)	2.759	0,2	676
	Liquid biofuels	3.409	0,3	711
	Biogas	3.478	0,3	597
	Biomethane	65	0,005	9
	Sewage gas	1.972	0,1	475
	Landfill gas	154	0,01	47
	Biogenic fraction of waste	6.662	0,5	1.529
	Solar thermal energy	4.293	0,3	1.185
	Deep geothermal energy	550	0,04	164
	Near-surface geothermal energy & ambient heat	4.233	0,3	489
<b>Total</b>	<b>137.797</b>	<b>10,4</b>	<b>27.186</b>	
<b>Final energy consumption transport</b>	Biodiesel	25.873	4,2	5.123
	Vegetable oil	4.042	0,7	761
	Bioethanol	4.608	0,7	1.029
	Biomethane	4	0,001	1
	RE electricity consumption transport	1.688	0,3	
<b>Total</b>	<b>36.215</b>	<b>5,9</b>	<b>6.914</b>	



## Renewable energy sources in the year 2009

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	RE 2009 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	19.031	3,3	15.410
	Wind energy onshore	39.382	6,7	28.470
	Wind energy offshore	38	0,01	28
	Solar Photovoltaic	6.715	1,2	4.622
	Solid biofuels & sewage sludge	9.746	1,7	6.986
	Liquid biofuels	1.632	0,3	920
	Biogas	13.188	2,3	5.637
	Biomethane	78	0,01	39
	Sewage gas	1.131	0,2	760
	Landfill gas	788	0,1	529
	Biogenic fraction of waste	4.323	0,7	3.500
	Geothermal energy	19	0,003	11
<b>Total</b>	<b>96.071</b>	<b>16,5</b>	<b>66.911</b>	
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	65.220	5,4	9.839
	Solid biofuels & charcoal (TCS sector)	16.476	1,4	4.172
	Solid biofuels & sewage sludge (industry)	22.972	1,9	7.018
	Solid biofuels & sewage sludge (HP/CHP)	3.581	0,3	887
	Liquid biofuels	3.660	0,3	785
	Biogas	5.060	0,4	861
	Biomethane	131	0,01	19
	Sewage gas	1.977	0,2	468
	Landfill gas	155	0,01	47
	Biogenic fraction of waste	6.530	0,5	1.513
	Solar thermal energy	5.061	0,4	1.405
	Deep geothermal energy	623	0,1	188
Near-surface geothermal energy & ambient heat	5.096	0,4	617	
<b>Total</b>	<b>136.542</b>	<b>11,3</b>	<b>27.819</b>	
Final energy consumption transport	Biodiesel	22.966	3,7	4.490
	Vegetable oil	961	0,2	189
	Bioethanol	6.576	1,1	1.435
	Biomethane	13	0,002	3
	RE electricity consumption transport	1.914	0,3	
<b>Total</b>	<b>32.430</b>	<b>5,3</b>	<b>6.117</b>	

## Renewable energy sources in the year 2010

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	RE 2010 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	20.953	3,4	16.890
	Wind energy onshore	38.371	6,2	27.641
	Wind energy offshore	176	0,03	127
	Solar Photovoltaic	11.963	1,9	8.218
	Solid biofuels & sewage sludge	10.351	1,7	7.566
	Liquid biofuels	1.278	0,2	713
	Biogas	15.300	2,5	6.531
	Biomethane	372	0,1	182
	Sewage gas	1.203	0,2	802
	Landfill gas	674	0,1	449
	Biogenic fraction of waste	4.746	0,8	3.820
	Geothermal energy	28	0,005	17
<b>Total</b>	<b>105.415</b>	<b>17,1</b>	<b>72.956</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	79.304	5,9	11.866
	Solid biofuels & charcoal (TCS sector)	21.236	1,6	5.314
	Solid biofuels & sewage sludge (industry)	28.088	2,1	7.974
	Solid biofuels & sewage sludge (HP/CHP)	4.057	0,3	982
	Liquid biofuels	3.366	0,3	698
	Biogas	7.472	0,6	1.255
	Biomethane	490	0,04	68
	Sewage gas	1.999	0,1	466
	Landfill gas	117	0,01	35
	Biogenic fraction of waste	7.260	0,5	1.645
	Solar thermal energy	5.383	0,4	1.536
	Deep geothermal energy	689	0,1	203
	Near-surface geothermal energy & ambient heat	5.938	0,4	699
<b>Total</b>	<b>165.399</b>	<b>12,3</b>	<b>32.741</b>	
<b>Final energy consumption transport</b>	Biodiesel	24.359	3,9	4.669
	Vegetable oil	574	0,1	115
	Bioethanol	8.537	1,4	1.846
	Biomethane	75	0,01	33
	RE electricity consumption transport	2.066	0,3	
	<b>Total</b>	<b>35.611</b>	<b>5,8</b>	<b>6.663</b>

## Renewable energy sources in the year 2011

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	RE 2011 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	17.671	2,9	14.849
	Wind energy onshore	49.280	8,1	37.994
	Wind energy offshore	577	0,1	429
	Solar Photovoltaic	19.991	3,3	14.314
	Solid biofuels & sewage sludge	10.516	1,7	7.981
	Liquid biofuels	382	0,1	220
	Biogas	18.754	3,1	8.684
	Biomethane	576	0,1	301
	Sewage gas	1.280	0,2	882
	Landfill gas	628	0,1	433
	Biogenic fraction of waste	4.755	0,8	3.963
	Geothermal energy	19	0,003	12
<b>Total</b>	<b>124.429</b>	<b>20,4</b>	<b>90.060</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	71.904	5,8	10.840
	Solid biofuels & charcoal (TCS sector)	15.813	1,3	4.036
	Solid biofuels & sewage sludge (industry)	29.089	2,3	8.455
	Solid biofuels & sewage sludge (HP/CHP)	4.665	0,4	1.138
	Liquid biofuels	2.562	0,2	521
	Biogas	8.972	0,7	1.547
	Biomethane	739	0,1	103
	Sewage gas	2.059	0,2	483
	Landfill gas	101	0,01	30
	Biogenic fraction of waste	8.140	0,7	1.858
	Solar thermal energy	6.160	0,5	1.760
	Deep geothermal energy	722	0,1	214
	Near-surface geothermal energy & ambient heat	6.818	0,6	806
<b>Total</b>	<b>157.744</b>	<b>12,7</b>	<b>31.791</b>	
<b>Final energy consumption transport</b>	Biodiesel	23.556	3,8	4.594
	Vegetable oil	188	0,03	34
	Bioethanol	9.031	1,4	1.895
	Biomethane	92	0,01	17
	RE electricity consumption transport	2.470	0,4	
	<b>Total</b>	<b>35.337</b>	<b>5,7</b>	<b>6.540</b>





## Renewable energy sources in the year 2012

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	RE 2012 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	21.755	3,6	16.767
	Wind energy onshore	50.948	8,4	33.858
	Wind energy offshore	732	0,1	493
	Solar Photovoltaic	26.744	4,4	16.768
	Solid biofuels & sewage sludge	10.693	1,8	7.500
	Liquid biofuels	246	0,04	130
	Biogas	24.383	4,0	9.955
	Biomethane	1.080	0,2	495
	Sewage gas	1.314	0,2	837
	Landfill gas	536	0,1	341
	Biogenic fraction of waste	4.951	0,8	3.841
	Geothermal energy	25	0,004	14
<b>Total</b>	<b>143.407</b>	<b>23,6</b>	<b>90.998</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	83.015	6,6	12.686
	Solid biofuels & charcoal (TCS sector)	17.437	1,4	4.479
	Solid biofuels & sewage sludge (industry)	27.793	2,2	7.915
	Solid biofuels & sewage sludge (HP/CHP)	5.776	0,5	1.420
	Liquid biofuels	2.104	0,2	434
	Biogas	8.422	0,7	1.429
	Biomethane	1.286	0,1	171
	Sewage gas	2.017	0,2	460
	Landfill gas	94	0,01	28
	Biogenic fraction of waste	9.033	0,7	2.075
	Solar thermal energy	6.416	0,5	1.833
	Deep geothermal energy	805	0,1	240
	Near-surface geothermal energy & ambient heat	7.766	0,6	939
<b>Total</b>	<b>171.964</b>	<b>13,7</b>	<b>34.108</b>	
<b>Final energy consumption transport</b>	Biodiesel	24.628	4,0	5.065
	Vegetable oil	251	0,04	45
	Bioethanol	9.149	1,5	1.902
	Biomethane	333	0,1	65
	RE electricity consumption transport	2.838	0,5	
	<b>Total</b>	<b>37.199</b>	<b>6,0</b>	<b>7.078</b>



## Renewable energy sources in the year 2013

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	RE 2013 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	22.998	3,8	16.405
	Wind energy onshore	51.819	8,6	36.738
	Wind energy offshore	918	0,2	653
	Solar Photovoltaic	30.621	5,1	18.293
	Solid biofuels & sewage sludge	10.555	1,7	6.895
	Liquid biofuels	288	0,05	135
	Biogas	25.839	4,3	9.180
	Biomethane	1.625	0,3	662
	Sewage gas	1.308	0,2	760
	Landfill gas	483	0,1	281
	Biogenic fraction of waste	5.415	0,9	3.893
	Geothermal energy	80	0,01	41
<b>Total</b>	<b>151.949</b>	<b>25,1</b>	<b>93.933</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	85.941	6,6	13.300
	Solid biofuels & charcoal (TCS sector)	18.696	1,4	4.846
	Solid biofuels & sewage sludge (industry)	25.600	2,0	6.953
	Solid biofuels & sewage sludge (HP/CHP)	5.532	0,4	1.204
	Liquid biofuels	2.196	0,2	445
	Biogas	9.257	0,7	1.553
	Biomethane	2.059	0,2	273
	Sewage gas	1.805	0,1	409
	Landfill gas	93	0,01	27
	Biogenic fraction of waste	11.645	0,9	2.665
	Solar thermal energy	6.500	0,5	1.854
	Deep geothermal energy	864	0,1	256
	Near-surface geothermal energy & ambient heat	8.732	0,7	1.137
<b>Total</b>	<b>178.920</b>	<b>13,8</b>	<b>34.921</b>	
<b>Final energy consumption transport</b>	Biodiesel	21.945	3,5	4.516
	Vegetable oil	0	0	0
	Bioethanol	8.832	1,4	1.867
	Biomethane	483	0,1	95
	RE electricity consumption transport	2.993	0,5	
	<b>Total</b>	<b>34.253</b>	<b>5,4</b>	<b>6.478</b>



## Renewable energy sources in the year 2014

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	RE 2014 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	19.587	3,3	15.586
	Wind energy onshore	57.026	9,6	43.568
	Wind energy offshore	1.471	0,2	1.138
	Solar Photovoltaic	35.448	6,0	23.623
	Solid biofuels & sewage sludge	10.798	1,8	7.870
	Liquid biofuels	334	0,1	182
	Biogas	26.917	4,5	11.719
	Biomethane	2.398	0,4	1.164
	Sewage gas	1.336	0,2	881
	Landfill gas	435	0,1	287
	Biogenic fraction of waste	6.069	1,0	4.841
	Geothermal energy	98	0,02	58
<b>Total</b>	<b>161.917</b>	<b>27,3</b>	<b>110.917</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	69.484	5,9	11.001
	Solid biofuels & charcoal (TCS sector)	14.945	1,3	3.824
	Solid biofuels & sewage sludge (industry)	26.530	2,3	7.251
	Solid biofuels & sewage sludge (HP/CHP)	5.465	0,5	1.205
	Liquid biofuels	2.372	0,2	486
	Biogas	10.451	0,9	1.764
	Biomethane	2.789	0,2	371
	Sewage gas	1.801	0,2	408
	Landfill gas	98	0,01	29
	Biogenic fraction of waste	11.380	1,0	2.612
	Solar thermal energy	7.026	0,6	2.004
	Deep geothermal energy	1.052	0,1	314
	Near-surface geothermal energy & ambient heat	9.643	0,8	1.337
<b>Total</b>	<b>163.036</b>	<b>14,0</b>	<b>32.607</b>	
<b>Final energy consumption transport</b>	Biodiesel	22.676	3,6	4.731
	Vegetable oil	52	0,01	9
	Bioethanol	9.002	1,4	1.915
	Biomethane	449	0,1	91
	RE electricity consumption transport	3.146	0,5	
	<b>Total</b>	<b>35.325</b>	<b>5,6</b>	<b>6.747</b>

## Renewable energy sources in the year 2015

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	RE 2015 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	18.977	3,2	14.889
	Wind energy onshore	72.340	12,1	53.494
	Wind energy offshore	8.284	1,4	6.069
	Solar Photovoltaic	38.076	6,4	25.561
	Solid biofuels & sewage sludge	11.034	1,8	7.868
	Liquid biofuels	426	0,1	225
	Biogas	28.302	4,7	12.068
	Biomethane	3.011	0,5	1.370
	Sewage gas	1.389	0,2	898
	Landfill gas	396	0,1	256
	Biogenic fraction of waste	5.768	1,0	4.499
	Geothermal energy	133	0,02	78
<b>Total</b>	<b>188.136</b>	<b>31,4</b>	<b>127.277</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	69.477	5,7	10.720
	Solid biofuels & charcoal (TCS sector)	17.137	1,4	4.267
	Solid biofuels & sewage sludge (industry)	25.108	2,1	7.214
	Solid biofuels & sewage sludge (HP/CHP)	5.957	0,5	1.185
	Liquid biofuels	2.189	0,2	486
	Biogas	11.342	0,9	2.802
	Biomethane	3.451	0,3	758
	Sewage gas	2.001	0,2	524
	Landfill gas	120	0,01	42
	Biogenic fraction of waste	11.807	1,0	2.471
	Solar thermal energy	7.562	0,6	1.981
	Deep geothermal energy	969	0,1	278
	Near-surface geothermal energy & ambient heat	10.510	0,9	1.407
<b>Total</b>	<b>167.630</b>	<b>13,9</b>	<b>34.135</b>	
<b>Final energy consumption transport</b>	Biodiesel	20.829	3,3	4.432
	Vegetable oil	10	0,002	2
	Bioethanol	8.589	1,4	1.855
	Biomethane	345	0,1	70
	RE electricity consumption transport	3.500	0,6	
	<b>Total</b>	<b>33.273</b>	<b>5,2</b>	<b>6.359</b>

## Renewable energy sources in the year 2016

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	RE 2016 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	20.546	3,4	15.880
	Wind energy onshore	67.650	11,3	49.837
	Wind energy offshore	12.274	2,1	9.122
	Solar Photovoltaic	37.556	6,3	25.052
	Solid biofuels & sewage sludge	10.797	1,8	7.627
	Liquid biofuels	489	0,1	256
	Biogas	28.904	4,8	12.052
	Biomethane	3.010	0,5	1.385
	Sewage gas	1.440	0,2	926
	Landfill gas	358	0,1	230
	Biogenic fraction of waste	5.930	1,0	4.591
	Geothermal energy	175	0,03	101
<b>Total</b>	<b>189.129</b>	<b>31,6</b>	<b>127.060</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	66.289	5,4	10.369
	Solid biofuels & charcoal (TCS sector)	16.731	1,4	4.182
	Solid biofuels & sewage sludge (industry)	27.031	2,2	7.744
	Solid biofuels & sewage sludge (HP/CHP)	6.259	0,5	1.246
	Liquid biofuels	2.188	0,2	518
	Biogas	12.108	1,0	2.883
	Biomethane	3.548	0,3	709
	Sewage gas	2.050	0,2	541
	Landfill gas	116	0,01	42
	Biogenic fraction of waste	11.669	0,9	2.352
	Solar thermal energy	7.604	0,6	1.986
	Deep geothermal energy	1.146	0,1	322
	Near-surface geothermal energy & ambient heat	11.408	0,9	1.575
<b>Total</b>	<b>168.147</b>	<b>13,7</b>	<b>34.469</b>	
<b>Final energy consumption transport</b>	Biodiesel	20.896	3,2	4.904
	Vegetable oil	31	0,005	6
	Bioethanol	8.604	1,3	1.978
	Biomethane	379	0,1	84
	RE electricity consumption transport	3.709	0,6	
	<b>Total</b>	<b>33.619</b>	<b>5,2</b>	<b>6.972</b>



## Renewable energy sources in the year 2017

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	RE 2017 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	20.150	3,4	15.020
	Wind energy onshore	88.018	14,7	61.669
	Wind energy offshore	17.675	2,9	12.542
	Solar Photovoltaic	38.761	6,5	24.955
	Solid biofuels & sewage sludge	10.644	1,8	7.219
	Liquid biofuels	437	0,1	211
	Biogas	29.245	4,9	11.552
	Biomethane	2.837	0,5	1.255
	Sewage gas	1.460	0,2	904
	Landfill gas	338	0,1	209
	Biogenic fraction of waste	5.956	1,0	4.423
	Geothermal energy	163	0,03	92
<b>Total</b>	<b>215.684</b>	<b>36,0</b>	<b>140.051</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	68.393	5,5	10.652
	Solid biofuels & charcoal (TCS sector)	17.450	1,4	3.715
	Solid biofuels & sewage sludge (industry)	26.326	2,1	7.372
	Solid biofuels & sewage sludge (HP/CHP)	6.193	0,5	1.260
	Liquid biofuels	2.194	0,2	557
	Biogas	12.816	1,0	3.025
	Biomethane	3.261	0,3	713
	Sewage gas	2.141	0,2	578
	Landfill gas	107	0,01	40
	Biogenic fraction of waste	12.669	1,0	2.475
	Solar thermal energy	7.834	0,6	2.045
	Deep geothermal energy	1.168	0,1	328
Near-surface geothermal energy & ambient heat	12.408	1,0	1.880	
<b>Total</b>	<b>172.960</b>	<b>14,0</b>	<b>34.639</b>	
<b>Final energy consumption transport</b>	Biodiesel	21.354	3,2	5.224
	Vegetable oil	31	0,005	6
	Bioethanol	8.464	1,3	2.126
	Biomethane	445	0,1	99
	RE electricity consumption transport	4.305	0,7	
	<b>Total</b>	<b>34.599</b>	<b>5,3</b>	<b>7.456</b>



## Renewable energy sources in the year 2018

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	RE 2018 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	18.098	3,1	13.617
	Wind energy onshore	90.484	15,3	64.349
	Wind energy offshore	19.467	3,3	13.986
	Solar Photovoltaic	44.320	7,5	27.801
	Solid biofuels & sewage sludge	11.068	1,9	7.617
	Liquid biofuels	382	0,1	179
	Biogas	28.471	4,8	11.725
	Biomethane	2.850	0,5	1.324
	Sewage gas	1.555	0,3	985
	Landfill gas	305	0,1	193
	Biogenic fraction of waste	6.163	1,0	4.633
	Geothermal energy	178	0,03	103
<b>Total</b>	<b>223.341</b>	<b>37,7</b>	<b>146.512</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	70.192	5,9	11.282
	Solid biofuels & charcoal (TCS sector)	17.812	1,5	3.895
	Solid biofuels & sewage sludge (industry)	24.522	2,1	7.161
	Solid biofuels & sewage sludge (HP/CHP)	5.740	0,5	1.313
	Liquid biofuels	2.298	0,2	572
	Biogas	12.883	1,1	3.027
	Biomethane	3.630	0,3	820
	Sewage gas	2.500	0,2	681
	Landfill gas	110	0,01	42
	Biogenic fraction of waste	14.508	1,2	3.061
	Solar thermal energy	8.955	0,8	2.402
	Deep geothermal energy	1.308	0,1	381
	Near-surface geothermal energy & ambient heat	13.504	1,1	2.263
<b>Total</b>	<b>177.962</b>	<b>14,9</b>	<b>36.899</b>	
<b>Final energy consumption transport</b>	Biodiesel	22.329	3,5	5.456
	Vegetable oil	10	0,002	2
	Bioethanol	8.685	1,4	2.240
	Biomethane	389	0,1	85
	RE electricity consumption transport	4.557	0,7	
	<b>Total</b>	<b>35.970</b>	<b>5,6</b>	<b>7.783</b>



## Renewable energy sources in the year 2019

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	RE 2019 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	20.135	3,5	16.317
	Wind energy onshore	101.150	17,6	77.041
	Wind energy offshore	24.744	4,3	19.165
	Solar Photovoltaic	45.221	7,9	31.653
	Solid biofuels & sewage sludge	11.038	1,9	8.311
	Liquid biofuels	330	0,1	162
	Biogas	28.225	4,9	13.547
	Biomethane	2.859	0,5	1.518
	Sewage gas	1.581	0,3	1.116
	Landfill gas	287	0,05	202
	Biogenic fraction of waste	5.806	1,0	4.724
	Geothermal energy	197	0,03	130
<b>Total</b>	<b>241.573</b>	<b>42,0</b>	<b>173.887</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	71.154	5,9	11.172
	Solid biofuels & charcoal (TCS sector)	19.219	1,6	4.090
	Solid biofuels & sewage sludge (industry)	23.784	2,0	6.720
	Solid biofuels & sewage sludge (HP/CHP)	6.121	0,5	1.459
	Liquid biofuels	2.383	0,2	565
	Biogas	13.295	1,1	3.167
	Biomethane	3.765	0,3	933
	Sewage gas	2.402	0,2	694
	Landfill gas	107	0,01	41
	Biogenic fraction of waste	15.308	1,3	3.451
	Solar thermal energy	8.667	0,7	2.315
	Deep geothermal energy	1.369	0,1	400
	Near-surface geothermal energy & ambient heat	14.655	1,2	2.717
<b>Total</b>	<b>182.229</b>	<b>15,1</b>	<b>37.724</b>	
<b>Final energy consumption transport</b>	Biodiesel	22.109	3,4	5.241
	Vegetable oil	21	0,003	4
	Bioethanol	8.353	1,3	2.198
	Biomethane	660	0,1	126
	RE electricity consumption transport	4.874	0,8	
	<b>Total</b>	<b>36.017</b>	<b>5,6</b>	<b>7.569</b>



## Renewable energy sources in the year 2020

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		RE 2020	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	18.721	3,4	15.085
	Wind energy onshore	104.796	18,9	79.350
	Wind energy offshore	27.306	4,9	21.079
	Solar Photovoltaic	49.496	8,9	34.572
	Solid biofuels & sewage sludge	11.306	2,0	8.474
	Liquid biofuels	307	0,1	125
	Biogas	28.757	5,2	13.833
	Biomethane	2.914	0,5	1.538
	Sewage gas	1.579	0,3	1.119
	Landfill gas	247	0,04	174
	Biogenic fraction of waste	5.820	1,0	4.715
	Geothermal energy	231	0,04	154
<b>Total</b>	<b>251.480</b>	<b>45,2</b>	<b>180.218</b>	
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	66.874	5,7	10.496
	Solid biofuels & charcoal (TCS sector)	19.101	1,6	4.001
	Solid biofuels & sewage sludge (industry)	23.279	2,0	6.467
	Solid biofuels & sewage sludge (HP/CHP)	6.296	0,5	1.536
	Liquid biofuels	3.217	0,3	709
	Biogas	13.603	1,1	3.257
	Biomethane	4.023	0,3	971
	Sewage gas	2.378	0,2	727
	Landfill gas	95	0,01	38
	Biogenic fraction of waste	15.060	1,3	3.556
	Solar thermal energy	9.014	0,8	2.401
	Deep geothermal energy	1.427	0,1	410
Near-surface geothermal energy & ambient heat	16.049	1,4	3.130	
<b>Total</b>	<b>180.416</b>	<b>15,3</b>	<b>37.699</b>	
Final energy consumption transport	Biodiesel	30.170	5,2	8.359
	Vegetable oil	21	0,004	5
	Bioethanol	8.014	1,4	2.484
	Biomethane	884	0,2	269
	RE electricity consumption transport	5.213	0,9	
	<b>Total</b>	<b>44.302</b>	<b>7,6</b>	<b>11.117</b>

## Renewable energy sources in the year 2021

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	RE 2021 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	19.657	3,5	15.823
	Wind energy onshore	90.272	15,9	68.156
	Wind energy offshore	24.375	4,3	18.721
	Solar Photovoltaic	49.340	8,7	33.859
	Solid biofuels & sewage sludge	11.028	1,9	8.207
	Liquid biofuels	202	0,04	60
	Biogas	28.189	5,0	13.423
	Biomethane	3.133	0,6	1.631
	Sewage gas	1.576	0,3	1.108
	Landfill gas	229	0,04	161
	Biogenic fraction of waste	5.792	1,0	4.686
	Geothermal energy	244	0,04	159
<b>Total</b>	<b>234.037</b>	<b>41,2</b>	<b>165.995</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	78.559	6,2	12.620
	Solid biofuels & charcoal (TCS sector)	22.086	1,8	4.707
	Solid biofuels & sewage sludge (industry)	24.820	2,0	7.072
	Solid biofuels & sewage sludge (HP/CHP)	6.831	0,5	1.665
	Liquid biofuels	2.601	0,2	555
	Biogas	13.393	1,1	3.326
	Biomethane	4.751	0,4	1.125
	Sewage gas	2.368	0,2	774
	Landfill gas	85	0,01	37
	Biogenic fraction of waste	15.650	1,2	3.723
	Solar thermal energy	8.551	0,7	2.277
	Deep geothermal energy	1.578	0,1	450
Near-surface geothermal energy & ambient heat	17.905	1,4	3.363	
<b>Total</b>	<b>199.178</b>	<b>15,8</b>	<b>41.692</b>	
<b>Final energy consumption transport</b>	Biodiesel	25.072	4,3	6.981
	Vegetable oil	21	0,004	5
	Bioethanol	8.412	1,4	2.594
	Biomethane	965	0,2	294
	RE electricity consumption transport	5.302	0,9	
	<b>Total</b>	<b>39.772</b>	<b>6,8</b>	<b>9.873</b>

## Renewable energy sources in the year 2022

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	RE 2022 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
<b>Gross electricity production</b>	Hydropower	17.462	3,2	14.061
	Wind energy onshore	100.164	18,2	75.625
	Wind energy offshore	25.123	4,6	19.295
	Solar Photovoltaic	60.787	11,1	41.714
	Solid biofuels & sewage sludge	11.187	2,0	8.325
	Liquid biofuels	175	0,03	52
	Biogas	28.471	5,2	13.557
	Biomethane	2.964	0,5	1.543
	Sewage gas	1.575	0,3	1.108
	Landfill gas	202	0,04	142
	Biogenic fraction of waste	5.607	1,0	4.536
	Geothermal energy	245	0,04	160
<b>Total</b>	<b>253.962</b>	<b>46,2</b>	<b>180.119</b>	
<b>Final energy consumption for heating and cooling</b>	Solid biofuels & charcoal (households)	80.021	6,9	13.020
	Solid biofuels & charcoal (TCS sector)	20.671	1,8	4.460
	Solid biofuels & sewage sludge (industry)	23.171	2,0	6.692
	Solid biofuels & sewage sludge (HP/CHP)	6.588	0,6	1.593
	Liquid biofuels	2.455	0,2	529
	Biogas	13.611	1,2	3.376
	Biomethane	4.761	0,4	1.119
	Sewage gas	2.412	0,2	789
	Landfill gas	83	0,01	36
	Biogenic fraction of waste	15.073	1,3	3.586
	Solar thermal energy	9.733	0,8	2.592
	Deep geothermal energy	1.505	0,1	428
	Near-surface geothermal energy & ambient heat	20.465	1,8	3.736
<b>Total</b>	<b>200.549</b>	<b>17,4</b>	<b>41.955</b>	
<b>Final energy consumption transport</b>	Biodiesel	24.518	4,1	6.826
	Vegetable oil	21	0,004	5
	Bioethanol	8.692	1,5	2.680
	Biomethane	1.061	0,2	323
	RE electricity consumption transport	6.148	1,0	
	<b>Total</b>	<b>40.440</b>	<b>6,8</b>	<b>9.835</b>

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## Methodological changes

National and international reporting obligations increase the demand of reliable and long-term updateable statistical data on the development of all renewable energy sources in Germany. The Working Group on Renewable Energy Statistics (AGEE-Stat) continuously improves and unifies data base and calculation methods. If new information allow conclusions to be drawn on historic values, these data are complemented or corrected. An overview of the implemented methodological changes in comparison to the previous publication is provided below:

Actualisation of the data basis of self consumption concerning hydropower plants

The time series of the gross electricity generation of hydropower plants was reviewed since 2018 on the basis of new findings concerning the completely and partly self-consumption of smaller hydropower plants.

The basis for the actualisation is a model calculation from the Ingeniuerbüro Floecksmühle as part of the project "Scientific analysis for selected aspects of renewable energy statistics to support the Working Group on Renewable Energy Statistics (AGEE-Stat)".

Aktualisation of the databasis concerning heat production from solid biomass

Regarding heat production from solid biomass the time series of the development of consumption of wood fuel in the private household sector and commerce, trade, service sector were adjusted from the year 2019 onwards. Background of the actualisation are new empirical data from the Thünen Institute of Forestry concerning households in the year 2020 and biomass plants < 1MW in 2020 from the collaborative project „Systemisches Rohstoffmonitoring Holz“ (Prof. Mantau / Thünen-Institut) "

## Conversion factors

Joule	J	for energy, work, heat
Watt	W	for capacity, energy flow, heat flow
1 Joule (J) = 1 Newton metre (Nm) = 1 Watt second (Ws)		

Legally binding units in Germany since 1978.  
Calorie and derived units such as coal equivalent and oil equivalent are still used as alternatives.

<i>referred to net calorific value</i>		PJ	TWh	Mtce	Mtoe
1 Petajoule	PJ	1	0,2778	0,0341	0,0239
1 Terawatt hour	TWh	3,6	1	0,123	0,0861
1 million tonne of hard coal unit	Mtce	29,308	8,14	1	0,7
1 million tonne of oil equivalent	Mtoe	41,869	11,63	1,429	1

1 TWh = 1 billion kWh	Kilo (k)	10 <sup>3</sup>	Tera (T)	10 <sup>12</sup>
1 GWh = 1 million kWh	Mega (M)	10 <sup>6</sup>	Peta (P)	10 <sup>15</sup>
1 MWh = 1.000 kWh	Giga (G)	10 <sup>9</sup>	Exa (E)	10 <sup>18</sup>

## Abbreviations

eq.	Equivalent
RE	Renewable energies
EEG	Renewable Energy Sources Act (Erneuer-bare-Energien-Gesetz)
FEC	Final energy consumption
N/A	Not quantified
PEC	Primary energy consumption
HP	Heating plant
CHP	Combined heat and power plant

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### INSTITUTIONS

- AGEB Working Group on Energy Balances e.V., Berlin.
- BAFA Federal Office for Economic Affairs and Export Control, Eschborn.
- BDEW German Association of Energy and Water Industries e.V., Berlin.
- BLE Federal Office of Agriculture and Food, Bonn.
- BMEL Federal Ministry of Food and Agriculture, Bonn.
- BMU Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Berlin.
- BMWi Federal Ministry for Economic Affairs and Energy, Berlin.
- BNetzA Federal Network Agency, Bonn.
- BSW German Solar Association, Berlin.
- BWE German Wind Energy Association e.V., Berlin.
- BWP German Heat Pump Association e.V., Berlin.
- DBFZ German Biomass Research Centre, Leipzig.
- DENA German Energy Agency, Berlin.
- DEPV German Energy Pellet Association e.V., Berlin.
- DIW German Institute for Economic Research, Berlin.
- FNR Specialist agency renewable raw materials e.V., Gülzow.
- GtV Geothermal Energy Association e.V., Berlin.
- GZB International Geothermal Center, Bochum
- LIAG Leibniz Institute for Applied Geophysics: Geothermal Information System for Germany, [www.geotis.de](http://www.geotis.de).
- RWI Leibniz Institute for Economic Research, Essen.
- StBA Federal Statistical Office, Wiesbaden.
- TI Institute of International Forestry and Forest Economics, Hamburg.
- UBA Federal Environment Agency, Dessau-Roßlau.
- UL UL International GmbH, DEWI, Wilhelmshaven.
- ÜNB Information platform of the German Transmission System Operators, [www.netztransparenz.de](http://www.netztransparenz.de)
- ZSW Centre for Solar Energy and Hydrogen Research Baden-Württemberg, Stuttgart.

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