



Federal Ministry  
for Economic Affairs  
and Energy



# 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 2019)

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### LIST OF INSTITUTIONS, REFERENCES AND LITERATURE

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: <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: <http://www.umweltbundesamt.de/publikationen/date-nquellen-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:

<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 adressed on

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**Table 1: Development of renewable energy sources 1990 to 2018**

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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
Gross final energy consumption <sup>1)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	166.551	188.028	228.148	261.889	269.665	266.007	305.512	315.276	352.288	365.681	360.046	388.436	387.515	419.843	430.522
Gross electricity production	18.934	16.465	19.240	20.128	22.739	25.327	26.140	22.673	25.086	28.901	36.226	38.742	45.436	46.670	57.957	63.400	72.509	89.368	94.280	95.939	105.181	124.037	143.043	152.338	162.525	188.786	189.671	216.338	225.691
Final energy consumption for heating and cooling	32.516	32.671	32.754	32.851	32.969	33.110	33.398	50.646	56.090	57.777	58.429	65.451	64.620	87.880	96.982	102.144	115.309	126.431	139.032	138.008	165.470	156.977	173.324	180.217	163.134	167.625	165.570	170.930	170.876
Final energy consumption in the transport sector <sup>2)</sup>	465	477	609	653	982	1.175	1.398	1.725	1.872	2.312	3.752	4.908	7.181	9.552	12.330	23.226	41.089	47.123	37.183	33.029	35.951	35.467	37.158	34.375	35.490	33.366	33.659	34.259	35.921
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
Gross final energy consumption EU-Directive <sup>3)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	164.921	187.930	228.008	256.152	267.314	270.314	311.705	316.816	352.490	366.821	363.244	382.733	388.675	407.365	430.031
Final energy consumption in the transport sector EU-Directive <sup>3)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.100	24.857	42.376	45.930	38.626	34.983	38.352	39.183	44.439	44.787	42.910	41.442	45.225	46.179	49.777
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
Primary energy consumption <sup>4)</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	1.644	1.676	1.790	1.809

1) according to the German government's Energy Concept

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

3) according to the European Directive 2009/28/EC

4) 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 2018

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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
of gross final energy consumption <sup>1)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,2	7,1	8,4	10,2	10,1	10,7	11,4	12,4	13,6	13,8	14,3	15,1	14,8	15,9	16,7
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	11,6	14,3	15,2	16,4	17,0	20,4	23,5	25,1	27,4	31,5	31,6	36,0	37,8
of final energy consumption for heating and cooling	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	7,4	8,0	8,8	10,7	10,8	11,6	12,4	12,9	14,2	14,1	14,2	14,0	13,5	13,4	13,9
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	1,5	1,9	3,7	6,5	7,5	6,0	5,4	5,8	5,7	6,0	5,5	5,6	5,2	5,2	5,2	5,6
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
of gross final energy consumption EU-Directive <sup>2)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,2	7,1	8,4	10,0	10,0	10,8	11,7	12,5	13,6	13,8	14,4	14,9	14,9	15,5	16,6
of final energy consumption in the transport sector EU-Directive <sup>2)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,2	4,0	6,8	7,5	6,4	5,9	6,4	6,5	7,4	7,3	6,9	6,6	7,0	7,0	7,7
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
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	12,4	12,4	13,3	14,0

1) according to the German government's Energy Concept

2) according to the European Directive 2009/28/EC

Sources: see table 1 and 7; partially preliminary data

**Table 3: Gross electricity production from renewable energy sources 1990 to 2018**

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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
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	16.500
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	92.249
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	19.341
Solar Photovoltaic	1	1	4	3	7	7	12	18	35	30	60	76	162	313	557	1.282	2.220	3.075	4.420	6.583	11.729	19.599	26.380	31.010	36.056	38.726	38.098	39.401	46.164
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	10.658	10.730
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	437
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	24.395	25.832	27.062	28.636	29.271	29.325	29.450
Biomethane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	44	78	372	576	1.068	1.632	2.253	2.677	2.643	2.757	2.703
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	1.490
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	300
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	6.155
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	172
<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>25.086</b>	<b>28.901</b>	<b>36.226</b>	<b>38.742</b>	<b>45.436</b>	<b>46.670</b>	<b>57.957</b>	<b>63.400</b>	<b>72.509</b>	<b>89.368</b>	<b>94.280</b>	<b>95.939</b>	<b>105.181</b>	<b>124.037</b>	<b>143.043</b>	<b>152.338</b>	<b>162.525</b>	<b>188.786</b>	<b>189.671</b>	<b>216.338</b>	<b>225.691</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	-

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 calculated with 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 and 2012, including mine gas annual statement of account for the EEG of the transmission system operators: <http://www.netztransparenz.de>.

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

**Table 4: Installed electrical capacity of renewable energy plants 1990 to 2018**

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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
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	5.598	5.605	5.612
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	50.292	52.565
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	5.427	6.417
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	42.339	45.277
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	1.604
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	229	230
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	4.204	4.311	4.416	4.671	4.901	5.209	5.620
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	264	389	567	544	532	526	529
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	255	256
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	171	171
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
<b>Total</b>	<b>4.168</b>	<b>4.276</b>	<b>4.368</b>	<b>4.626</b>	<b>5.049</b>	<b>5.714</b>	<b>6.143</b>	<b>6.728</b>	<b>7.761</b>	<b>9.600</b>	<b>11.745</b>	<b>14.572</b>	<b>18.239</b>	<b>21.197</b>	<b>24.397</b>	<b>27.866</b>	<b>31.576</b>	<b>34.818</b>	<b>37.768</b>	<b>46.519</b>	<b>55.784</b>	<b>66.680</b>	<b>77.435</b>	<b>82.843</b>	<b>89.387</b>	<b>96.894</b>	<b>103.431</b>	<b>111.692</b>	<b>118.323</b>
for information: biogenic fraction of waste <sup>5)</sup>	550	550	550	564	499	509	551	527	540	555	585	585	585	902	943	1.174	1.273	1.228	1.351	1.441	1.526	1.486	1.429	1.860	1.888	1.924	1.957	2.008	2.081

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 according to the plant registry of the Federal Network Agency (BNetzA)

5) installed capacity of thermal waste combustion plants is completely taken into account

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 2018

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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
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	61.774	64.092	75.797	66.810	79.304	71.020	84.372	87.292	69.484	69.537	64.004	65.840	63.860
Solid biofuels (TCS sector) <sup>2)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	6.972	9.581	9.695	11.120	11.442	16.046	16.476	21.236	15.729	17.196	18.258	14.725	16.684	16.125	17.527	17.496
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	26.326
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	5.659
Liquid biofuels <sup>5)</sup>	0	0	0	0	0	0	0	0	3	2	8	10	48	192	311	713	1.275	1.889	2.642	3.291	3.172	2.431	2.020	2.086	2.225	2.114	2.113	2.124	2.242
Biogas	-	-	-	-	-	-	-	-	-	-	-	-	-	300	444	820	1.344	3.646	3.487	5.088	7.502	9.059	8.523	9.329	10.593	11.580	12.359	12.991	13.288
Biomethane	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	21	65	131	490	739	1.277	2.268	2.917	3.509	3.563	3.527	3.444
Sewage gas	-	-	-	-	-	-	-	-	-	-	-	-	-	1.834	1.974	2.086	1.862	1.865	1.982	1.984	2.013	2.065	2.020	1.807	1.804	2.003	2.053	2.144	2.159
Landfill gas	-	-	-	-	-	-	-	-	-	-	-	-	-	192	187	257	259	242	179	176	129	111	104	103	110	141	136	126	122
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	12.719
Solarthermal energy	131	168	219	278	352	438	548	690	826	1.090	1.292	1.626	1.917	2.527	2.563	3.028	3.547	3.934	4.474	5.250	5.592	6.389	6.640	6.701	7.206	7.706	7.693	7.853	8.877
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	804	864	1.052	969	1.146	1.168	1.133
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	11.419	12.442	13.551
<b>Total</b>	<b>32.516</b>	<b>32.671</b>	<b>32.754</b>	<b>32.851</b>	<b>32.969</b>	<b>33.110</b>	<b>33.398</b>	<b>50.646</b>	<b>56.090</b>	<b>57.777</b>	<b>58.429</b>	<b>65.451</b>	<b>64.620</b>	<b>87.880</b>	<b>96.982</b>	<b>102.144</b>	<b>115.309</b>	<b>126.431</b>	<b>139.032</b>	<b>138.008</b>	<b>165.470</b>	<b>156.977</b>	<b>173.324</b>	<b>180.217</b>	<b>163.134</b>	<b>167.625</b>	<b>165.570</b>	<b>170.930</b>	<b>170.876</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

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

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.

7) before 2003 balneological plants are not taken into account

8) International Geothermal Energy Centre Bochum (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 6: Final energy consumption from renewable sources in the transport sector 1990 to 2018

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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
Biodiesel <sup>1)</sup>	0	2	52	52	289	362	568	930	1.033	1.343	2.583	3.617	5.683	8.254	10.287	18.046	28.364	33.182	26.630	23.401	24.474	23.606	24.530	21.998	22.760	20.840	20.866	21.248	22.419
Vegetable oil	0	0	21	31	31	52	52	104	115	146	167	209	251	292	345	2.047	7.426	8.752	4.188	1.044	637	209	261	10	63	21	42	10	10
Bioethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	486	1.780	3.828	3.439	4.673	6.669	8.711	9.090	9.208	8.891	9.061	8.648	8.663	8.530	8.795
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	401
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	1.471	1.750	1.688	1.902	2.054	2.470	2.826	2.993	3.157	3.512	3.709	4.026	4.296
<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>9.552</b>	<b>12.330</b>	<b>23.226</b>	<b>41.089</b>	<b>47.123</b>	<b>37.183</b>	<b>33.029</b>	<b>35.951</b>	<b>35.467</b>	<b>37.158</b>	<b>34.375</b>	<b>35.490</b>	<b>33.366</b>	<b>33.659</b>	<b>34.259</b>	<b>35.921</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
Biodiesel <sup>1)</sup>	0	0,2	5	5	28	35	55	90	100	130	250	350	550	800	997	1.749	2.749	3.216	2.581	2.268	2.372	2.263	2.314	2.064	2.156	1.999	2.002	2.063	2.177
Vegetable oil	0	0	2	3	3	5	5	10	11	14	16	20	24	28	33	196	711	838	401	100	61	20	25	1	6	2	4	1	1
Bioethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65	238	512	460	625	892	1.165	1.233	1.249	1.206	1.229	1.173	1.175	1.157	1.193
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	30
<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>828</b>	<b>1.095</b>	<b>2.183</b>	<b>3.972</b>	<b>4.514</b>	<b>3.607</b>	<b>3.261</b>	<b>3.604</b>	<b>3.523</b>	<b>3.613</b>	<b>3.307</b>	<b>3.424</b>	<b>3.199</b>	<b>3.209</b>	<b>3.254</b>	<b>3.401</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 2018**

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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
Gross electricity consumption <sup>1)</sup>	549,9	538,7	531,6	526,6	531,1	541,8	550,4	547,6	555,3	557,2	578,1	589,0	592,7	606,6	616,1	618,5	623,3	624,8	621,5	584,3	618,3	609,5	608,7	606,5	593,9	600,0	599,9	601,3	597,5
Final energy consumption for heating and cooling <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	1.346,8	1.315,7	1.281,3	1.316,5	1.178,7	1.288,2	1.187,9	1.330,4	1.215,5	1.222,1	1.277,8	1.152,2	1.200,2	1.222,4	1.272,6	1.228,3
Final energy consumption in the transport sector <sup>3)</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	635,8	647,9	655,0	638,5

  

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
Gross final energy consumption EU-Directive <sup>4)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.606	9.488	9.728	9.206	9.582	8.991	9.619	9.145	9.330	9.552	9.070	9.236	9.397	9.491	9.300
Final energy consumption in the transport sector EU-Directive <sup>4)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.295	2.221	2.252	2.197	2.162	2.121	2.149	2.176	2.160	2.206	2.237	2.270	2.320	2.363	2.325

  

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
Primary energy consumption <sup>5)</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	13.262	13.491	13.440	12.965

1) gross electricity production by fossil fuels accounting to BDEW status February 2019, data on electricity trade according to the German Federal Statistical Office

2) Working Group on Energy Balances (AGEB), without electricity consumption for heating and cooling, status February 2019

3) Working Group on Energy Balances (AGEB), without energy consumption for international aviation, status February 2019

4) according to the European Directive 2009/28/EC

5) Working Group on Energy Balances (AGEB), calculated by the "physical energy content" principle, status February 2019

Sources: AGEE-Stat based on AGEB [1]; StBA [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 2018**

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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
by RE gross electricity production	21.317	18.400	21.484	22.306	25.053	27.606	27.391	22.482	23.836	28.114	33.977	36.778	43.221	42.943	52.800	55.807	55.191	64.812	63.540	65.953	71.708	88.564	89.365	94.565	99.990	116.991	117.501	135.205	140.776
by RE final energy consumption for heating and cooling	6.491	6.521	6.535	6.553	6.576	6.603	6.601	9.941	11.204	11.380	11.492	12.858	12.640	18.356	21.003	22.233	24.618	27.001	29.873	30.117	35.280	33.581	36.439	37.042	33.729	34.618	34.233	35.290	35.244
by RE final energy consumption in the transport sector <sup>1)</sup>	0	0,4	13	15	60	78	118	197	220	287	526	731	1.127	1.620	2.112	4.156	7.510	8.518	6.760	5.991	6.530	6.460	6.978	6.423	6.694	6.297	6.915	7.377	7.717
<b>Total avoided GHG-emissions</b>	<b>27.808</b>	<b>24.921</b>	<b>28.032</b>	<b>28.874</b>	<b>31.689</b>	<b>34.287</b>	<b>34.110</b>	<b>32.620</b>	<b>35.260</b>	<b>39.781</b>	<b>45.995</b>	<b>50.367</b>	<b>56.988</b>	<b>62.919</b>	<b>75.915</b>	<b>82.196</b>	<b>87.319</b>	<b>100.331</b>	<b>100.173</b>	<b>102.061</b>	<b>113.518</b>	<b>128.605</b>	<b>132.782</b>	<b>138.030</b>	<b>140.413</b>	<b>157.906</b>	<b>158.649</b>	<b>177.872</b>	<b>183.737</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
Avoidance factor of RE gross electricity production	1.126	1.118	1.117	1.108	1.102	1.090	1.048	992	950	973	938	949	951	920	911	880	761	725	674	687	682	714	625	621	615	620	620	625	624
Avoidance factor of RE final energy consumption for heating and cooling	200	200	200	199	199	199	198	196	200	197	197	196	196	209	217	218	213	214	215	218	213	214	210	206	207	207	207	206	206
Avoidance factor of RE final energy consumption in the transport sector <sup>1)</sup>	-	189	185	183	189	189	190	191	192	192	191	191	190	190	190	190	190	188	190	192	193	196	203	205	207	211	231	244	244

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

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 2018**

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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
by RE gross electricity production	21.106	18.217	21.268	22.082	24.799	27.314	27.091	22.202	23.525	27.688	33.284	36.041	42.039	41.540	50.587	54.107	52.548	62.177	61.690	64.880	70.999	86.831	88.857	93.884	99.153	114.993	115.805	131.914	136.999
by RE final energy consumption for heating and cooling	6.456	6.489	6.503	6.520	6.542	6.568	6.551	9.969	11.194	11.342	11.437	12.826	12.583	18.025	20.493	21.839	24.200	26.795	29.757	30.095	35.823	34.238	37.165	37.977	34.809	35.855	35.549	36.668	36.648
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	7.618	8.054	7.386	7.669	7.167	7.656	8.082	8.457
<b>Total avoided CO<sub>2</sub>-emissions</b>	<b>27.562</b>	<b>24.707</b>	<b>27.788</b>	<b>28.621</b>	<b>31.415</b>	<b>33.978</b>	<b>33.785</b>	<b>32.410</b>	<b>34.985</b>	<b>39.376</b>	<b>45.355</b>	<b>49.748</b>	<b>55.983</b>	<b>61.522</b>	<b>73.633</b>	<b>81.009</b>	<b>86.007</b>	<b>99.553</b>	<b>99.732</b>	<b>102.219</b>	<b>114.698</b>	<b>128.687</b>	<b>134.076</b>	<b>139.247</b>	<b>141.631</b>	<b>158.015</b>	<b>159.010</b>	<b>176.664</b>	<b>182.104</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
Avoidance factor of RE gross electricity production	1.115	1.106	1.105	1.097	1.091	1.078	1.036	979	938	958	919	930	925	890	873	853	725	696	654	676	675	700	621	616	610	609	611	610	607
Avoidance factor of RE final energy consumption for heating and cooling	199	199	199	198	198	198	196	197	200	196	196	196	195	205	211	214	210	212	214	218	216	218	214	211	213	214	215	215	214
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	229	230	231	234	233	233	233	232	231	235	235	237	240	256	267	267

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

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 2018 <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
by RE gross electricity production	123,3	105,5	123,5	127,8	143,0	156,5	128,4	82,9	62,8	55,5	41,2	41,4	43,4	33,2	36,9	33,2	25,2	23,5	25,2	23,3	26,2	35,9	25,8	26,5	26,3	36,7	35,8	50,8	54,4
by RE final energy consumption for heating and cooling	6,5	6,5	6,5	6,6	6,6	6,6	5,4	8,1	7,3	5,9	4,5	5,0	4,2	6,2	6,9	3,0	3,0	1,87	7,2	3,9	1,6	1,7	-0,8	-5,6	-4,5	-4,7	-5,2	-5,4	-5,3
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	-3,1	-3,3
<b>Total avoided acidifying agents <sup>2)</sup></b>	<b>129,8</b>	<b>112,0</b>	<b>130,0</b>	<b>134,4</b>	<b>149,6</b>	<b>163,1</b>	<b>133,8</b>	<b>91,0</b>	<b>70,1</b>	<b>61,4</b>	<b>45,8</b>	<b>46,5</b>	<b>47,7</b>	<b>39,5</b>	<b>43,6</b>	<b>35,0</b>	<b>24,6</b>	<b>13,5</b>	<b>24,6</b>	<b>22,4</b>	<b>20,8</b>	<b>33,0</b>	<b>19,0</b>	<b>14,0</b>	<b>17,0</b>	<b>28,3</b>	<b>27,0</b>	<b>42,3</b>	<b>45,8</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
Avoidance factor of RE gross electricity production	6,51	6,41	6,42	6,35	6,29	6,18	4,91	3,65	2,50	1,92	1,14	1,07	0,95	0,71	0,64	0,52	0,35	0,26	0,27	0,24	0,25	0,29	0,18	0,17	0,16	0,19	0,19	0,23	0,24
Avoidance factor of RE final energy consumption for heating and cooling	0,20	0,20	0,20	0,20	0,20	0,20	0,16	0,16	0,13	0,10	0,08	0,08	0,06	0,07	0,07	0,03	0,03	0,01	0,05	0,03	0,01	0,01	0,00	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03
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	-0,26	-0,22	-0,16	-0,21	-0,14	-0,17	-0,22	-0,15	-0,12	-0,12	-0,10	-0,10

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

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 2017**

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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
Hydropower	520	340	120	170	210	240	220	330	370	500	350	300	200	130	80	80	50	20	-
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	7.280	-
Wind energy offshore	0	0	0	0	0	0	0	30	170	470	450	610	2.440	4.270	3.940	3.680	3.380	3.370	-
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	1.610	1.700	-
Solar thermal energy	440	610	370	480	470	630	990	760	1.700	1.490	990	1.060	950	860	790	800	700	540	-
Geothermal energy, ambient heat	130	180	190	210	290	410	940	930	1.250	1.160	960	990	1.060	1.090	1.090	1.030	1.230	1.330	-
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	170	270	290	-
Biomass heat	900	920	890	1.060	1.100	1.510	2.300	1.500	1.760	1.610	1.210	1.320	1.500	1.530	1.360	1.270	1.230	1.200	-
<b>Total</b>	<b>4.700</b>	<b>6.280</b>	<b>6.950</b>	<b>7.380</b>	<b>9.950</b>	<b>12.030</b>	<b>13.950</b>	<b>13.630</b>	<b>17.740</b>	<b>23.620</b>	<b>27.890</b>	<b>26.120</b>	<b>22.470</b>	<b>16.450</b>	<b>16.440</b>	<b>13.880</b>	<b>15.380</b>	<b>15.730</b>	-

1) differences in the totals may occur due to roundings

Source: ZSW [32]; partially preliminary data; status December 2018

**Table 9.2: Economic stimuli from the operation of renewable energy plants 2000 to 2017**

Status: February 2019

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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
Hydropower	100	110	110	120	120	130	130	140	150	160	170	190	190	200	200	200	210	210	-
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	-
Wind energy offshore	0	0	0	0	0	0	0	0	0	10	20	30	60	130	210	280	350	420	-
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	-
Solar thermal energy	0	10	20	30	40	50	70	90	110	140	170	190	210	230	240	260	270	290	-
Geothermal energy, ambient heat	170	180	190	200	220	240	290	360	440	530	620	730	820	900	990	1.070	1.160	1.250	-
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	4.590	4.620	4.610	-
Biomass heat	1.150	1.180	1.210	1.240	1.270	1.460	1.670	1.860	2.020	2.290	2.700	2.660	2.880	3.060	2.750	2.890	3.080	3.060	-
Biomass fuels	210	300	460	670	880	1.790	3.150	3.750	3.530	2.390	2.930	3.700	3.720	3.100	2.690	2.490	2.620	2.760	-
<b>Total</b>	<b>1.960</b>	<b>2.230</b>	<b>2.600</b>	<b>3.120</b>	<b>3.600</b>	<b>5.060</b>	<b>7.210</b>	<b>8.790</b>	<b>9.330</b>	<b>9.260</b>	<b>11.120</b>	<b>12.780</b>	<b>14.200</b>	<b>14.360</b>	<b>14.330</b>	<b>14.930</b>	<b>15.640</b>	<b>16.150</b>	-

1) differences in the totals may occur due to roundings

Source: ZSW [32]; partially preliminary data; status December 2018

## Renewable energy sources in the year 1990

Status: February 2019

		RE 1990		Share of renewable energy	avoided GHG-emissions
		[GWh]		[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	17.426	of national gross electricity consumption	3,2	20.355
	Wind energy onshore	72		0,01	36
	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	30
	Landfill gas	188		0,03	193
	Biogenic fraction of waste	1.213		0,2	701
	Geothermal energy	0		0	0
	<b>Total</b>	<b>18.934</b>			<b>3,4</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.355	of final energy consumption for heating and cooling	1,7	4.886
	Solid biofuels (industry)	2.909		0,2	897
	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	541
	Solar thermal energy	131		0,01	33
	Deep geothermal energy	100		0,01	30
	Near-surface geothermal energy & ambient heat	1.712		0,1	103
	<b>Total</b>	<b>32.516</b>			<b>2,1</b>
Final energy consumption transport	Biodiesel	0	of final energy consumption transport	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>



## Renewable energy sources in the year 1991

Status: February 2019

		RE 1991		Share of renewable energy	avoided GHG-emissions
		[GWh]		[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	14.891	of national gross electricity consumption	2,8	17.389
	Wind energy onshore	102		0,02	51
	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	26
	Landfill gas	224		0,04	230
	Biogenic fraction of waste	1.211		0,2	700
	Geothermal energy	0		0	0
	<b>Total</b>	<b>16.465</b>			<b>3,1</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	of final energy consumption for heating and cooling	1,7	4.904
	Solid biofuels (industry)	2.909		0,2	897
	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	541
	Solar thermal energy	168		0,01	43
	Deep geothermal energy	100		0,01	30
	Near-surface geothermal energy & ambient heat	1.735		0,1	105
	<b>Total</b>	<b>32.671</b>			<b>2,2</b>
Final energy consumption transport	Biodiesel	2	of final energy consumption transport	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>

## Renewable energy sources in the year 1992

Status: February 2019

		RE 1992		Share of renewable energy	avoided GHG-emissions
		[GWh]		[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	17.397	of national gross electricity consumption	3,3	20.321
	Wind energy onshore	281		0,1	139
	Wind energy offshore	0		0	0
	Solar Photovoltaic	4		0,001	1,8
	Solid biofuels	14		0,003	7
	Liquid biofuels	0		0	0
	Biogas	3		0,001	0,3
	Sewage gas	20		0,004	20
	Landfill gas	259		0,05	266
	Biogenic fraction of waste	1.262		0,2	729
	Geothermal energy	0		0	0
	<b>Total</b>	<b>19.240</b>		<b>3,6</b>	<b>21.484</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	of final energy consumption for heating and cooling	1,8	4.904
	Solid biofuels (industry)	2.909		0,2	897
	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	541
	Solar thermal energy	219		0,02	56
	Deep geothermal energy	100		0,01	30
	Near-surface geothermal energy & ambient heat	1.765		0,1	106
	<b>Total</b>	<b>32.754</b>		<b>2,3</b>	<b>6.535</b>
Final energy consumption transport	Biodiesel	52	of final energy consumption transport	0,01	9,8
	Vegetable oil	21		0,003	3,6
	Bioethanol	0		0	0
	RE electricity consumption transport	536		0,1	
	<b>Total</b>	<b>609</b>		<b>0,1</b>	<b>13</b>

## Renewable energy sources in the year 1993

Status: February 2019

		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	20.883
	Wind energy onshore	612	0,1	304
	Wind energy offshore	0	0	0
	Solar Photovoltaic	3	0,001	1
	Solid biofuels	32	0,01	16
	Liquid biofuels	0	0	0
	Biogas	4	0,001	0,4
	Sewage gas	24	0,005	25
	Landfill gas	372	0,1	382
	Biogenic fraction of waste	1.203	0,2	695
	Geothermal energy	0	0	0
	<b>Total</b>	<b>20.128</b>	<b>3,8</b>	<b>22.306</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,8	4.904
	Solid biofuels (industry)	2.909	0,2	897
	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	541
	Solar thermal energy	278	0,02	70
	Deep geothermal energy	100	0,01	30
	Near-surface geothermal energy & ambient heat	1.797	0,1	108
	<b>Total</b>	<b>32.851</b>	<b>2,3</b>	<b>6.553</b>
Final energy consumption transport	Biodiesel	52	0,01	10
	Vegetable oil	31	0,005	5
	Bioethanol	0	0	0
	RE electricity consumption transport	570	0,1	
	<b>Total</b>	<b>653</b>	<b>0,1</b>	<b>15</b>

## Renewable energy sources in the year 1994

Status: February 2019

		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	23.284
	Wind energy onshore	927	0,2	460
	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	1
	Sewage gas	27	0,01	28
	Landfill gas	485	0,1	498
	Biogenic fraction of waste	1.306	0,2	755
	Geothermal energy	0	0	0
	<b>Total</b>	<b>22.739</b>	<b>4,3</b>	<b>25.053</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,8	4.904
	Solid biofuels (industry)	2.909	0,2	897
	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	541
	Solar thermal energy	352	0,03	89
	Deep geothermal energy	100	0,01	30
	Near-surface geothermal energy & ambient heat	1.834	0,1	110
	<b>Total</b>	<b>32.969</b>	<b>2,4</b>	<b>6.576</b>
Final energy consumption transport	Biodiesel	289	0,04	55
	Vegetable oil	31	0,005	5
	Bioethanol	0	0	0
	RE electricity consumption transport	662	0,1	
	<b>Total</b>	<b>982</b>	<b>0,2</b>	<b>60</b>

## Renewable energy sources in the year 1995

Status: February 2019

		RE 1995		Share of renewable energy	avoided GHG-emissions
		[GWh]		[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	21.780	of national gross electricity consumption	4,0	25.448
	Wind energy onshore	1.530		0,3	759
	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
	Sewage gas	34		0,01	35
	Landfill gas	525		0,1	539
	Biogenic fraction of waste	1.348		0,2	779
	Geothermal energy	0		0	0
	<b>Total</b>	<b>25.327</b>			<b>4,7</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	of final energy consumption for heating and cooling	1,8	4.904
	Solid biofuels (industry)	2.909		0,2	897
	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	541
	Solar thermal energy	438		0,03	110
	Deep geothermal energy	100		0,01	30
	Near-surface geothermal energy & ambient heat	1.877		0,1	113
	<b>Total</b>	<b>33.110</b>			<b>2,3</b>
Final energy consumption transport	Biodiesel	362	of final energy consumption transport	0,1	69
	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>

## Renewable energy sources in the year 1996

Status: February 2019

		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	24.978
	Wind energy onshore	2.073	0,4	1.006
	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	2
	Sewage gas	41	0,01	41
	Landfill gas	565	0,1	564
	Biogenic fraction of waste	1.343	0,2	739
	Geothermal energy	0	0	0
	<b>Total</b>	<b>26.140</b>	<b>4,7</b>	<b>27.391</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,7	4.854
	Solid biofuels (industry)	2.788	0,2	854
	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	586
	Solar thermal energy	548	0,04	137
	Deep geothermal energy	111	0,01	33
	Near-surface geothermal energy & ambient heat	1.924	0,1	126
	<b>Total</b>	<b>33.398</b>	<b>2,2</b>	<b>6.601</b>
Final energy consumption transport	Biodiesel	568	0,1	109
	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>118</b>

## Renewable energy sources in the year 1997

Status: February 2019

		RE 1997		Share of renewable energy	avoided GHG-emissions
		[GWh]		[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	17.357	of national gross electricity consumption	3,2	19.572
	Wind energy onshore	3.025		0,6	1.426
	Wind energy offshore	0		0	0
	Solar Photovoltaic	18		0,003	8
	Solid biofuels	179		0,03	82
	Liquid biofuels	0		0	0
	Biogas	44		0,01	1
	Sewage gas	48		0,01	47
	Landfill gas	605		0,1	599
	Biogenic fraction of waste	1.397		0,3	747
	Geothermal energy	0		0	0
	<b>Total</b>	<b>22.673</b>			<b>4,1</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	42.740	of final energy consumption for heating and cooling	2,9	8.188
	Solid biofuels (industry)	2.788		0,2	864
	Solid biofuels (HP/CHP)	63		0,004	15
	Liquid biofuels	0		0	0
	Gaseous biofuels	0		0	0
	Biogenic fraction of waste	2.290		0,2	526
	Solar thermal energy	690		0,05	171
	Deep geothermal energy	111		0,01	32
	Near-surface geothermal energy & ambient heat	1.964		0,1	145
	<b>Total</b>	<b>50.646</b>			<b>3,5</b>
Final energy consumption transport	Biodiesel	930	of final energy consumption transport	0,1	179
	Vegetable oil	104		0,02	18
	Bioethanol	0		0	0
	RE electricity consumption transport	691		0,1	
	<b>Total</b>	<b>1.725</b>			<b>0,3</b>

## Renewable energy sources in the year 1998

Status: February 2019

		RE 1998		Share of renewable energy	avoided GHG-emissions
		[GWh]		[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	17.216	of national gross electricity consumption	3,1	19.114
	Wind energy onshore	4.579		0,8	2.371
	Wind energy offshore	0		0	0
	Solar Photovoltaic	35		0,01	14
	Solid biofuels	210		0,04	107
	Liquid biofuels	0		0	0
	Biogas	118		0,02	6
	Sewage gas	633		0,1	614
	Landfill gas	677		0,1	658
	Biogenic fraction of waste	1.618		0,3	951
	Geothermal energy	0		0	0
	<b>Total</b>	<b>25.086</b>		<b>4,5</b>	<b>23.836</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	44.369	of final energy consumption for heating and cooling	3,1	8.464
	Solid biofuels (industry)	3.959		0,3	1.210
	Solid biofuels (HP/CHP)	74		0,01	18
	Liquid biofuels	3		0,0002	0,6
	Gaseous biofuels	1.335		0,1	350
	Biogenic fraction of waste	3.405		0,2	780
	Solar thermal energy	826		0,1	203
	Deep geothermal energy	113		0,01	33
	Near-surface geothermal energy & ambient heat	2.006		0,1	144
	<b>Total</b>	<b>56.090</b>		<b>3,9</b>	<b>11.204</b>
Final energy consumption transport	Biodiesel	1.033	of final energy consumption transport	0,2	200
	Vegetable oil	115		0,02	20
	Bioethanol	0		0	0
	RE electricity consumption transport	724		0,1	
	<b>Total</b>	<b>1.872</b>		<b>0,3</b>	<b>220</b>



## Renewable energy sources in the year 1999

Status: February 2019

		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	22.067
	Wind energy onshore	5.639	1,0	3.290
	Wind energy offshore	0	0	0
	Solar Photovoltaic	30	0,01	13
	Solid biofuels	246	0,04	144
	Liquid biofuels	0	0	0
	Biogas	145	0,03	14
	Sewage gas	727	0,1	717
	Landfill gas	727	0,1	718
	Biogenic fraction of waste	1.740	0,3	1.152
	Geothermal energy	0	0	0
	<b>Total</b>	<b>28.901</b>	<b>5,2</b>	<b>28.114</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	45.590	3,4	8.568
	Solid biofuels (industry)	3.917	0,3	1.177
	Solid biofuels (HP/CHP)	86	0,01	21
	Liquid biofuels	2	0,0001	0,4
	Gaseous biofuels	1.263	0,1	332
	Biogenic fraction of waste	3.674	0,3	829
	Solar thermal energy	1.090	0,1	266
	Deep geothermal energy	113	0,01	33
	Near-surface geothermal energy & ambient heat	2.042	0,2	154
	<b>Total</b>	<b>57.777</b>	<b>4,3</b>	<b>11.380</b>
Final energy consumption transport	Biodiesel	1.343	0,2	261
	Vegetable oil	146	0,02	25
	Bioethanol	0	0	0
	RE electricity consumption transport	823	0,1	
	<b>Total</b>	<b>2.312</b>	<b>0,3</b>	<b>287</b>

## Renewable energy sources in the year 2000

Status: February 2019

		RE 2000		Share of renewable energy	avoided GHG-emissions
		[GWh]		[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	21.732	of national gross electricity consumption	3,8	23.829
	Wind energy onshore	9.703		1,7	6.547
	Wind energy offshore	0		0	0
	Solar Photovoltaic	60		0,01	28
	Solid biofuels	925		0,2	633
	Liquid biofuels	0		0	0
	Biogas	445		0,1	78
	Sewage gas	705		0,1	676
	Landfill gas	812		0,1	780
	Biogenic fraction of waste	1.844		0,3	1.405
	Geothermal energy	0		0	0
	<b>Total</b>	<b>36.226</b>			<b>6,3</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	45.834	of final energy consumption for heating and cooling	3,5	8.593
	Solid biofuels (industry)	3.898		0,3	1.165
	Solid biofuels (HP/CHP)	324		0,02	78
	Liquid biofuels	8		0,001	2
	Gaseous biofuels	1.355		0,1	350
	Biogenic fraction of waste	3.548		0,3	801
	Solar thermal energy	1.292		0,1	314
	Deep geothermal energy	113		0,01	33
	Near-surface geothermal energy & ambient heat	2.057		0,2	156
	<b>Total</b>	<b>58.429</b>			<b>4,4</b>
Final energy consumption transport	Biodiesel	2.583	of final energy consumption transport	0,4	497
	Vegetable oil	167		0,02	29
	Bioethanol	0		0	0
	RE electricity consumption transport	1.002		0,1	
	<b>Total</b>	<b>3.752</b>			<b>0,5</b>

## Renewable energy sources in the year 2001

Status: February 2019

		RE 2001	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	22.733	3,9	25.149
	Wind energy onshore	10.719	1,8	7.708
	Wind energy offshore	0	0	0
	Solar Photovoltaic	76	0,01	33
	Solid biofuels	1.112	0,2	809
	Liquid biofuels	15	0,003	9
	Biogas	745	0,1	134
	Sewage gas	735	0,1	712
	Landfill gas	748	0,1	725
	Biogenic fraction of waste	1.859	0,3	1.499
	Geothermal energy	0	0	0
	<b>Total</b>	<b>38.742</b>	<b>6,6</b>	<b>36.778</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	52.307	3,7	9.857
	Solid biofuels (industry)	4.161	0,3	1.216
	Solid biofuels (HP/CHP)	389	0,03	94
	Liquid biofuels	10	0,001	2
	Gaseous biofuels	1.353	0,1	335
	Biogenic fraction of waste	3.421	0,2	774
	Solar thermal energy	1.626	0,1	392
	Deep geothermal energy	114	0,01	33
	Near-surface geothermal energy & ambient heat	2.070	0,1	155
	<b>Total</b>	<b>65.451</b>	<b>4,7</b>	<b>12.858</b>
Final energy consumption transport	Biodiesel	3.617	0,5	694
	Vegetable oil	209	0,03	36
	Bioethanol	0	0	0
	RE electricity consumption transport	1.082	0,2	
	<b>Total</b>	<b>4.908</b>	<b>0,7</b>	<b>731</b>

## Renewable energy sources in the year 2002

Status: February 2019

		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	25.651
	Wind energy onshore	16.102	2,7	12.786
	Wind energy offshore	0	0	0
	Solar Photovoltaic	162	0,03	71
	Solid biofuels	1.485	0,3	1.206
	Liquid biofuels	20	0,003	14
	Biogas	1.046	0,2	252
	Sewage gas	777	0,1	755
	Landfill gas	771	0,1	750
	Biogenic fraction of waste	1.949	0,3	1.736
	Geothermal energy	0	0	0
	<b>Total</b>	<b>45.436</b>	<b>7,7</b>	<b>43.221</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	50.963	3,8	9.535
	Solid biofuels (industry)	4.273	0,3	1.252
	Solid biofuels (HP/CHP)	520	0,04	125
	Liquid biofuels	48	0,004	8
	Gaseous biofuels	1.438	0,1	335
	Biogenic fraction of waste	3.295	0,2	742
	Solar thermal energy	1.917	0,1	460
	Deep geothermal energy	114	0,01	33
	Near-surface geothermal energy & ambient heat	2.052	0,2	151
	<b>Total</b>	<b>64.620</b>	<b>4,8</b>	<b>12.640</b>
Final energy consumption transport	Biodiesel	5.683	0,8	1.084
	Vegetable oil	251	0,04	44
	Bioethanol	0	0	0
	RE electricity consumption transport	1.247	0,2	
	<b>Total</b>	<b>7.181</b>	<b>1,1</b>	<b>1.127</b>

## Renewable energy sources in the year 2003

Status: February 2019

		RE 2003	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	18.322	3,0	19.862
	Wind energy onshore	19.087	3,1	15.828
	Wind energy offshore	0	0	0
	Solar Photovoltaic	313	0,1	144
	Solid biofuels & sewage sludge	3.392	0,6	2.903
	Liquid biofuels	52	0,01	38
	Biogas	1.518	0,3	414
	Sewage gas	955	0,2	907
	Landfill gas	793	0,1	753
	Biogenic fraction of waste	2.238	0,4	2.093
	Geothermal energy	0	0	0
	<b>Total</b>	<b>46.670</b>	<b>7,7</b>	<b>42.943</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	54.279	4,0	9.842
	Solid biofuels & charcoal (TCS sector)	6.972	0,5	1.953
	Solid biofuels & sewage sludge (industry)	12.442	0,9	3.591
	Solid biofuels & sewage sludge (HP/CHP)	994	0,1	240
	Liquid biofuels	192	0,01	30
	Biogas	300	0,02	10
	Sewage gas	1.834	0,1	452
	Landfill gas	192	0,01	59
	Biogenic fraction of waste	5.642	0,4	1.287
	Solar thermal energy	2.527	0,2	603
	Deep geothermal energy	445	0,03	130
	Near-surface geothermal energy & ambient heat	2.061	0,2	159
<b>Total</b>	<b>87.880</b>	<b>6,5</b>	<b>18.356</b>	
Final energy consumption transport	Biodiesel	8.254	1,3	1.569
	Vegetable oil	292	0,04	51
	Bioethanol	0	0	0
	RE electricity consumption transport	1.006	0,2	
	<b>Total</b>	<b>9.552</b>	<b>1,5</b>	<b>1.620</b>

## Renewable energy sources in the year 2004

Status: February 2019

		RE 2004	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	20.745	3,4	22.247
	Wind energy onshore	26.019	4,2	21.525
	Wind energy offshore	0	0	0
	Solar Photovoltaic	557	0,1	256
	Solid biofuels & sewage sludge	5.162	0,8	4.407
	Liquid biofuels	136	0,02	99
	Biogas	1.111	0,2	311
	Sewage gas	986	0,2	926
	Landfill gas	988	0,2	929
	Biogenic fraction of waste	2.253	0,4	2.099
	Geothermal energy	0,2	0,00003	0,1
	<b>Total</b>	<b>57.957</b>	<b>9,4</b>	<b>52.800</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	53.044	4,0	9.538
	Solid biofuels & charcoal (TCS sector)	9.581	0,7	2.674
	Solid biofuels & sewage sludge (industry)	18.462	1,4	5.416
	Solid biofuels & sewage sludge (HP/CHP)	1.797	0,1	434
	Liquid biofuels	311	0,02	65
	Biogas	444	0,03	62
	Sewage gas	1.974	0,2	483
	Landfill gas	187	0,01	57
	Biogenic fraction of waste	6.034	0,5	1.408
	Solar thermal energy	2.563	0,2	609
	Deep geothermal energy	464	0,04	140
	Near-surface geothermal energy & ambient heat	2.121	0,2	117
<b>Total</b>	<b>96.982</b>	<b>7,4</b>	<b>21.003</b>	
Final energy consumption transport	Biodiesel	10.287	1,6	1.947
	Vegetable oil	345	0,1	60
	Bioethanol	486	0,1	104
	RE electricity consumption transport	1.212	0,2	
	<b>Total</b>	<b>12.330</b>	<b>1,9</b>	<b>2.112</b>

## Renewable energy sources in the year 2005

Status: February 2019

		RE 2005	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	19.638	3,2	20.806
	Wind energy onshore	27.774	4,5	22.588
	Wind energy offshore	0	0	0
	Solar Photovoltaic	1.282	0,2	590
	Solid biofuels & sewage sludge	7.478	1,2	6.286
	Liquid biofuels	116	0,02	83
	Biogas	1.696	0,3	466
	Sewage gas	1.096	0,2	1.017
	Landfill gas	1.068	0,2	991
	Biogenic fraction of waste	3.252	0,5	2.981
	Geothermal energy	0,2	0,00003	0,1
	<b>Total</b>	<b>63.400</b>	<b>10,3</b>	<b>55.807</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	52.222	4,1	9.336
	Solid biofuels & charcoal (TCS sector)	9.695	0,8	2.692
	Solid biofuels & sewage sludge (industry)	21.266	1,7	6.199
	Solid biofuels & sewage sludge (HP/CHP)	2.043	0,2	480
	Liquid biofuels	713	0,1	147
	Biogas	820	0,1	118
	Sewage gas	2.086	0,2	510
	Landfill gas	257	0,02	79
	Biogenic fraction of waste	7.199	0,6	1.595
	Solar thermal energy	3.028	0,2	718
	Deep geothermal energy	532	0,04	152
	Near-surface geothermal energy & ambient heat	2.283	0,2	206
<b>Total</b>	<b>102.144</b>	<b>8,0</b>	<b>22.233</b>	
Final energy consumption transport	Biodiesel	18.046	2,9	3.409
	Vegetable oil	2.047	0,3	359
	Bioethanol	1.780	0,3	388
	RE electricity consumption transport	1.353	0,2	
	<b>Total</b>	<b>23.226</b>	<b>3,7</b>	<b>4.156</b>

## Renewable energy sources in the year 2006

Status: February 2019

		RE 2006	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	20.031	3,2	17.285
	Wind energy onshore	31.324	5,0	23.665
	Wind energy offshore	0	0	0
	Solar Photovoltaic	2.220	0,4	1.311
	Solid biofuels & sewage sludge	8.819	1,4	6.778
	Liquid biofuels	719	0,1	427
	Biogas	3.346	0,5	1.004
	Sewage gas	1.057	0,2	699
	Landfill gas	1.092	0,2	723
	Biogenic fraction of waste	3.901	0,6	3.298
	Geothermal energy	0,4	0,0001	0,2
	<b>Total</b>	<b>72.509</b>	<b>11,6</b>	<b>55.191</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	61.774	4,7	11.083
	Solid biofuels & charcoal (TCS sector)	11.120	0,8	3.125
	Solid biofuels & sewage sludge (industry)	20.319	1,5	5.825
	Solid biofuels & sewage sludge (HP/CHP)	2.104	0,2	466
	Liquid biofuels	1.275	0,1	286
	Biogas	1.344	0,1	197
	Sewage gas	1.862	0,1	452
	Landfill gas	259	0,02	79
	Biogenic fraction of waste	8.433	0,6	1.864
	Solar thermal energy	3.547	0,3	839
	Deep geothermal energy	525	0,04	149
	Near-surface geothermal energy & ambient heat	2.747	0,2	253
<b>Total</b>	<b>115.309</b>	<b>8,8</b>	<b>24.618</b>	
Final energy consumption transport	Biodiesel	28.364	4,5	5.351
	Vegetable oil	7.426	1,2	1.317
	Bioethanol	3.828	0,6	842
	RE electricity consumption transport	1.471	0,2	
	<b>Total</b>	<b>41.089</b>	<b>6,5</b>	<b>7.510</b>



## Renewable energy sources in the year 2007

Status: February 2019

	RE 2007 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	21.170	3,4	17.707
	Wind energy onshore	40.507	6,5	30.460
	Wind energy offshore	0	0	0
	Solar Photovoltaic	3.075	0,5	1.809
	Solid biofuels & sewage sludge	8.699	1,4	6.556
	Liquid biofuels	948	0,2	561
	Biogas	8.386	1,3	2.606
	Biomethane	20	0,003	10
	Sewage gas	1.033	0,2	680
	Landfill gas	1.009	0,2	665
	Biogenic fraction of waste	4.521	0,7	3.759
	Geothermal energy	0,4	0,0001	0,3
	<b>Total</b>	<b>89.368</b>	<b>14,3</b>	<b>64.812</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	64.092	5,4	11.643
	Solid biofuels & charcoal (TCS sector)	11.442	1,0	3.229
	Solid biofuels & sewage sludge (industry)	22.367	1,9	6.416
	Solid biofuels & sewage sludge (HP/CHP)	2.225	0,2	516
	Liquid biofuels	1.889	0,2	412
	Biogas	3.646	0,3	547
	Biomethane	21	0,002	3
	Sewage gas	1.865	0,2	449
	Landfill gas	242	0,02	74
	Biogenic fraction of waste	10.747	0,9	2.339
	Solar thermal energy	3.934	0,3	930
	Deep geothermal energy	524	0,04	146
	Near-surface geothermal energy & ambient heat	3.437	0,3	298
<b>Total</b>	<b>126.431</b>	<b>10,7</b>	<b>27.001</b>	
Final energy consumption transport	Biodiesel	33.182	5,3	6.222
	Vegetable oil	8.752	1,4	1.534
	Bioethanol	3.439	0,5	761
	RE electricity consumption transport	1.750	0,3	
	<b>Total</b>	<b>47.123</b>	<b>7,5</b>	<b>8.518</b>

## Renewable energy sources in the year 2008

Status: February 2019

		RE 2008	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	20.443	3,3	16.013
	Wind energy onshore	41.385	6,7	29.089
	Wind energy offshore	0	0	0
	Solar Photovoltaic	4.420	0,7	2.969
	Solid biofuels & sewage sludge	9.296	1,5	6.414
	Liquid biofuels	1.088	0,2	632
	Biogas	10.957	1,8	3.470
	Biomethane	44	0,01	21
	Sewage gas	1.094	0,2	712
	Landfill gas	864	0,1	563
	Biogenic fraction of waste	4.671	0,8	3.647
	Geothermal energy	18	0,003	10
	<b>Total</b>	<b>94.280</b>	<b>15,2</b>	<b>63.540</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	75.797	5,9	13.830
	Solid biofuels & charcoal (TCS sector)	16.046	1,2	4.490
	Solid biofuels & sewage sludge (industry)	20.156	1,6	6.144
	Solid biofuels & sewage sludge (HP/CHP)	2.759	0,2	655
	Liquid biofuels	2.642	0,2	544
	Biogas	3.487	0,3	552
	Biomethane	65	0,005	10
	Sewage gas	1.982	0,2	481
	Landfill gas	179	0,01	55
	Biogenic fraction of waste	6.662	0,5	1.487
	Solar thermal energy	4.474	0,3	1.056
	Deep geothermal energy	550	0,04	159
	Near-surface geothermal energy & ambient heat	4.233	0,3	410
<b>Total</b>	<b>139.032</b>	<b>10,8</b>	<b>29.873</b>	
Final energy consumption transport	Biodiesel	26.630	4,3	5.017
	Vegetable oil	4.188	0,7	730
	Bioethanol	4.673	0,8	1.012
	Biomethane	4	0,001	1
	RE electricity consumption transport	1.688	0,3	
	<b>Total</b>	<b>37.183</b>	<b>6,0</b>	<b>6.760</b>

## Renewable energy sources in the year 2009

Status: February 2019

	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	15.301
	Wind energy onshore	39.382	6,7	28.724
	Wind energy offshore	38	0,01	28
	Solar Photovoltaic	6.583	1,1	4.502
	Solid biofuels & sewage sludge	9.746	1,7	6.928
	Liquid biofuels	1.632	0,3	985
	Biogas	13.188	2,3	4.667
	Biomethane	78	0,01	39
	Sewage gas	1.131	0,2	763
	Landfill gas	788	0,1	532
	Biogenic fraction of waste	4.323	0,7	3.473
	Geothermal energy	19	0,003	11
	<b>Total</b>	<b>95.939</b>	<b>16,4</b>	<b>65.953</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	66.810	5,6	12.222
	Solid biofuels & charcoal (TCS sector)	16.476	1,4	4.589
	Solid biofuels & sewage sludge (industry)	22.972	1,9	6.962
	Solid biofuels & sewage sludge (HP/CHP)	3.581	0,3	858
	Liquid biofuels	3.291	0,3	729
	Biogas	5.088	0,4	810
	Biomethane	131	0,01	19
	Sewage gas	1.984	0,2	474
	Landfill gas	176	0,01	54
	Biogenic fraction of waste	6.530	0,5	1.468
	Solar thermal energy	5.250	0,4	1.238
	Deep geothermal energy	623	0,1	182
	Near-surface geothermal energy & ambient heat	5.096	0,4	513
<b>Total</b>	<b>138.008</b>	<b>11,6</b>	<b>30.117</b>	
Final energy consumption transport	Biodiesel	23.401	3,8	4.397
	Vegetable oil	1.044	0,2	181
	Bioethanol	6.669	1,1	1.410
	Biomethane	13	0,002	3
	RE electricity consumption transport	1.902	0,3	
	<b>Total</b>	<b>33.029</b>	<b>5,4</b>	<b>5.991</b>

## Renewable energy sources in the year 2010

Status: February 2019

	RE 2010 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	20.953	3,4	16.742
	Wind energy onshore	38.371	6,2	27.836
	Wind energy offshore	176	0,03	128
	Solar Photovoltaic	11.729	1,9	7.988
	Solid biofuels & sewage sludge	10.351	1,7	7.489
	Liquid biofuels	1.278	0,2	762
	Biogas	15.300	2,5	5.528
	Biomethane	372	0,1	182
	Sewage gas	1.203	0,2	803
	Landfill gas	674	0,1	450
	Biogenic fraction of waste	4.746	0,8	3.784
	Geothermal energy	28	0,005	16
	<b>Total</b>	<b>105.181</b>	<b>17,0</b>	<b>71.708</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	79.304	6,0	14.363
	Solid biofuels & charcoal (TCS sector)	21.236	1,6	5.848
	Solid biofuels & sewage sludge (industry)	28.088	2,1	7.908
	Solid biofuels & sewage sludge (HP/CHP)	4.057	0,3	950
	Liquid biofuels	3.172	0,2	673
	Biogas	7.502	0,6	1.199
	Biomethane	490	0,04	69
	Sewage gas	2.013	0,2	474
	Landfill gas	129	0,01	39
	Biogenic fraction of waste	7.260	0,5	1.597
	Solar thermal energy	5.592	0,4	1.393
	Deep geothermal energy	689	0,1	196
	Near-surface geothermal energy & ambient heat	5.938	0,4	570
<b>Total</b>	<b>165.470</b>	<b>12,4</b>	<b>35.280</b>	
Final energy consumption transport	Biodiesel	24.474	4,0	4.572
	Vegetable oil	637	0,1	110
	Bioethanol	8.711	1,4	1.815
	Biomethane	75	0,01	33
	RE electricity consumption transport	2.054	0,3	
<b>Total</b>	<b>35.951</b>	<b>5,8</b>	<b>6.530</b>	

## Renewable energy sources in the year 2011

Status: February 2019

	RE 2011 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	17.671	2,9	14.710
	Wind energy onshore	49.280	8,1	38.211
	Wind energy offshore	577	0,1	431
	Solar Photovoltaic	19.599	3,2	13.907
	Solid biofuels & sewage sludge	10.516	1,7	7.897
	Liquid biofuels	382	0,1	237
	Biogas	18.754	3,1	7.621
	Biomethane	576	0,1	300
	Sewage gas	1.280	0,2	883
	Landfill gas	628	0,1	434
	Biogenic fraction of waste	4.755	0,8	3.923
	Geothermal energy	19	0,003	12
	<b>Total</b>	<b>124.037</b>	<b>20,4</b>	<b>88.564</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	71.020	5,8	12.858
	Solid biofuels & charcoal (TCS sector)	15.729	1,3	4.414
	Solid biofuels & sewage sludge (industry)	29.089	2,4	8.384
	Solid biofuels & sewage sludge (HP/CHP)	4.665	0,4	1.102
	Liquid biofuels	2.431	0,2	484
	Biogas	9.059	0,7	1.469
	Biomethane	739	0,1	105
	Sewage gas	2.065	0,2	489
	Landfill gas	111	0,01	34
	Biogenic fraction of waste	8.140	0,7	1.805
	Solar thermal energy	6.389	0,5	1.592
	Deep geothermal energy	722	0,1	207
	Near-surface geothermal energy & ambient heat	6.818	0,6	639
<b>Total</b>	<b>156.977</b>	<b>12,9</b>	<b>33.581</b>	
Final energy consumption transport	Biodiesel	23.606	3,8	4.523
	Vegetable oil	209	0,03	36
	Bioethanol	9.090	1,5	1.885
	Biomethane	92	0,01	16
	RE electricity consumption transport	2.470	0,4	
	<b>Total</b>	<b>35.467</b>	<b>5,7</b>	<b>6.460</b>

## Renewable energy sources in the year 2012

Status: February 2019

	RE 2012 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	21.755	3,6	16.605
	Wind energy onshore	50.948	8,4	34.141
	Wind energy offshore	732	0,1	497
	Solar Photovoltaic	26.380	4,3	16.391
	Solid biofuels & sewage sludge	10.693	1,8	7.417
	Liquid biofuels	246	0,04	140
	Biogas	24.395	4,0	8.690
	Biomethane	1.068	0,2	489
	Sewage gas	1.314	0,2	838
	Landfill gas	536	0,1	342
	Biogenic fraction of waste	4.951	0,8	3.801
	Geothermal energy	25	0,004	14
	<b>Total</b>	<b>143.043</b>	<b>23,5</b>	<b>89.365</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	84.372	6,9	15.353
	Solid biofuels & charcoal (TCS sector)	17.196	1,4	4.852
	Solid biofuels & sewage sludge (industry)	27.793	2,3	7.846
	Solid biofuels & sewage sludge (HP/CHP)	5.776	0,5	1.376
	Liquid biofuels	2.020	0,2	426
	Biogas	8.523	0,7	1.300
	Biomethane	1.277	0,1	173
	Sewage gas	2.020	0,2	466
	Landfill gas	104	0,01	31
	Biogenic fraction of waste	9.033	0,7	2.017
	Solar thermal energy	6.640	0,5	1.655
	Deep geothermal energy	804	0,1	233
	Near-surface geothermal energy & ambient heat	7.766	0,6	711
<b>Total</b>	<b>173.324</b>	<b>14,2</b>	<b>36.439</b>	
Final energy consumption transport	Biodiesel	24.530	4,0	4.977
	Vegetable oil	261	0,04	45
	Bioethanol	9.208	1,5	1.892
	Biomethane	333	0,1	64
	RE electricity consumption transport	2.826	0,5	
	<b>Total</b>	<b>37.158</b>	<b>6,0</b>	<b>6.978</b>

## Renewable energy sources in the year 2013

Status: February 2019

	RE 2013 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	22.998	3,8	17.428
	Wind energy onshore	51.819	8,5	34.690
	Wind energy offshore	918	0,2	622
	Solar Photovoltaic	31.010	5,1	19.092
	Solid biofuels & sewage sludge	10.555	1,7	7.339
	Liquid biofuels	288	0,05	162
	Biogas	25.832	4,3	9.188
	Biomethane	1.632	0,3	738
	Sewage gas	1.308	0,2	827
	Landfill gas	483	0,1	306
	Biogenic fraction of waste	5.415	0,9	4.129
	Geothermal energy	80	0,01	44
	<b>Total</b>	<b>152.338</b>	<b>25,1</b>	<b>94.565</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	87.292	6,8	15.917
	Solid biofuels & charcoal (TCS sector)	18.258	1,4	5.197
	Solid biofuels & sewage sludge (industry)	25.600	2,0	6.890
	Solid biofuels & sewage sludge (HP/CHP)	5.532	0,4	1.165
	Liquid biofuels	2.086	0,2	423
	Biogas	9.329	0,7	1.414
	Biomethane	2.268	0,2	301
	Sewage gas	1.807	0,1	413
	Landfill gas	103	0,01	30
	Biogenic fraction of waste	11.645	0,9	2.587
	Solar thermal energy	6.701	0,5	1.668
	Deep geothermal energy	864	0,1	248
	Near-surface geothermal energy & ambient heat	8.732	0,7	787
<b>Total</b>	<b>180.217</b>	<b>14,1</b>	<b>37.042</b>	
Final energy consumption transport	Biodiesel	21.998	3,5	4.469
	Vegetable oil	10	0,002	2
	Bioethanol	8.891	1,4	1.858
	Biomethane	483	0,1	95
	RE electricity consumption transport	2.993	0,5	
	<b>Total</b>	<b>34.375</b>	<b>5,5</b>	<b>6.423</b>

## Renewable energy sources in the year 2014

Status: February 2019

	RE 2014 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	19.587	3,3	14.790
	Wind energy onshore	57.026	9,6	38.030
	Wind energy offshore	1.471	0,2	993
	Solar Photovoltaic	36.056	6,1	22.119
	Solid biofuels & sewage sludge	10.798	1,8	7.459
	Liquid biofuels	334	0,1	187
	Biogas	27.062	4,6	9.615
	Biomethane	2.253	0,4	1.017
	Sewage gas	1.336	0,2	842
	Landfill gas	435	0,1	275
	Biogenic fraction of waste	6.069	1,0	4.609
	Geothermal energy	98	0,02	55
	<b>Total</b>	<b>162.525</b>	<b>27,4</b>	<b>99.990</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	69.484	6,0	12.808
	Solid biofuels & charcoal (TCS sector)	14.725	1,3	4.138
	Solid biofuels & sewage sludge (industry)	26.530	2,3	7.181
	Solid biofuels & sewage sludge (HP/CHP)	5.465	0,5	1.164
	Liquid biofuels	2.225	0,2	456
	Biogas	10.593	0,9	1.614
	Biomethane	2.917	0,3	391
	Sewage gas	1.804	0,2	413
	Landfill gas	110	0,01	32
	Biogenic fraction of waste	11.380	1,0	2.531
	Solar thermal energy	7.206	0,6	1.794
	Deep geothermal energy	1.052	0,1	304
	Near-surface geothermal energy & ambient heat	9.643	0,8	903
<b>Total</b>	<b>163.134</b>	<b>14,2</b>	<b>33.729</b>	
Final energy consumption transport	Biodiesel	22.760	3,6	4.688
	Vegetable oil	63	0,01	11
	Bioethanol	9.061	1,4	1.904
	Biomethane	449	0,1	90
	RE electricity consumption transport	3.157	0,5	
	<b>Total</b>	<b>35.490</b>	<b>5,6</b>	<b>6.694</b>



## Renewable energy sources in the year 2015

Status: February 2019

	RE 2015 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	18.977	3,2	14.327
	Wind energy onshore	72.340	12,1	48.249
	Wind energy offshore	8.284	1,4	5.591
	Solar Photovoltaic	38.726	6,5	23.781
	Solid biofuels & sewage sludge	11.034	1,8	7.619
	Liquid biofuels	426	0,1	239
	Biogas	28.636	4,8	10.370
	Biomethane	2.677	0,4	1.229
	Sewage gas	1.389	0,2	880
	Landfill gas	396	0,1	251
	Biogenic fraction of waste	5.768	1,0	4.380
	Geothermal energy	133	0,02	75
	<b>Total</b>	<b>188.786</b>	<b>31,5</b>	<b>116.991</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	69.537	5,8	12.722
	Solid biofuels & charcoal (TCS sector)	16.684	1,4	4.650
	Solid biofuels & sewage sludge (industry)	25.108	2,1	6.829
	Solid biofuels & sewage sludge (HP/CHP)	5.957	0,5	1.295
	Liquid biofuels	2.114	0,2	439
	Biogas	11.580	1,0	1.791
	Biomethane	3.509	0,3	484
	Sewage gas	2.003	0,2	456
	Landfill gas	141	0,01	42
	Biogenic fraction of waste	11.807	1,0	2.645
	Solar thermal energy	7.706	0,6	1.916
	Deep geothermal energy	969	0,1	284
	Near-surface geothermal energy & ambient heat	10.510	0,9	1.066
<b>Total</b>	<b>167.625</b>	<b>14,0</b>	<b>34.618</b>	
Final energy consumption transport	Biodiesel	20.840	3,3	4.379
	Vegetable oil	21	0,003	4
	Bioethanol	8.648	1,4	1.844
	Biomethane	345	0,1	70
	RE electricity consumption transport	3.512	0,6	
	<b>Total</b>	<b>33.366</b>	<b>5,2</b>	<b>6.297</b>

## Renewable energy sources in the year 2016

Status: February 2019

	RE 2016 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	20.546	3,4	15.506
	Wind energy onshore	67.650	11,3	45.108
	Wind energy offshore	12.274	2,0	8.282
	Solar Photovoltaic	38.098	6,4	23.395
	Solid biofuels & sewage sludge	10.797	1,8	7.439
	Liquid biofuels	489	0,1	274
	Biogas	29.271	4,9	10.538
	Biomethane	2.643	0,4	1.218
	Sewage gas	1.440	0,2	914
	Landfill gas	358	0,1	227
	Biogenic fraction of waste	5.930	1,0	4.502
	Geothermal energy	175	0,03	100
	<b>Total</b>	<b>189.671</b>	<b>31,6</b>	<b>117.501</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	64.004	5,2	11.691
	Solid biofuels & charcoal (TCS sector)	16.125	1,3	4.540
	Solid biofuels & sewage sludge (industry)	27.031	2,2	7.296
	Solid biofuels & sewage sludge (HP/CHP)	6.259	0,5	1.346
	Liquid biofuels	2.113	0,2	462
	Biogas	12.359	1,0	1.896
	Biomethane	3.563	0,3	495
	Sewage gas	2.053	0,2	467
	Landfill gas	136	0,01	40
	Biogenic fraction of waste	11.669	1,0	2.568
	Solar thermal energy	7.693	0,6	1.911
	Deep geothermal energy	1.146	0,1	330
	Near-surface geothermal energy & ambient heat	11.419	0,9	1.192
<b>Total</b>	<b>165.570</b>	<b>13,5</b>	<b>34.233</b>	
Final energy consumption transport	Biodiesel	20.866	3,2	4.855
	Vegetable oil	42	0,01	7
	Bioethanol	8.663	1,3	1.968
	Biomethane	379	0,1	84
	RE electricity consumption transport	3.709	0,6	
	<b>Total</b>	<b>33.659</b>	<b>5,2</b>	<b>6.915</b>

## Renewable energy sources in the year 2017

Status: February 2019

	RE 2017 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO <sub>2</sub> -eq.]	
Gross electricity production	Hydropower	20.150	3,4	15.209
	Wind energy onshore	88.018	14,6	58.691
	Wind energy offshore	17.675	2,9	11.927
	Solar Photovoltaic	39.401	6,6	24.199
	Solid biofuels & sewage sludge	10.658	1,8	7.333
	Liquid biofuels	437	0,1	245
	Biogas	29.325	4,9	10.572
	Biomethane	2.757	0,5	1.273
	Sewage gas	1.460	0,2	928
	Landfill gas	338	0,1	214
	Biogenic fraction of waste	5.956	1,0	4.522
	Geothermal energy	163	0,03	93
	<b>Total</b>	<b>216.338</b>	<b>36,0</b>	<b>135.205</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	65.840	5,2	12.002
	Solid biofuels & charcoal (TCS sector)	17.527	1,4	4.927
	Solid biofuels & sewage sludge (industry)	26.326	2,1	7.151
	Solid biofuels & sewage sludge (HP/CHP)	6.193	0,5	1.327
	Liquid biofuels	2.124	0,2	481
	Biogas	12.991	1,0	1.993
	Biomethane	3.527	0,3	491
	Sewage gas	2.144	0,2	487
	Landfill gas	126	0,01	37
	Biogenic fraction of waste	12.669	1,0	2.788
	Solar thermal energy	7.853	0,6	1.950
	Deep geothermal energy	1.168	0,1	337
	Near-surface geothermal energy & ambient heat	12.442	1,0	1.318
<b>Total</b>	<b>170.930</b>	<b>13,4</b>	<b>35.290</b>	
Final energy consumption transport	Biodiesel	21.248	3,2	5.153
	Vegetable oil	10	0,002	2
	Bioethanol	8.530	1,3	2.123
	Biomethane	445	0,1	99
	RE electricity consumption transport	4.026	0,6	
	<b>Total</b>	<b>34.259</b>	<b>5,2</b>	<b>7.377</b>

## Renewable energy sources in the year 2018

Status: February 2019

		RE 2018	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	16.500	2,8	12.452
	Wind energy onshore	92.249	15,4	61.512
	Wind energy offshore	19.341	3,2	13.050
	Solar Photovoltaic	46.164	7,7	28.353
	Solid biofuels & sewage sludge	10.730	1,8	7.391
	Liquid biofuels	437	0,1	245
	Biogas	29.450	4,9	10.617
	Biomethane	2.703	0,5	1.248
	Sewage gas	1.490	0,2	947
	Landfill gas	300	0,1	190
	Biogenic fraction of waste	6.155	1,0	4.673
	Geothermal energy	172	0,03	98
	<b>Total</b>	<b>225.691</b>	<b>37,8</b>	<b>140.776</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	63.860	5,2	11.622
	Solid biofuels & charcoal (TCS sector)	17.496	1,4	4.946
	Solid biofuels & sewage sludge (industry)	26.326	2,1	7.151
	Solid biofuels & sewage sludge (HP/CHP)	5.659	0,5	1.208
	Liquid biofuels	2.242	0,2	510
	Biogas	13.288	1,1	2.039
	Biomethane	3.444	0,3	479
	Sewage gas	2.159	0,2	490
	Landfill gas	122	0,01	36
	Biogenic fraction of waste	12.719	1,0	2.799
	Solar thermal energy	8.877	0,7	2.204
	Deep geothermal energy	1.133	0,1	327
	Near-surface geothermal energy & ambient heat	13.551	1,1	1.435
<b>Total</b>	<b>170.876</b>	<b>13,9</b>	<b>35.244</b>	
Final energy consumption transport	Biodiesel	22.419	3,5	5.437
	Vegetable oil	10	0,002	2
	Bioethanol	8.795	1,4	2.189
	Biomethane	401	0,1	89
	RE electricity consumption transport	4.296	0,7	
	<b>Total</b>	<b>35.921</b>	<b>5,6</b>	<b>7.717</b>

### 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:

This time series was revised as from 2003 with the help of the updated results of the research project “GHD-Festbiomasse im Wärmesektor“ (“TCS solid biofuels in the heat sector”) done by the Thünen Institute. Therein the current empirical survey of the research project “Resource monitoring for wood” [15] was taken into account.

Final energy consumption from solid biofuels for heat production in the TCS sector

Main part of the total TCS time series in the heat sector is the time series for the final energy consumption from solid biofuels for heat only production in the TCS sector.

### 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)

103

Tera (T)

1012

1 GWh = 1 million kWh

Mega (M)

106

Peta (P)

1015

1 MWh = 1.000 kWh

Giga (G)

109

Exa (E)

1018

### 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

### 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, <a href="http://www.geotis.de">www.geotis.de</a> .
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, <a href="http://www.netztransparenz.de">www.netztransparenz.de</a>
ZSW	Centre for Solar Energy and Hydrogen Research Baden-Württemberg, Stuttgart.

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