



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: December 2020)

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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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Section V 1.5 - Energy data,  
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Table 1: Development of renewable energy sources 1990 to 2019

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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
Gross final energy consumption <sup>1)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	166.461	187.890	228.151	261.613	269.297	266.408	305.282	316.322	352.687	365.780	359.478	389.989	389.555	420.915	436.824	457.517
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	216.324	224.506	242.434
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	88.366	97.459	102.613	115.962	127.330	139.637	139.036	165.591	158.181	173.716	180.487	162.779	169.330	167.718	172.021	178.218	181.733
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	8.998	11.765	22.627	40.443	45.956	36.215	32.418	35.614	35.341	37.202	34.257	35.350	33.307	33.641	34.613	36.045	36.040

  

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
Gross final energy consumption EU-Directive <sup>3)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	165.660	188.845	228.684	256.732	268.055	271.024	311.664	316.177	350.553	364.737	362.141	382.324	388.573	407.407	434.743	448.121
Final energy consumption in the transport sector EU-Directive <sup>3)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.607	24.364	41.883	45.902	37.879	34.606	38.281	39.049	43.940	44.729	42.860	41.415	45.194	46.141	50.341	49.397

  

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
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	1.830	1.905

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 2019

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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
of gross final energy consumption <sup>1)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,2	7,1	8,4	10,2	10,1	10,7	11,4	12,5	13,6	13,8	14,3	15,2	14,9	16,0	16,8	17,7
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	42,0
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	6,6	7,4	8,0	8,8	10,8	10,8	11,7	12,4	13,0	14,2	14,1	14,1	14,1	13,7	13,9	15,0	15,0
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
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
of gross final energy consumption EU-Directive <sup>2)</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	17,4
of final energy consumption in the transport sector EU-Directive <sup>2)</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	7,7
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	2019
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	13,2	13,9	14,9

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 2019

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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
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	17.693	19.731
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
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
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	45.784	46.392
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	11.167	11.106
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	452	397
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	28.655	28.425
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	2.602	2.620
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
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	306	285
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
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
<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>216.324</b>	<b>224.506</b>	<b>242.434</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

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 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]; AGEb [1]; DBFZ [13]; IE [21]; partially preliminary data

**Table 5: Final energy consumption from renewable sources for heating and cooling 1990 to 2019**

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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
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	61.976	64.092	75.670	67.523	79.304	72.227	84.790	87.672	69.484	71.603	66.462	68.234	70.193	71.354
Solid biofuels (TCS sector) <sup>2)</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	6.972	9.581	9.695	11.120	11.443	16.046	16.476	21.236	15.703	17.206	18.337	14.525	16.583	16.057	16.666	18.508	19.146
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
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
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	3.351	2.558	2.090	2.191	2.357	2.174	2.173	2.180	2.235	2.380
Biogas	-	-	-	-	-	-	-	-	-	-	-	-	-	297	441	813	1.334	3.638	3.482	5.062	7.472	8.972	8.422	9.257	10.451	11.342	12.108	12.816	13.024	13.315
Biomethane	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	21	65	131	490	739	1.286	2.059	2.789	3.451	3.548	3.261	3.191	3.314
Sewage gas	-	-	-	-	-	-	-	-	-	-	-	-	-	1.830	1.968	2.082	1.852	1.858	1.977	1.977	1.999	2.059	2.017	1.805	1.801	2.001	2.050	2.141	2.500	2.402
Landfill gas	-	-	-	-	-	-	-	-	-	-	-	-	-	176	165	231	227	210	154	155	117	101	94	93	98	120	116	107	110	102
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
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	5.590	6.388	6.638	6.700	7.204	7.705	7.691	7.852	8.875	8.483
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
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
<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>88.366</b>	<b>97.459</b>	<b>102.613</b>	<b>115.962</b>	<b>127.330</b>	<b>139.637</b>	<b>139.036</b>	<b>165.591</b>	<b>158.181</b>	<b>173.716</b>	<b>180.487</b>	<b>162.779</b>	<b>169.330</b>	<b>167.718</b>	<b>172.021</b>	<b>178.218</b>	<b>181.733</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 4: Installed electrical capacity of renewable energy plants 1990 to 2019**

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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
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	5.585	5.595
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	53.193
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	7.528
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	49.047
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	1.606	1.605
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
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	5.616	5.947
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	557	558
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
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	167	167
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
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
<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>119.166</b>	<b>125.398</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 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 6: Final energy consumption from renewable sources in the transport sector 1990 to 2019

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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
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	23.545	24.628	21.934	22.676	20.829	20.896	21.354	22.370	22.109
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	10
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	8.552	9.046	9.164	8.847	9.016	8.611	8.626	8.478	8.707	8.375
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
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	4.305	4.569	4.886
<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>40.443</b>	<b>45.956</b>	<b>36.215</b>	<b>32.418</b>	<b>35.614</b>	<b>35.341</b>	<b>37.202</b>	<b>34.257</b>	<b>35.350</b>	<b>33.307</b>	<b>33.641</b>	<b>34.613</b>	<b>36.045</b>	<b>36.040</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
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	2.257	2.322	2.058	2.148	1.998	2.005	2.073	2.173	2.145
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	1
Bioethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65	238	512	460	625	892	1.160	1.227	1.243	1.200	1.223	1.168	1.170	1.150	1.181	1.136
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
<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>3.582</b>	<b>3.509</b>	<b>3.614</b>	<b>3.294</b>	<b>3.409</b>	<b>3.192</b>	<b>3.206</b>	<b>3.259</b>	<b>3.384</b>	<b>3.331</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 2019**

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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
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	592,6	605,9	615,4	618,5	623,3	625,0	621,4	584,2	618,2	609,4	608,7	606,5	593,9	600,0	599,9	601,3	594,5	577,4
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	1.241,4	1.191,7	1.214,2
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	657,8	647,9	647,1
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
Gross final energy consumption EU-Directive <sup>4)</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	9.388	9.297
Final energy consumption in the transport sector EU-Directive <sup>4)</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	2.288	2.315
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
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	13.523	13.129	12.740

1) gross electricity production by fossil fuels accounting to AGEB status September 2020, data on electricity trade according to StBA

2) calculated without electricity consumption for heating and cooling based on the "usage balances" of the AGEB, status October 2020; 2019 preliminary adjusted by AGEE-Stat, status November 2020

3) calculated without energy consumption for international aviation based on AGEB, status August 2020; 2019 preliminary adjusted by AGEE-Stat, status November 2020

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

5) calculated with the "physical energy content" principle, calculation based on AGEB, status August 2020; 2019 preliminary adjusted by AGEE-Stat, status November 2020

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 2019**

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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
by RE gross electricity production	21.315	18.398	21.480	22.296	25.038	27.582	27.360	22.439	23.784	28.056	33.903	36.751	43.176	42.934	52.655	55.708	55.139	65.068	63.904	66.392	72.166	88.887	89.834	93.181	110.141	123.353	125.426	137.148	144.939	157.676
by RE final energy consumption for heating and cooling	6.523	6.553	6.568	6.586	6.609	6.635	6.633	9.996	11.261	11.439	11.551	12.925	12.705	18.578	21.192	22.431	24.863	27.383	30.176	30.485	35.549	34.134	36.795	37.421	33.973	34.328	34.109	34.877	36.081	36.695
by RE final energy consumption in the transport sector <sup>1) 2)</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	6.445	6.997	6.409	6.675	6.292	6.911	7.394	7.735	7.505
<b>Total avoided GHG-emissions</b>	<b>27.838</b>	<b>24.951</b>	<b>28.061</b>	<b>28.897</b>	<b>31.707</b>	<b>34.295</b>	<b>34.111</b>	<b>32.632</b>	<b>35.265</b>	<b>39.782</b>	<b>45.980</b>	<b>50.407</b>	<b>57.008</b>	<b>63.132</b>	<b>75.959</b>	<b>82.295</b>	<b>87.512</b>	<b>100.969</b>	<b>100.840</b>	<b>102.868</b>	<b>114.245</b>	<b>129.466</b>	<b>133.626</b>	<b>137.011</b>	<b>150.789</b>	<b>163.973</b>	<b>166.446</b>	<b>179.419</b>	<b>188.755</b>	<b>201.876</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
Avoidance factor of RE gross electricity production	1.126	1.117	1.116	1.108	1.101	1.089	1.047	990	948	971	936	949	950	920	909	879	760	728	678	692	686	717	628	612	678	653	661	634	646	650
Avoidance factor of RE final energy consumption for heating and cooling	201	201	201	200	200	200	199	197	201	198	202	201	201	214	221	222	217	218	219	222	217	219	215	210	212	205	206	205	205	204
Avoidance factor of RE final energy consumption in the transport sector <sup>1) 2)</sup>	-	189	185	183	189	189	190	191	192	192	191	191	190	203	200	195	193	193	196	196	195	196	204	205	207	211	231	244	246	241

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

2) based on BLE data for the year 2019 and the fossil reference value according to the EU-Directive 2009/28/EC (83,8 g CO<sub>2</sub>-eq./MJ), fossil reference values of § 10 of 38. BImSchV deviate from this value (93,3 g CO<sub>2</sub>-eq./MJ for petrol and 95,1 g CO<sub>2</sub>-eq./MJ for diesel fuel)

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 2019**

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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
by RE gross electricity production	21.105	18.216	21.264	22.073	24.785	27.290	27.061	22.160	23.466	27.620	33.167	35.927	41.876	41.361	50.339	53.833	52.178	61.656	61.132	64.325	70.419	86.035	87.950	91.523	107.390	124.243	126.956	137.624	144.804	156.772
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	18.156	20.620	21.965	24.352	27.030	29.908	30.274	35.827	34.466	37.215	38.018	34.708	35.610	35.448	36.263	37.472	38.116
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	7.599	8.074	7.369	7.646	7.162	7.651	8.102	8.398	8.195
<b>Total avoided CO<sub>2</sub>-emissions</b>	<b>27.561</b>	<b>24.706</b>	<b>27.784</b>	<b>28.612</b>	<b>31.401</b>	<b>33.954</b>	<b>33.755</b>	<b>32.368</b>	<b>34.926</b>	<b>39.308</b>	<b>45.238</b>	<b>49.634</b>	<b>55.820</b>	<b>61.474</b>	<b>73.512</b>	<b>80.861</b>	<b>85.789</b>	<b>99.267</b>	<b>99.325</b>	<b>101.843</b>	<b>114.122</b>	<b>128.100</b>	<b>133.239</b>	<b>136.910</b>	<b>149.744</b>	<b>167.015</b>	<b>170.055</b>	<b>181.989</b>	<b>190.674</b>	<b>203.083</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
Avoidance factor of RE gross electricity production	1.115	1.106	1.105	1.097	1.090	1.078	1.035	977	935	956	916	927	922	886	869	849	720	690	648	670	670	694	615	601	661	658	669	636	645	647
Avoidance factor of RE final energy consumption for heating and cooling	199	199	199	198	198	198	196	197	200	196	200	200	199	209	215	217	213	215	217	221	219	221	217	213	216	213	214	213	213	212
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	236	238	240	256	267	267	263

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 2019 <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
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	26,3	24,9	25,0	22,9	24,4	33,6	23,1	21,6	32,2	94,4	83,0	98,1	107,0	122,6
by RE final energy consumption for heating and cooling	6,8	6,8	6,8	6,8	6,8	6,8	5,6	8,4	7,5	6,1	4,7	5,2	4,5	6,6	5,9	1,7	1,4	0,33	6,0	2,9	0,7	0,0	-2,5	-6,9	-5,3	-9,9	-10,3	-10,9	-11,4	-11,9
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	-4,6
<b>Total avoided acidifying agents <sup>2)</sup></b>	<b>130,2</b>	<b>112,4</b>	<b>130,4</b>	<b>134,7</b>	<b>149,9</b>	<b>163,5</b>	<b>134,1</b>	<b>91,4</b>	<b>70,4</b>	<b>61,8</b>	<b>46,1</b>	<b>46,6</b>	<b>47,9</b>	<b>40,0</b>	<b>42,8</b>	<b>34,3</b>	<b>24,1</b>	<b>13,3</b>	<b>23,2</b>	<b>21,0</b>	<b>18,1</b>	<b>29,0</b>	<b>14,6</b>	<b>7,8</b>	<b>22,1</b>	<b>80,8</b>	<b>69,1</b>	<b>84,1</b>	<b>92,3</b>	<b>106,1</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
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	0,50	0,44	0,45	0,48	0,51
Avoidance factor of RE final energy consumption for heating and cooling	0,21	0,21	0,21	0,21	0,21	0,21	0,17	0,17	0,13	0,11	0,08	0,08	0,07	0,08	0,06	0,02	0,01	0,00	0,04	0,02	0,00	0,00	-0,01	-0,04	-0,03	-0,06	-0,06	-0,06	-0,06	-0,07
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	-0,10	-0,11	-0,15

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 NO<sub>x</sub> 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 2019**

Status: December 2020

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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
Hydropower	520	340	120	170	200	230	210	270	300	410	310	260	180	130	90	80	60	50	30	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	3.280	1.480
Wind energy offshore	-	-	-	-	-	-	-	30	170	470	450	610	2.440	4.270	3.940	3.680	3.380	3.420	4.220	2.080
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	3.540
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	420
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
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	380	360
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	1.530	1.360	1.270	1.230	1.230	1.240	1.230
<b>Total</b>	<b>4.700</b>	<b>6.280</b>	<b>6.960</b>	<b>7.400</b>	<b>9.940</b>	<b>12.020</b>	<b>13.940</b>	<b>13.560</b>	<b>17.650</b>	<b>23.510</b>	<b>27.850</b>	<b>26.080</b>	<b>22.450</b>	<b>16.450</b>	<b>16.440</b>	<b>13.910</b>	<b>15.330</b>	<b>15.780</b>	<b>13.740</b>	<b>10.540</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 2019**

Status: December 2020

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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
Hydropower	100	110	110	120	120	130	130	140	150	160	170	180	190	190	200	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	2.220	2.290
Wind energy offshore	-	-	-	-	-	-	-	-	-	10	20	30	60	130	210	280	350	420	500	570
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
Solar thermal energy	-	10	20	30	40	50	70	90	110	140	170	190	210	230	240	260	270	290	300	310
Geothermal energy, ambient heat	170	180	190	200	220	240	290	360	440	530	620	730	820	900	990	1.080	1.170	1.270	1.370	1.490
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	4.450	4.450	4.470	4.500	4.520
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	3.020	3.190	3.400	3.420	3.440	3.470
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
<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>12.970</b>	<b>14.440</b>	<b>14.560</b>	<b>14.550</b>	<b>15.050</b>	<b>15.730</b>	<b>16.330</b>	<b>16.740</b>	<b>17.230</b>

1) differences in the totals may occur due to roundings

Source: ZSW [32]; partially preliminary data

## Renewable energy sources in the year 1990

Status: December 2020

		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	35
	Wind energy offshore	0		0	0
	Solar Photovoltaic	1		0,0002	0,4
	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	4.919
	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: December 2020

		RE 1991	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	14.891	2,8	17.389
	Wind energy onshore	102	0,02	49
	Wind energy offshore	0	0	0
	Solar Photovoltaic	1	0,0002	0,4
	Solid biofuels	9	0,002	4
	Liquid biofuels	0	0	0
	Biogas	2	0,0004	0,3
	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>	<b>18.398</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,7	4.937
	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>	<b>6.554</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

Status: December 2020

		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	20.321
	Wind energy onshore	281	0,1	135
	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	0,4
	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>21.480</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,8	4.937
	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>6.568</b>
Final energy consumption transport	Biodiesel	52	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: December 2020

		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	294
	Wind energy offshore	0	0	0
	Solar Photovoltaic	3	0,001	1,3
	Solid biofuels	32	0,01	16
	Liquid biofuels	0	0	0
	Biogas	4	0,001	0,6
	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>22.296</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,8	4.937
	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>6.586</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: December 2020

		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	445
	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	0,9
	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>25.038</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,8	4.937
	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>6.609</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: December 2020

		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	25.448
	Wind energy onshore	1.530	0,3	734
	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	2,8
	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>	<b>27.582</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,8	4.937
	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>	<b>6.635</b>
Final energy consumption transport	Biodiesel	362	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>	<b>78</b>

## Renewable energy sources in the year 1996

Status: December 2020

		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	974
	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	4,2
	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>27.360</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	1,7	4.887
	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>6.633</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: December 2020

		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	19.572
	Wind energy onshore	3.025	0,6	1.380
	Wind energy offshore	0	0	0
	Solar Photovoltaic	18	0,003	7
	Solid biofuels	179	0,03	82
	Liquid biofuels	0	0	0
	Biogas	44	0,01	5,4
	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>	<b>22.439</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	42.740	2,9	8.242
	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>	<b>9.996</b>
Final energy consumption transport	Biodiesel	930	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>	<b>197</b>

## Renewable energy sources in the year 1998

Status: December 2020

		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	19.114
	Wind energy onshore	4.579	0,8	2.307
	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	18
	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>23.784</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	44.369	3,1	8.521
	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>11.261</b>
Final energy consumption transport	Biodiesel	1.033	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: December 2020

		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	3.216
	Wind energy offshore	0	0	0
	Solar Photovoltaic	30	0,01	12
	Solid biofuels	246	0,04	144
	Liquid biofuels	0	0	0
	Biogas	145	0,03	31
	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>28.056</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	45.590	3,4	8.627
	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>11.439</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: December 2020

		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	23.829
	Wind energy onshore	9.703	1,7	6.419
	Wind energy offshore	0	0	0
	Solar Photovoltaic	60	0,01	27
	Solid biofuels	925	0,2	633
	Liquid biofuels	0	0	0
	Biogas	445	0,1	133
	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>	<b>33.903</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	45.834	3,5	8.653
	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>	<b>11.551</b>
Final energy consumption transport	Biodiesel	2.583	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>	<b>526</b>

## Renewable energy sources in the year 2001

Status: December 2020

		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	7.583
	Wind energy offshore	0	0	0
	Solar Photovoltaic	76	0,01	32
	Solid biofuels	1.112	0,2	809
	Liquid biofuels	15	0,003	8
	Biogas	745	0,1	234
	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>36.751</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	52.307	3,7	9.925
	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>12.925</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: December 2020

		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	12.606
	Wind energy offshore	0	0	0
	Solar Photovoltaic	162	0,03	69
	Solid biofuels	1.485	0,3	1.206
	Liquid biofuels	20	0,003	13
	Biogas	1.046	0,2	390
	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>43.176</b>
Final energy consumption for heating and cooling	Solid biofuels (households)	50.963	3,8	9.600
	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>12.705</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: December 2020

		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	3,2	15.631
	Wind energy offshore	0	0	0
	Solar Photovoltaic	313	0,1	140
	Solid biofuels & sewage sludge	3.392	0,6	2.904
	Liquid biofuels	52	0,01	35
	Biogas	1.518	0,3	609
	Sewage gas	955	0,2	907
	Landfill gas	793	0,1	754
	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>42.934</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	54.279	4,0	9.908
	Solid biofuels & charcoal (TCS sector)	6.972	0,5	1.954
	Solid biofuels & sewage sludge (industry)	12.442	0,9	3.591
	Solid biofuels & sewage sludge (HP/CHP)	994	0,1	240
	Liquid biofuels	701	0,05	146
	Biogas	297	0,02	53
	Sewage gas	1.830	0,1	451
	Landfill gas	176	0,01	54
	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	160
<b>Total</b>	<b>88.366</b>	<b>6,6</b>	<b>18.578</b>	
Final energy consumption transport	Biodiesel	7.919	1,2	1.569
	Vegetable oil	73	0,01	51
	Bioethanol	0	0	0
	RE electricity consumption transport	1.006	0,2	
	<b>Total</b>	<b>8.998</b>	<b>1,4</b>	<b>1.620</b>

## Renewable energy sources in the year 2004

Status: December 2020

		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	21.256
	Wind energy offshore	0	0	0
	Solar Photovoltaic	557	0,1	249
	Solid biofuels & sewage sludge	5.162	0,8	4.407
	Liquid biofuels	136	0,02	92
	Biogas	1.111	0,2	450
	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>52.655</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	53.044	4,0	9.602
	Solid biofuels & charcoal (TCS sector)	9.581	0,7	2.676
	Solid biofuels & sewage sludge (industry)	18.462	1,4	5.416
	Solid biofuels & sewage sludge (HP/CHP)	1.797	0,1	434
	Liquid biofuels	819	0,06	180
	Biogas	441	0,03	79
	Sewage gas	1.968	0,1	481
	Landfill gas	165	0,01	50
	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>97.459</b>	<b>7,4</b>	<b>21.192</b>	
Final energy consumption transport	Biodiesel	9.942	1,5	1.947
	Vegetable oil	125	0,0	60
	Bioethanol	486	0,1	104
	RE electricity consumption transport	1.212	0,2	
	<b>Total</b>	<b>11.765</b>	<b>1,8</b>	<b>2.112</b>

## Renewable energy sources in the year 2005

Status: December 2020

		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	22.305
	Wind energy offshore	0	0	0
	Solar Photovoltaic	1.282	0,2	572
	Solid biofuels & sewage sludge	7.478	1,2	6.286
	Liquid biofuels	116	0,02	76
	Biogas	1.696	0,3	673
	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>55.708</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	52.222	4,1	9.398
	Solid biofuels & charcoal (TCS sector)	9.695	0,8	2.694
	Solid biofuels & sewage sludge (industry)	21.266	1,7	6.199
	Solid biofuels & sewage sludge (HP/CHP)	2.043	0,2	480
	Liquid biofuels	1.219	0,1	261
	Biogas	813	0,1	148
	Sewage gas	2.082	0,2	509
	Landfill gas	231	0,02	71
	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>102.613</b>	<b>8,0</b>	<b>22.431</b>	
Final energy consumption transport	Biodiesel	17.666	2,8	3.409
	Vegetable oil	1.828	0,3	359
	Bioethanol	1.780	0,3	388
	RE electricity consumption transport	1.353	0,2	
	<b>Total</b>	<b>22.627</b>	<b>3,6</b>	<b>4.156</b>

## Renewable energy sources in the year 2006

Status: December 2020

		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	23.309
	Wind energy offshore	0	0	0
	Solar Photovoltaic	2.220	0,4	1.282
	Solid biofuels & sewage sludge	8.819	1,4	6.779
	Liquid biofuels	719	0,1	386
	Biogas	3.346	0,5	1.378
	Sewage gas	1.057	0,2	700
	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>55.139</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	61.976	4,7	11.195
	Solid biofuels & charcoal (TCS sector)	11.120	0,8	3.127
	Solid biofuels & sewage sludge (industry)	20.319	1,5	5.823
	Solid biofuels & sewage sludge (HP/CHP)	2.104	0,2	466
	Liquid biofuels	1.778	0,1	386
	Biogas	1.334	0,1	242
	Sewage gas	1.852	0,1	450
	Landfill gas	227	0,02	69
	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>115.962</b>	<b>8,8</b>	<b>24.863</b>	
Final energy consumption transport	Biodiesel	27.938	4,4	5.351
	Vegetable oil	7.206	1,1	1.317
	Bioethanol	3.828	0,6	842
	RE electricity consumption transport	1.471	0,2	
	<b>Total</b>	<b>40.443</b>	<b>6,4</b>	<b>7.510</b>



## Renewable energy sources in the year 2007

Status: December 2020

		RE 2007	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[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	29.952
	Wind energy offshore	0	0	0
	Solar Photovoltaic	3.075	0,5	1.768
	Solid biofuels & sewage sludge	8.699	1,4	6.557
	Liquid biofuels	948	0,2	507
	Biogas	8.386	1,3	3.463
	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>65.068</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	64.092	5,4	11.717
	Solid biofuels & charcoal (TCS sector)	11.443	1,0	3.230
	Solid biofuels & sewage sludge (industry)	22.367	1,9	6.414
	Solid biofuels & sewage sludge (HP/CHP)	2.225	0,2	516
	Liquid biofuels	2.834	0,2	613
	Biogas	3.638	0,3	666
	Biomethane	21	0,002	3
	Sewage gas	1.858	0,2	448
	Landfill gas	210	0,02	64
	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	299
<b>Total</b>	<b>127.330</b>	<b>10,8</b>	<b>27.383</b>	
Final energy consumption transport	Biodiesel	32.282	5,1	6.222
	Vegetable oil	8.533	1,4	1.534
	Bioethanol	3.391	0,5	761
	RE electricity consumption transport	1.750	0,3	
	<b>Total</b>	<b>45.956</b>	<b>7,3</b>	<b>8.518</b>

## Renewable energy sources in the year 2008

Status: December 2020

		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	28.558
	Wind energy offshore	0	0	0
	Solar Photovoltaic	4.420	0,7	2.912
	Solid biofuels & sewage sludge	9.296	1,5	6.415
	Liquid biofuels	1.088	0,2	570
	Biogas	10.957	1,8	4.481
	Biomethane	44	0,01	21
	Sewage gas	1.094	0,2	713
	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>63.904</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	75.670	5,9	13.888
	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	656
	Liquid biofuels	3.409	0,3	691
	Biogas	3.482	0,3	657
	Biomethane	65	0,005	10
	Sewage gas	1.977	0,2	480
	Landfill gas	154	0,01	48
	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	413
<b>Total</b>	<b>139.637</b>	<b>10,8</b>	<b>30.176</b>	
Final energy consumption transport	Biodiesel	25.873	4,2	5.017
	Vegetable oil	4.042	0,7	730
	Bioethanol	4.608	0,7	1.012
	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>6.760</b>

## Renewable energy sources in the year 2009

Status: December 2020

	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	28.241
	Wind energy offshore	38	0,01	28
	Solar Photovoltaic	6.583	1,1	4.419
	Solid biofuels & sewage sludge	9.746	1,7	6.929
	Liquid biofuels	1.632	0,3	893
	Biogas	13.188	2,3	5.764
	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>66.392</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	67.523	5,7	12.425
	Solid biofuels & charcoal (TCS sector)	16.476	1,4	4.590
	Solid biofuels & sewage sludge (industry)	22.972	1,9	6.960
	Solid biofuels & sewage sludge (HP/CHP)	3.581	0,3	858
	Liquid biofuels	3.660	0,3	763
	Biogas	5.062	0,4	947
	Biomethane	131	0,01	19
	Sewage gas	1.977	0,2	472
	Landfill gas	155	0,01	47
	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	515
<b>Total</b>	<b>139.036</b>	<b>11,7</b>	<b>30.485</b>	
Final energy consumption transport	Biodiesel	22.966	3,7	4.397
	Vegetable oil	961	0,2	181
	Bioethanol	6.576	1,1	1.410
	Biomethane	13	0,002	3
	RE electricity consumption transport	1.902	0,3	
<b>Total</b>	<b>32.418</b>	<b>5,3</b>	<b>5.991</b>	

## Renewable energy sources in the year 2010

Status: December 2020

		RE 2010	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[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	27.377
	Wind energy offshore	176	0,03	126
	Solar Photovoltaic	11.729	1,9	7.844
	Solid biofuels & sewage sludge	10.351	1,7	7.491
	Liquid biofuels	1.278	0,2	690
	Biogas	15.300	2,5	6.661
	Biomethane	372	0,1	183
	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>72.166</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	79.304	6,0	14.443
	Solid biofuels & charcoal (TCS sector)	21.236	1,6	5.848
	Solid biofuels & sewage sludge (industry)	28.088	2,1	7.909
	Solid biofuels & sewage sludge (HP/CHP)	4.057	0,3	950
	Liquid biofuels	3.351	0,3	677
	Biogas	7.472	0,6	1.385
	Biomethane	490	0,04	69
	Sewage gas	1.999	0,2	471
	Landfill gas	117	0,01	35
	Biogenic fraction of waste	7.260	0,5	1.597
	Solar thermal energy	5.590	0,4	1.392
	Deep geothermal energy	689	0,1	197
	Near-surface geothermal energy & ambient heat	5.938	0,4	576
<b>Total</b>	<b>165.591</b>	<b>12,4</b>	<b>35.549</b>	
Final energy consumption transport	Biodiesel	24.359	3,9	4.572
	Vegetable oil	574	0,1	110
	Bioethanol	8.552	1,4	1.815
	Biomethane	75	0,01	33
	RE electricity consumption transport	2.054	0,3	
	<b>Total</b>	<b>35.614</b>	<b>5,8</b>	<b>6.530</b>

## Renewable energy sources in the year 2011

Status: December 2020

	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	37.602
	Wind energy offshore	577	0,1	424
	Solar Photovoltaic	19.599	3,2	13.660
	Solid biofuels & sewage sludge	10.516	1,7	7.898
	Liquid biofuels	382	0,1	213
	Biogas	18.754	3,1	8.829
	Biomethane	576	0,1	301
	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>88.887</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	72.227	5,9	13.166
	Solid biofuels & charcoal (TCS sector)	15.703	1,3	4.406
	Solid biofuels & sewage sludge (industry)	29.089	2,4	8.381
	Solid biofuels & sewage sludge (HP/CHP)	4.665	0,4	1.102
	Liquid biofuels	2.558	0,2	510
	Biogas	8.972	0,7	1.701
	Biomethane	739	0,1	106
	Sewage gas	2.059	0,2	487
	Landfill gas	101	0,01	31
	Biogenic fraction of waste	8.140	0,7	1.805
	Solar thermal energy	6.388	0,5	1.592
	Deep geothermal energy	722	0,1	207
	Near-surface geothermal energy & ambient heat	6.818	0,6	641
<b>Total</b>	<b>158.181</b>	<b>13,0</b>	<b>34.134</b>	
Final energy consumption transport	Biodiesel	23.545	3,8	4.511
	Vegetable oil	188	0,03	33
	Bioethanol	9.046	1,4	1.885
	Biomethane	92	0,01	16
	RE electricity consumption transport	2.470	0,4	
<b>Total</b>	<b>35.341</b>	<b>5,7</b>	<b>6.445</b>	

## Renewable energy sources in the year 2012

Status: December 2020

		RE 2012	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[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	33.499
	Wind energy offshore	732	0,1	487
	Solar Photovoltaic	26.380	4,3	16.053
	Solid biofuels & sewage sludge	10.693	1,8	7.418
	Liquid biofuels	246	0,04	125
	Biogas	24.383	4,0	10.156
	Biomethane	1.080	0,2	496
	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>89.834</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	84.790	6,9	15.531
	Solid biofuels & charcoal (TCS sector)	17.206	1,4	4.855
	Solid biofuels & sewage sludge (industry)	27.793	2,3	7.842
	Solid biofuels & sewage sludge (HP/CHP)	5.776	0,5	1.376
	Liquid biofuels	2.090	0,2	423
	Biogas	8.422	0,7	1.482
	Biomethane	1.286	0,1	176
	Sewage gas	2.017	0,2	465
	Landfill gas	94	0,01	28
	Biogenic fraction of waste	9.033	0,7	2.017
	Solar thermal energy	6.638	0,5	1.654
	Deep geothermal energy	805	0,1	233
	Near-surface geothermal energy & ambient heat	7.766	0,6	714
<b>Total</b>	<b>173.716</b>	<b>14,2</b>	<b>36.795</b>	
Final energy consumption transport	Biodiesel	24.628	4,0	4.996
	Vegetable oil	251	0,04	44
	Bioethanol	9.164	1,5	1.892
	Biomethane	333	0,1	64
	RE electricity consumption transport	2.826	0,5	
<b>Total</b>	<b>37.202</b>	<b>6,0</b>	<b>6.997</b>	

## Renewable energy sources in the year 2013

Status: December 2020

		RE 2013	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	22.998	3,8	16.249
	Wind energy onshore	51.819	8,5	36.358
	Wind energy offshore	918	0,2	646
	Solar Photovoltaic	31.010	5,1	17.969
	Solid biofuels & sewage sludge	10.555	1,7	6.822
	Liquid biofuels	288	0,05	129
	Biogas	25.839	4,3	9.413
	Biomethane	1.625	0,3	658
	Sewage gas	1.308	0,2	762
	Landfill gas	483	0,1	282
	Biogenic fraction of waste	5.415	0,9	3.853
	Geothermal energy	80	0,01	40
	<b>Total</b>	<b>152.338</b>	<b>25,1</b>	<b>93.181</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	87.672	6,9	16.095
	Solid biofuels & charcoal (TCS sector)	18.337	1,4	5.219
	Solid biofuels & sewage sludge (industry)	25.600	2,0	6.887
	Solid biofuels & sewage sludge (HP/CHP)	5.532	0,4	1.165
	Liquid biofuels	2.191	0,2	435
	Biogas	9.257	0,7	1.610
	Biomethane	2.059	0,2	276
	Sewage gas	1.805	0,1	413
	Landfill gas	93	0,01	27
	Biogenic fraction of waste	11.645	0,9	2.587
	Solar thermal energy	6.700	0,5	1.668
	Deep geothermal energy	864	0,1	249
	Near-surface geothermal energy & ambient heat	8.732	0,7	790
<b>Total</b>	<b>180.487</b>	<b>14,1</b>	<b>37.421</b>	
Final energy consumption transport	Biodiesel	21.934	3,5	4.456
	Vegetable oil	0	0,000	0
	Bioethanol	8.847	1,4	1.858
	Biomethane	483	0,1	95
	RE electricity consumption transport	2.993	0,5	
<b>Total</b>	<b>34.257</b>	<b>5,4</b>	<b>6.409</b>	

## Renewable energy sources in the year 2014

Status: December 2020

		RE 2014	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	19.587	3,3	15.439
	Wind energy onshore	57.026	9,6	43.124
	Wind energy offshore	1.471	0,2	1.126
	Solar Photovoltaic	36.056	6,1	23.368
	Solid biofuels & sewage sludge	10.798	1,8	7.787
	Liquid biofuels	334	0,1	176
	Biogas	26.917	4,5	11.944
	Biomethane	2.398	0,4	1.159
	Sewage gas	1.336	0,2	882
	Landfill gas	435	0,1	288
	Biogenic fraction of waste	6.069	1,0	4.792
	Geothermal energy	98	0,02	58
	<b>Total</b>	<b>162.525</b>	<b>27,4</b>	<b>110.141</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	69.484	6,0	12.892
	Solid biofuels & charcoal (TCS sector)	14.525	1,3	4.085
	Solid biofuels & sewage sludge (industry)	26.530	2,3	7.178
	Solid biofuels & sewage sludge (HP/CHP)	5.465	0,5	1.164
	Liquid biofuels	2.357	0,2	473
	Biogas	10.451	0,9	1.829
	Biomethane	2.789	0,2	376
	Sewage gas	1.801	0,2	412
	Landfill gas	98	0,01	29
	Biogenic fraction of waste	11.380	1,0	2.531
	Solar thermal energy	7.204	0,6	1.793
	Deep geothermal energy	1.052	0,1	304
	Near-surface geothermal energy & ambient heat	9.643	0,8	906
<b>Total</b>	<b>162.779</b>	<b>14,1</b>	<b>33.973</b>	
Final energy consumption transport	Biodiesel	22.676	3,6	4.671
	Vegetable oil	52	0,01	9
	Bioethanol	9.016	1,4	1.904
	Biomethane	449	0,1	90
	RE electricity consumption transport	3.157	0,5	
	<b>Total</b>	<b>35.350</b>	<b>5,6</b>	<b>6.675</b>



## Renewable energy sources in the year 2015

Status: December 2020

		RE 2015	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	18.977	3,2	14.423
	Wind energy onshore	72.340	12,1	51.794
	Wind energy offshore	8.284	1,4	5.875
	Solar Photovoltaic	38.726	6,5	24.756
	Solid biofuels & sewage sludge	11.034	1,8	7.577
	Liquid biofuels	426	0,1	210
	Biogas	28.302	4,7	11.771
	Biomethane	3.011	0,5	1.392
	Sewage gas	1.389	0,2	875
	Landfill gas	396	0,1	249
	Biogenic fraction of waste	5.768	1,0	4.357
	Geothermal energy	133	0,02	75
	<b>Total</b>	<b>188.786</b>	<b>31,5</b>	<b>123.353</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	71.603	6,0	12.873
	Solid biofuels & charcoal (TCS sector)	16.583	1,4	4.513
	Solid biofuels & sewage sludge (industry)	25.108	2,1	6.650
	Solid biofuels & sewage sludge (HP/CHP)	5.957	0,5	1.285
	Liquid biofuels	2.174	0,2	434
	Biogas	11.342	0,9	1.895
	Biomethane	3.451	0,3	458
	Sewage gas	2.001	0,2	439
	Landfill gas	120	0,01	34
	Biogenic fraction of waste	11.807	1,0	2.627
	Solar thermal energy	7.705	0,6	1.853
	Deep geothermal energy	969	0,1	276
	Near-surface geothermal energy & ambient heat	10.510	0,9	989
<b>Total</b>	<b>169.330</b>	<b>14,1</b>	<b>34.328</b>	
Final energy consumption transport	Biodiesel	20.829	3,3	4.377
	Vegetable oil	10	0,002	2
	Bioethanol	8.611	1,4	1.844
	Biomethane	345	0,1	70
	RE electricity consumption transport	3.512	0,6	
<b>Total</b>	<b>33.307</b>	<b>5,2</b>	<b>6.292</b>	

## Renewable energy sources in the year 2016

Status: December 2020

		RE 2016	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	20.546	3,4	15.653
	Wind energy onshore	67.650	11,3	49.097
	Wind energy offshore	12.274	2,0	8.979
	Solar Photovoltaic	38.098	6,4	24.629
	Solid biofuels & sewage sludge	10.797	1,8	7.475
	Liquid biofuels	489	0,1	245
	Biogas	28.904	4,8	12.165
	Biomethane	3.010	0,5	1.415
	Sewage gas	1.440	0,2	918
	Landfill gas	358	0,1	228
	Biogenic fraction of waste	5.930	1,0	4.523
	Geothermal energy	175	0,03	100
	<b>Total</b>	<b>189.671</b>	<b>31,6</b>	<b>125.426</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	66.462	5,4	12.073
	Solid biofuels & charcoal (TCS sector)	16.057	1,3	4.389
	Solid biofuels & sewage sludge (industry)	27.031	2,2	7.096
	Solid biofuels & sewage sludge (HP/CHP)	6.259	0,5	1.333
	Liquid biofuels	2.173	0,2	461
	Biogas	12.108	1,0	2.007
	Biomethane	3.548	0,3	471
	Sewage gas	2.050	0,2	449
	Landfill gas	116	0,01	33
	Biogenic fraction of waste	11.669	1,0	2.546
	Solar thermal energy	7.691	0,6	1.848
	Deep geothermal energy	1.146	0,1	320
	Near-surface geothermal energy & ambient heat	11.408	0,9	1.084
<b>Total</b>	<b>167.718</b>	<b>13,7</b>	<b>34.109</b>	
Final energy consumption transport	Biodiesel	20.896	3,2	4.862
	Vegetable oil	31	0,00	5
	Bioethanol	8.626	1,3	1.960
	Biomethane	379	0,1	84
	RE electricity consumption transport	3.709	0,6	
	<b>Total</b>	<b>33.641</b>	<b>5,2</b>	<b>6.911</b>

## Renewable energy sources in the year 2017

Status: December 2020

		RE 2017	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	20.150	3,4	14.707
	Wind energy onshore	88.018	14,6	60.358
	Wind energy offshore	17.675	2,9	12.265
	Solar Photovoltaic	39.401	6,6	24.426
	Solid biofuels & sewage sludge	10.644	1,8	7.009
	Liquid biofuels	437	0,1	204
	Biogas	29.245	4,9	11.417
	Biomethane	2.837	0,5	1.253
	Sewage gas	1.460	0,2	886
	Landfill gas	338	0,1	205
	Biogenic fraction of waste	5.956	1,0	4.329
	Geothermal energy	163	0,03	89
	<b>Total</b>	<b>216.324</b>	<b>36,0</b>	<b>137.148</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	68.234	5,5	12.309
	Solid biofuels & charcoal (TCS sector)	16.666	1,3	4.512
	Solid biofuels & sewage sludge (industry)	26.326	2,1	6.952
	Solid biofuels & sewage sludge (HP/CHP)	6.193	0,5	1.301
	Liquid biofuels	2.180	0,2	478
	Biogas	12.816	1,0	2.135
	Biomethane	3.261	0,3	443
	Sewage gas	2.141	0,2	469
	Landfill gas	107	0,01	30
	Biogenic fraction of waste	12.669	1,0	2.734
	Solar thermal energy	7.852	0,6	1.883
	Deep geothermal energy	1.168	0,1	325
	Near-surface geothermal energy & ambient heat	12.408	1,0	1.307
<b>Total</b>	<b>172.021</b>	<b>13,9</b>	<b>34.877</b>	
Final energy consumption transport	Biodiesel	21.354	3,2	5.179
	Vegetable oil	31	0,005	6
	Bioethanol	8.478	1,3	2.110
	Biomethane	445	0,1	99
	RE electricity consumption transport	4.305	0,7	
<b>Total</b>	<b>34.613</b>	<b>5,3</b>	<b>7.394</b>	

## Renewable energy sources in the year 2018

Status: December 2020

		RE 2018	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	17.693	3,0	13.154
	Wind energy onshore	90.484	15,2	63.579
	Wind energy offshore	19.467	3,3	13.806
	Solar Photovoltaic	45.784	7,7	27.987
	Solid biofuels & sewage sludge	11.167	1,9	7.536
	Liquid biofuels	452	0,1	224
	Biogas	28.655	4,8	11.624
	Biomethane	2.602	0,4	1.194
	Sewage gas	1.555	0,3	969
	Landfill gas	306	0,1	190
	Biogenic fraction of waste	6.163	1,0	4.575
	Geothermal energy	178	0,03	102
	<b>Total</b>	<b>224.506</b>	<b>37,8</b>	<b>144.939</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	70.193	5,9	12.645
	Solid biofuels & charcoal (TCS sector)	18.508	1,6	4.976
	Solid biofuels & sewage sludge (industry)	24.522	2,1	6.468
	Solid biofuels & sewage sludge (HP/CHP)	5.740	0,5	1.210
	Liquid biofuels	2.235	0,2	494
	Biogas	13.024	1,1	2.166
	Biomethane	3.191	0,3	437
	Sewage gas	2.500	0,2	546
	Landfill gas	110	0,01	31
	Biogenic fraction of waste	14.508	1,2	3.131
	Solar thermal energy	8.875	0,7	2.126
	Deep geothermal energy	1.308	0,1	365
	Near-surface geothermal energy & ambient heat	13.504	1,1	1.486
<b>Total</b>	<b>178.218</b>	<b>15,0</b>	<b>36.081</b>	
Final energy consumption transport	Biodiesel	22.370	3,5	5.423
	Vegetable oil	10	0,002	2
	Bioethanol	8.707	1,3	2.226
	Biomethane	389	0,1	85
	RE electricity consumption transport	4.569	0,7	
<b>Total</b>	<b>36.045</b>	<b>5,6</b>	<b>7.735</b>	

## Renewable energy sources in the year 2019

Status: December 2020

		RE 2019	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO <sub>2</sub> -eq.]
Gross electricity production	Hydropower	19.731	3,4	14.666
	Wind energy onshore	101.150	17,5	71.074
	Wind energy offshore	24.744	4,3	17.549
	Solar Photovoltaic	46.392	8,0	28.360
	Solid biofuels & sewage sludge	11.106	1,9	7.498
	Liquid biofuels	397	0,1	204
	Biogas	28.425	4,9	11.536
	Biomethane	2.620	0,5	1.203
	Sewage gas	1.581	0,3	986
	Landfill gas	285	0,0	177
	Biogenic fraction of waste	5.806	1,0	4.309
	Geothermal energy	197	0,03	113
	<b>Total</b>	<b>242.434</b>	<b>42,0</b>	<b>157.676</b>
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	71.354	5,9	12.891
	Solid biofuels & charcoal (TCS sector)	19.146	1,6	5.155
	Solid biofuels & sewage sludge (industry)	23.784	2,0	6.263
	Solid biofuels & sewage sludge (HP/CHP)	6.121	0,5	1.292
	Liquid biofuels	2.380	0,2	538
	Biogas	13.315	1,1	2.214
	Biomethane	3.314	0,3	454
	Sewage gas	2.402	0,2	521
	Landfill gas	102	0,01	29
	Biogenic fraction of waste	15.308	1,3	3.303
	Solar thermal energy	8.483	0,7	2.032
	Deep geothermal energy	1.369	0,1	383
	Near-surface geothermal energy & ambient heat	14.655	1,2	1.619
<b>Total</b>	<b>181.733</b>	<b>15,0</b>	<b>36.695</b>	
Final energy consumption transport	Biodiesel	22.109	3,4	5.187
	Vegetable oil	10	0,002	2
	Bioethanol	8.375	1,3	2.191
	Biomethane	660	0,1	125
	RE electricity consumption transport	4.886	0,8	
	<b>Total</b>	<b>36.040</b>	<b>5,6</b>	<b>7.505</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 are the data for the use of 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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