



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 2020)

INTRODUCTION

DEVELOPMENT OF RENEWABLE ENERGY SOURCES IN GERMANY

- Tab. 1 Development of renewable energy sources 1990 to 2019
- Tab. 2 Shares of renewable energy sources 1990 to 2019
- Tab. 3 Gross electricity production from renewable energy sources 1990 to 2019
- Tab. 4 Installed electrical capacity of renewable energy plants 1990 to 2019
- Tab. 5 Final energy consumption from renewable sources for heating and cooling 1990 to 2019
- Tab. 6 Final energy consumption from renewable sources in the transport sector 1990 to 2019

DEVELOPMENT OF TOTAL FINAL ENERGY CONSUMPTION IN GERMANY

- Tab. 7 Development of energy consumption in Germany 1990 to 2019

RENEWABLE ENERGY SOURCES AND ENVIRONMENT

- Tab. 8.1 Greenhouse gas emissions avoided through the use of renewable energy sources 1990 to 2019
- Tab. 8.2 CO₂-emissions avoided through the use of renewable energy sources 1990 to 2019
- Tab. 8.3 Acidifying emissions avoided through the use of renewable energy sources 1990 to 2019

ECONOMIC STIMULI FROM RENEWABLE ENERGY SOURCES

- Tab. 9.1 Investments in construction of renewable energy plants 2000 to 2019
- Tab. 9.2 Economic stimuli from the operation of renewable energy plants 2000 to 2019

RENEWABLE ENERGY SOURCES IN YEARS

- 1990-2019 Detailed data on renewable energy sources for each year 1990 to 2019

ANNEX: CONVERSION FACTORS AND ABBREVIATIONS

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 addressed on

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

Table 1: Development of renewable energy sources 1990 to 2019

Status: February 2020

[back to directory](#)

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 ¹⁾	-	-	-	-	-	-	-	-	-	-	-	-	-	-	166.806	188.270	228.375	262.561	270.245	266.233	305.579	315.168	352.313	365.432	359.521	387.954	387.110	418.549	429.042	455.205
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	224.757	244.293
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	115.760	127.329	139.764	138.323	165.602	156.963	173.298	180.097	162.779	167.264	165.260	169.653	170.216	176.422
Final energy consumption in the transport sector ²⁾	465	477	609	653	982	1.175	1.398	1.725	1.872	2.312	3.752	4.908	7.181	9.333	12.110	23.007	40.869	46.904	37.037	32.956	35.901	35.404	37.245	34.300	35.393	33.338	33.653	34.613	36.015	36.908

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 ³⁾	-	-	-	-	-	-	-	-	-	-	-	-	-	-	165.813	189.082	229.011	257.176	268.563	271.568	312.241	316.652	350.909	364.972	362.261	382.324	388.573	407.407	427.995	446.376
Final energy consumption in the transport sector EU-Directive ³⁾	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.612	24.370	41.888	45.913	37.892	34.624	38.302	39.072	43.963	44.753	42.877	41.426	45.200	46.141	50.383	51.932

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 ⁴⁾	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	1.802	1.896

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

Status: February 2020

[back to directory](#)

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

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

Status: February 2020

[back to directory](#)

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 ¹⁾	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	17.974	20.192
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	101.270
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	24.705
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	47.517
Solid biofuels ²⁾	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	10.840	10.486
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	422
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	28.952	29.203
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	2.680
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	1.550
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	289
Biogenic fraction of waste ³⁾	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	5.783
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	196
Total	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	224.757	244.293
for information: amount of electricity under the EEG ⁴⁾	-	-	-	-	-	-	-	-	-	-	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	-

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 4: Installed electrical capacity of renewable energy plants 1990 to 2019

Status: February 2020

[back to directory](#)

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 ¹⁾	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	52.447	53.333
Wind energy offshore ²⁾	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	6.396	7.507
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	45.181	49.016
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	1.615	1.637
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 ³⁾	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	5.597	5.901
Biomethane ³⁾	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 ⁴⁾	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	422
Landfill gas	59	64	68	95	119	132	145	158	168	173	193	193	200	212	240	248	252	257	268	261	237	232	214	210	211	183	172	165	169	170
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	48
Total	4.168	4.276	4.368	4.626	5.049	5.714	6.143	6.728	7.761	9.600	11.745	14.572	18.239	21.197	24.397	27.866	31.576	34.818	37.768	46.519	55.784	66.680	77.435	82.843	89.387	96.894	103.462	111.516	118.240	124.418
not included: biogenic fraction of waste ⁵⁾	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	2.118	2.129

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 the total installed capacity of thermal waste combustion plants. To avoid double countings there is no breakdown into a renewable and a fossil share taken into account for this installed capacity, which is why it is not included in the total.

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 2019

Status: February 2020

[back to directory](#)

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) ¹⁾	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	65.865	63.889	68.865
Solid biofuels (TCS sector) ²⁾	-	-	-	-	-	-	-	-	-	-	-	-	-	6.972	9.581	9.695	11.120	11.442	16.046	16.476	21.236	15.703	17.206	18.337	14.525	16.583	16.057	16.666	16.638	17.705
Solid biofuels (industry) ³⁾	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	23.786
Solid biofuels (HP/CHP) ⁴⁾	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	5.702
Liquid biofuels ⁵⁾	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	3.362	2.547	2.090	2.181	2.357	2.174	2.173	2.179	2.276	2.261
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	13.148	13.394
Biomethane	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	21	65	131	490	739	1.286	2.059	2.789	3.451	3.548	3.261	3.191	3.262
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	2.503	2.496
Landfill gas	-	-	-	-	-	-	-	-	-	-	-	-	-	176	165	231	227	210	154	155	117	101	94	93	98	120	116	109	114	112
Gaseous biofuels	-	-	-	-	-	-	-	-	1.335	1.263	1.355	1.353	1.438	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Biogenic fraction of waste ⁶⁾	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	14.396
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 ⁷⁾	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	1.305
Near-surface geothermal energy, ambient heat ⁸⁾	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
Total	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	115.760	127.329	139.764	138.323	165.602	156.963	173.298	180.097	162.779	167.264	165.260	169.653	170.216	176.422

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 6: Final energy consumption from renewable sources in the transport sector 1990 to 2019

Status: February 2020

[back to directory](#)

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 ¹⁾	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	23.411	24.525	23.618	24.682	21.977	22.718	20.860	20.908	21.354	22.340	22.512
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	178	240	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	3.439	4.673	6.669	8.673	9.046	9.164	8.847	9.017	8.611	8.626	8.478	8.707	8.537
Biomethane ²⁾	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 ³⁾	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	5.189
Total	465	477	609	653	982	1.175	1.398	1.725	1.872	2.312	3.752	4.908	7.181	9.333	12.110	23.007	40.869	46.904	37.037	32.956	35.901	35.404	37.245	34.300	35.393	33.338	33.653	34.613	36.015	36.908

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 ¹⁾	0	0,2	5	5	28	35	55	90	100	130	250	350	550	800	997	1.749	2.749	3.216	2.581	2.269	2.377	2.264	2.327	2.062	2.152	2.001	2.006	2.073	2.170	2.187
Vegetable oil	0	0	2	3	3	5	5	10	11	14	16	20	24	7	12	175	690	817	387	92	55	17	23	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	1.158
Biomethane ²⁾	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
Total	0	0,2	7	8	31	40	60	100	111	144	266	370	574	807	1.074	2.162	3.951	4.493	3.593	3.254	3.598	3.515	3.618	3.298	3.413	3.195	3.207	3.259	3.381	3.395

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

Status: February 2020

[back to directory](#)

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 ¹⁾	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	606,5	616,0	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	594,7	579,8
Final energy consumption for heating and cooling ²⁾	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	1.187,0	1.216,7
Final energy consumption in the transport sector ³⁾	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	648,1	656,8
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 ⁴⁾	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.610	9.487	9.726	9.209	9.584	8.994	9.619	9.141	9.319	9.545	9.065	9.237	9.398	9.479	9.349	9.381
Final energy consumption in the transport sector EU-Directive ⁴⁾	-	-	-	-	-	-	-	-	-	-	-	-	-	-	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	2.291	2.314
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 ⁵⁾	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	13.515	13.102	12.832

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

2) calculated based on Working Group on Energy Balances (AGEB) and AGEE-Stat, without electricity consumption for heating and cooling, status February 2020

3) calculated based on Working Group on Energy Balances (AGEB) and AGEE-Stat, without energy consumption for international aviation, status February 2020

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

5) calculated based on Working Group on Energy Balances (AGEB) and AGEE-Stat, calculated by the "physical energy content" principle, status February 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

Status: February 2020

[back to directory](#)

Figures in [1.000 t CO ₂ -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	55.707	55.139	65.068	63.900	66.379	72.151	89.115	89.784	93.118	110.080	124.907	126.960	138.939	145.572	159.240
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	24.826	27.383	30.199	30.352	35.547	33.903	36.711	37.340	33.964	34.839	34.455	35.225	35.208	36.371
by RE final energy consumption in the transport sector ^{1) 2)}	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	6.993	6.411	6.677	6.295	6.914	7.391	7.726	7.766
Total avoided GHG-emissions	27.838	24.951	28.061	28.897	31.707	34.295	34.111	32.632	35.265	39.782	45.980	50.407	57.008	63.132	75.959	82.294	87.475	100.969	100.859	102.722	114.228	129.463	133.488	136.869	150.721	166.041	168.329	181.555	188.506	203.377

Figures in [g CO ₂ -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	718	628	611	677	662	669	642	648	652
Avoidance factor of RE final energy consumption for heating and cooling	201	201	201	200	200	200	199	197	201	198	198	197	197	210	217	219	214	215	216	219	215	216	212	207	209	208	208	208	207	206
Avoidance factor of RE final energy consumption in the transport sector ^{1) 2)}	-	189	185	183	189	189	190	191	192	192	191	191	190	202	199	195	192	192	195	195	194	196	204	205	207	211	231	244	246	245

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

2) based on BLE data for the year 2018 and the fossil reference value according to the EU-Directive 2009/28/EC (83,8 g CO₂-eq./MJ), fossil reference values of § 10 of 38. BImSchV deviate from this value (93,3 g CO₂-eq./MJ for petrol and 95,1 g CO₂-eq./MJ for diesel fuel)

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

Table 8.2: CO₂-emissions avoided through the use of renewable energy sources 1990 to 2019

Status: February 2020

[back to directory](#)

Figures in [1.000 t CO ₂]	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	87.936	91.507	107.378	120.993	123.960	134.130	140.001	152.502
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	24.315	27.030	29.931	30.143	35.830	34.237	37.136	37.943	34.708	35.696	35.382	36.196	36.201	37.410
by RE final energy consumption in the transport sector ¹⁾	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	8.069	7.371	7.648	7.165	7.654	8.099	8.389	8.434
Total avoided CO₂-emissions	27.561	24.706	27.784	28.612	31.401	33.954	33.755	32.368	34.926	39.308	45.238	49.634	55.820	61.474	73.512	80.861	85.752	99.267	99.348	101.712	114.125	127.871	133.141	136.821	149.734	163.854	166.996	178.425	184.591	198.346

Figures in [g CO ₂ /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	669	694	615	601	661	641	654	620	623	624
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	212	214	210	212	214	218	216	218	214	211	213	213	214	213	213	212
Avoidance factor of RE final energy consumption in the transport sector ¹⁾	-	228	233	234	230	231	231	231	232	232	231	230	229	244	241	237	237	238	239	236	234	231	235	236	238	240	256	267	267	266

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 ²

Status: February 2020

[back to directory](#)

Figures in [1.000 t SO ₂ -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	33,7	26,3	24,9	25,0	22,8	24,2	34,7	22,7	21,1	31,7	40,0	32,3	39,3	43,8	54,4
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	0,34	6,0	2,9	0,7	0,0	-2,5	-6,9	-5,3	-6,5	-6,9	-7,4	-7,7	-8,0
by RE final energy consumption in the transport sector ¹⁾	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	-3,4
Total avoided acidifying agents ²⁾	130,2	112,4	130,4	134,7	149,9	163,5	134,1	91,4	70,4	61,8	46,1	46,6	47,9	40,0	42,8	34,2	24,1	13,3	23,2	20,9	17,9	30,1	14,2	7,3	21,6	29,8	21,8	28,8	32,8	43,0

Figures in [g SO ₂ -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	0,26	0,24	0,23	0,28	0,16	0,14	0,20	0,21	0,17	0,18	0,19	0,22
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	0,07	0,06	0,02	0,01	0,00	0,04	0,02	0,00	0,00	-0,01	-0,04	-0,03	-0,04	-0,04	-0,04	-0,05	-0,05
Avoidance factor of RE final energy consumption in the transport sector ¹⁾	-	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	-0,11

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

2) as acidifying emissions only SO₂ and NO_x 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: February 2020

[back to directory](#)

Figures in [million euro] ¹⁾	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	30	20	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	2.600	3.490
Solar thermal energy	440	610	370	480	470	630	990	760	1.700	1.490	990	1.060	950	860	790	800	700	540	470	400
Geothermal energy, ambient heat	130	180	190	210	290	410	940	920	1.230	1.140	960	990	1.060	1.090	1.080	1.020	1.210	1.310	1.490	1.400
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	400	390
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	1.210	1.210
Total	4.700	6.280	6.950	7.380	9.940	12.020	13.940	13.560	17.650	23.510	27.850	26.080	22.450	16.450	16.440	13.920	15.330	15.720	13.690	10.470

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: February 2020

[back to directory](#)

Figures in [million euro] ¹⁾	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	4.510	4.580
Biomass heat	1.130	1.160	1.180	1.210	1.250	1.460	1.740	1.960	2.150	2.450	2.880	2.870	3.120	3.320	3.020	3.190	3.400	3.410	3.440	3.480
Biomass fuels	210	300	460	670	880	1.790	3.150	3.750	3.530	2.390	2.920	3.690	3.720	3.100	2.690	2.490	2.620	2.760	2.760	2.930
Total	1.940	2.210	2.570	3.090	3.580	5.060	7.280	8.890	9.460	9.420	11.290	12.970	14.440	14.610	14.600	15.100	15.790	16.370	16.810	17.400

1) differences in the totals may occur due to roundings

Source: ZSW [32]; partially preliminary data

Renewable energy sources in the year 1990

Status: February 2020

		RE 1990		Share of renewable energy	avoided GHG-emissions
		[GWh]		[%]	[1.000 t CO ₂ -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
	Total	18.934			3,4
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
	Total	32.516			2,1
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	
	Total	465			0,1

Renewable energy sources in the year 1991

Status: February 2020

		RE 1991		Share of renewable energy	avoided GHG-emissions
		[GWh]		[%]	[1.000 t CO ₂ -eq.]
Gross electricity production	Hydropower	14.891	of national gross electricity consumption	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
	Total	16.465			3,1
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	of final energy consumption for heating and cooling	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
	Total	32.671			2,2
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	
	Total	477			0,1

Renewable energy sources in the year 1992

Status: February 2020

		RE 1992		Share of renewable energy	avoided GHG-emissions
		[GWh]		[%]	[1.000 t CO ₂ -eq.]
Gross electricity production	Hydropower	17.397	of national gross electricity consumption	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
	Total	19.240			3,6
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	of final energy consumption for heating and cooling	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
	Total	32.754			2,3
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	
	Total	609			0,1

Renewable energy sources in the year 1993

Status: February 2020

		RE 1993	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO ₂ -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
	Total	20.128	3,8	22.296
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
	Total	32.851	2,3	6.586
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	
	Total	653	0,1	15

Renewable energy sources in the year 1994

Status: February 2020

		RE 1994	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO ₂ -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
	Total	22.739	4,3	25.038
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
	Total	32.969	2,4	6.609
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	
	Total	982	0,2	60

Renewable energy sources in the year 1995

Status: February 2020

		RE 1995		Share of renewable energy	avoided GHG-emissions
		[GWh]		[%]	[1.000 t CO ₂ -eq.]
Gross electricity production	Hydropower	21.780	of national gross electricity consumption	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
	Total	25.327		4,7	27.582
Final energy consumption for heating and cooling	Solid biofuels (households)	25.448	of final energy consumption for heating and cooling	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
	Total	33.110		2,3	6.635
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	
	Total	1.175		0,2	78

Renewable energy sources in the year 1996

Status: February 2020

		RE 1996	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO ₂ -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
	Total	26.140	4,7	27.360
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
	Total	33.398	2,2	6.633
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	
	Total	1.398	0,2	118

Renewable energy sources in the year 1997

Status: February 2020

		RE 1997	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO ₂ -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
	Total	22.673	4,1	22.439
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
	Total	50.646	3,5	9.996
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	
	Total	1.725	0,3	197

Renewable energy sources in the year 1998

Status: February 2020

		RE 1998	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO ₂ -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
	Total	25.086	4,5	23.784
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
	Total	56.090	3,9	11.261
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	
	Total	1.872	0,3	220

Renewable energy sources in the year 1999

Status: February 2020

		RE 1999		Share of renewable energy	avoided GHG-emissions
		[GWh]		[%]	[1.000 t CO ₂ -eq.]
Gross electricity production	Hydropower	19.647	of national gross electricity consumption	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
	Total	28.901			5,2
Final energy consumption for heating and cooling	Solid biofuels (households)	45.590	of final energy consumption for heating and cooling	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
	Total	57.777			4,3
Final energy consumption transport	Biodiesel	1.343	of final energy consumption transport	0,2	261
	Vegetable oil	146		0,02	25
	Bioethanol	0		0	0
	RE electricity consumption transport	823		0,1	
	Total	2.312			0,3

Renewable energy sources in the year 2000

Status: February 2020

		RE 2000	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO ₂ -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
	Total	36.226	6,3	33.903
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
	Total	58.429	4,4	11.551
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	
	Total	3.752	0,5	526

Renewable energy sources in the year 2001

Status: February 2020

		RE 2001	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO ₂ -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
	Total	38.742	6,6	36.751
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
	Total	65.451	4,7	12.925
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	
	Total	4.908	0,7	731

Renewable energy sources in the year 2002

Status: February 2020

		RE 2002		Share of renewable energy	avoided GHG-emissions
		[GWh]		[%]	[1.000 t CO ₂ -eq.]
Gross electricity production	Hydropower	23.124	of national gross electricity consumption	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
	Total	45.436		7,7	43.176
Final energy consumption for heating and cooling	Solid biofuels (households)	50.963	of final energy consumption for heating and cooling	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
	Total	64.620		4,8	12.705
Final energy consumption transport	Biodiesel	5.683	of final energy consumption transport	0,8	1.084
	Vegetable oil	251		0,04	44
	Bioethanol	0		0	0
	RE electricity consumption transport	1.247		0,2	
	Total	7.181		1,1	1.127

Renewable energy sources in the year 2003

Status: February 2020

		RE 2003	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO ₂ -eq.]
Gross electricity production	Hydropower	18.322	3,0	19.862
	Wind energy onshore	19.087	3,1	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
	Total	46.670	7,7	42.934
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
Total	88.366	6,6	18.578	
Final energy consumption transport	Biodiesel	8.254	1,3	1.569
	Vegetable oil	73	0,01	51
	Bioethanol	0	0	0
	RE electricity consumption transport	1.006	0,2	
	Total	9.333	1,4	1.620

Renewable energy sources in the year 2004

Status: February 2020

		RE 2004	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO ₂ -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
	Total	57.957	9,4	52.655
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
Total	97.459	7,4	21.192	
Final energy consumption transport	Biodiesel	10.287	1,6	1.947
	Vegetable oil	125	0,0	60
	Bioethanol	486	0,1	104
	RE electricity consumption transport	1.212	0,2	
	Total	12.110	1,9	2.112

Renewable energy sources in the year 2005

Status: February 2020

		RE 2005	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO ₂ -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	672
	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
	Total	63.400	10,3	55.707
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
Total	102.613	8,0	22.431	
Final energy consumption transport	Biodiesel	18.046	2,9	3.409
	Vegetable oil	1.828	0,3	359
	Bioethanol	1.780	0,3	388
	RE electricity consumption transport	1.353	0,2	
	Total	23.007	3,6	4.156

Renewable energy sources in the year 2006

Status: February 2020

		RE 2006	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO ₂ -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
	Total	72.509	11,6	55.139
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	61.774	4,7	11.157
	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
	Total	115.760	8,8	24.826
Final energy consumption transport	Biodiesel	28.364	4,5	5.351
	Vegetable oil	7.206	1,1	1.317
	Bioethanol	3.828	0,6	842
	RE electricity consumption transport	1.471	0,2	
	Total	40.869	6,4	7.510

Renewable energy sources in the year 2007

Status: February 2020

	RE 2007 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO ₂ -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
	Total	89.368	14,3	65.068
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	64.092	5,4	11.717
	Solid biofuels & charcoal (TCS sector)	11.442	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
Total	127.329	10,8	27.383	
Final energy consumption transport	Biodiesel	33.182	5,3	6.222
	Vegetable oil	8.533	1,4	1.534
	Bioethanol	3.439	0,5	761
	RE electricity consumption transport	1.750	0,3	
	Total	46.904	7,5	8.518

Renewable energy sources in the year 2008

Status: February 2020

	RE 2008 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO ₂ -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	4.477
	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
	Total	94.280	15,2	63.900
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	75.797	5,9	13.911
	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	656
	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
Total	139.764	10,8	30.199	
Final energy consumption transport	Biodiesel	26.630	4,3	5.017
	Vegetable oil	4.042	0,7	730
	Bioethanol	4.673	0,8	1.012
	Biomethane	4	0,001	1
	RE electricity consumption transport	1.688	0,3	
	Total	37.037	6,0	6.760

Renewable energy sources in the year 2009

Status: February 2020

	RE 2009 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO ₂ -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	5.751
	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
	Total	95.939	16,4	66.379
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	66.810	5,6	12.294
	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	945
	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	516
Total	138.323	11,6	30.352	
Final energy consumption transport	Biodiesel	23.411	3,8	4.397
	Vegetable oil	961	0,2	181
	Bioethanol	6.669	1,1	1.410
	Biomethane	13	0,002	3
	RE electricity consumption transport	1.902	0,3	
	Total	32.956	5,4	5.991

Renewable energy sources in the year 2010

Status: February 2020

	RE 2010 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO ₂ -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	6.645
	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
	Total	105.181	17,0	72.151
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	3.362	0,3	679
	Biogas	7.472	0,6	1.382
	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
Total	165.602	12,4	35.547	
Final energy consumption transport	Biodiesel	24.525	4,0	4.572
	Vegetable oil	574	0,1	110
	Bioethanol	8.673	1,4	1.815
	Biomethane	75	0,01	33
	RE electricity consumption transport	2.054	0,3	
	Total	35.901	5,8	6.530

Renewable energy sources in the year 2011

Status: February 2020

	RE 2011 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO ₂ -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	9.056
	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
	Total	124.037	20,4	89.115
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	71.020	5,8	12.940
	Solid biofuels & charcoal (TCS sector)	15.703	1,3	4.409
	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	2.547	0,2	507
	Biogas	8.972	0,7	1.696
	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
Total	156.963	12,9	33.903	
Final energy consumption transport	Biodiesel	23.618	3,8	4.513
	Vegetable oil	178	0,03	31
	Bioethanol	9.046	1,4	1.885
	Biomethane	92	0,01	16
	RE electricity consumption transport	2.470	0,4	
	Total	35.404	5,7	6.445

Renewable energy sources in the year 2012

Status: February 2020

	RE 2012 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO ₂ -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	10.119
	Biomethane	1.080	0,2	496
	Sewage gas	1.314	0,2	838
	Landfill gas	536	0,1	329
	Biogenic fraction of waste	4.951	0,8	3.801
	Geothermal energy	25	0,004	14
	Total	143.043	23,5	89.784
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	84.372	6,9	15.453
	Solid biofuels & charcoal (TCS sector)	17.206	1,4	4.856
	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	1.475
	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
Total	173.298	14,2	36.711	
Final energy consumption transport	Biodiesel	24.682	4,0	4.994
	Vegetable oil	240	0,04	42
	Bioethanol	9.164	1,5	1.892
	Biomethane	333	0,1	64
	RE electricity consumption transport	2.826	0,5	
	Total	37.245	6,0	6.993

Renewable energy sources in the year 2013

Status: February 2020

		RE 2013	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO ₂ -eq.]
Gross electricity production	Hydropower	22.998	3,8	16.248
	Wind energy onshore	51.819	8,5	36.357
	Wind energy offshore	918	0,2	646
	Solar Photovoltaic	31.010	5,1	17.969
	Solid biofuels & sewage sludge	10.555	1,7	6.821
	Liquid biofuels	288	0,05	129
	Biogas	25.839	4,3	9.365
	Biomethane	1.625	0,3	658
	Sewage gas	1.308	0,2	762
	Landfill gas	483	0,1	269
	Biogenic fraction of waste	5.415	0,9	3.853
	Geothermal energy	80	0,01	40
	Total	152.338	25,1	93.118
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	87.292	6,8	16.024
	Solid biofuels & charcoal (TCS sector)	18.337	1,4	5.220
	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	2.181	0,2	433
	Biogas	9.257	0,7	1.602
	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
Total	180.097	14,1	37.340	
Final energy consumption transport	Biodiesel	21.977	3,5	4.458
	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	
	Total	34.300	5,5	6.411

Renewable energy sources in the year 2014

Status: February 2020

	RE 2014 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO ₂ -eq.]	
Gross electricity production	Hydropower	19.587	3,3	15.439
	Wind energy onshore	57.026	9,6	43.125
	Wind energy offshore	1.471	0,2	1.126
	Solar Photovoltaic	36.056	6,1	23.370
	Solid biofuels & sewage sludge	10.798	1,8	7.787
	Liquid biofuels	334	0,1	176
	Biogas	26.917	4,5	11.894
	Biomethane	2.398	0,4	1.159
	Sewage gas	1.336	0,2	882
	Landfill gas	435	0,1	273
	Biogenic fraction of waste	6.069	1,0	4.792
	Geothermal energy	98	0,02	58
	Total	162.525	27,4	110.080
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	1.820
	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
Total	162.779	14,1	33.964	
Final energy consumption transport	Biodiesel	22.718	3,6	4.673
	Vegetable oil	52	0,01	9
	Bioethanol	9.017	1,4	1.904
	Biomethane	449	0,1	90
	RE electricity consumption transport	3.157	0,5	
	Total	35.393	5,6	6.677

Renewable energy sources in the year 2015

Status: February 2020

	RE 2015 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO ₂ -eq.]	
Gross electricity production	Hydropower	18.977	3,2	14.586
	Wind energy onshore	72.340	12,1	52.420
	Wind energy offshore	8.284	1,4	5.948
	Solar Photovoltaic	38.726	6,5	25.075
	Solid biofuels & sewage sludge	11.034	1,8	7.672
	Liquid biofuels	426	0,1	214
	Biogas	28.302	4,7	11.964
	Biomethane	3.011	0,5	1.418
	Sewage gas	1.389	0,2	887
	Landfill gas	396	0,1	242
	Biogenic fraction of waste	5.768	1,0	4.406
	Geothermal energy	133	0,02	76
	Total	188.786	31,5	124.907
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	69.537	5,8	12.800
	Solid biofuels & charcoal (TCS sector)	16.583	1,4	4.623
	Solid biofuels & sewage sludge (industry)	25.108	2,1	6.818
	Solid biofuels & sewage sludge (HP/CHP)	5.957	0,5	1.285
	Liquid biofuels	2.174	0,2	439
	Biogas	11.342	0,9	1.999
	Biomethane	3.451	0,3	490
	Sewage gas	2.001	0,2	455
	Landfill gas	120	0,01	35
	Biogenic fraction of waste	11.807	1,0	2.627
	Solar thermal energy	7.705	0,6	1.914
	Deep geothermal energy	969	0,1	282
	Near-surface geothermal energy & ambient heat	10.510	0,9	1.072
Total	167.264	13,9	34.839	
Final energy consumption transport	Biodiesel	20.860	3,3	4.379
	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	
Total	33.338	5,2	6.295	

Renewable energy sources in the year 2016

Status: February 2020

	RE 2016 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO ₂ -eq.]	
Gross electricity production	Hydropower	20.546	3,4	15.825
	Wind energy onshore	67.650	11,3	49.668
	Wind energy offshore	12.274	2,0	9.086
	Solar Photovoltaic	38.098	6,4	24.942
	Solid biofuels & sewage sludge	10.797	1,8	7.566
	Liquid biofuels	489	0,1	249
	Biogas	28.904	4,8	12.355
	Biomethane	3.010	0,5	1.440
	Sewage gas	1.440	0,2	930
	Landfill gas	358	0,1	225
	Biogenic fraction of waste	5.930	1,0	4.573
	Geothermal energy	175	0,03	101
	Total	189.671	31,6	126.960
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	64.004	5,2	11.778
	Solid biofuels & charcoal (TCS sector)	16.057	1,3	4.528
	Solid biofuels & sewage sludge (industry)	27.031	2,2	7.276
	Solid biofuels & sewage sludge (HP/CHP)	6.259	0,5	1.333
	Liquid biofuels	2.173	0,2	466
	Biogas	12.108	1,0	2.117
	Biomethane	3.548	0,3	504
	Sewage gas	2.050	0,2	466
	Landfill gas	116	0,01	34
	Biogenic fraction of waste	11.669	1,0	2.546
	Solar thermal energy	7.691	0,6	1.909
	Deep geothermal energy	1.146	0,1	326
	Near-surface geothermal energy & ambient heat	11.408	0,9	1.173
Total	165.260	13,5	34.455	
Final energy consumption transport	Biodiesel	20.908	3,2	4.865
	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	
	Total	33.653	5,2	6.914

Renewable energy sources in the year 2017

Status: February 2020

	RE 2017 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO ₂ -eq.]	
Gross electricity production	Hydropower	20.150	3,4	14.878
	Wind energy onshore	88.018	14,6	61.114
	Wind energy offshore	17.675	2,9	12.421
	Solar Photovoltaic	39.401	6,6	24.755
	Solid biofuels & sewage sludge	10.644	1,8	7.099
	Liquid biofuels	437	0,1	207
	Biogas	29.245	4,9	11.615
	Biomethane	2.837	0,5	1.277
	Sewage gas	1.460	0,2	899
	Landfill gas	338	0,1	202
	Biogenic fraction of waste	5.956	1,0	4.380
	Geothermal energy	163	0,03	91
	Total	216.324	36,0	138.939
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	65.865	5,3	11.993
	Solid biofuels & charcoal (TCS sector)	16.666	1,3	4.664
	Solid biofuels & sewage sludge (industry)	26.326	2,1	7.128
	Solid biofuels & sewage sludge (HP/CHP)	6.193	0,5	1.301
	Liquid biofuels	2.179	0,2	482
	Biogas	12.816	1,0	2.252
	Biomethane	3.261	0,3	473
	Sewage gas	2.141	0,2	487
	Landfill gas	109	0,01	32
	Biogenic fraction of waste	12.669	1,0	2.734
	Solar thermal energy	7.852	0,6	1.945
	Deep geothermal energy	1.168	0,1	332
	Near-surface geothermal energy & ambient heat	12.408	1,0	1.403
Total	169.653	13,7	35.225	
Final energy consumption transport	Biodiesel	21.354	3,2	5.176
	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	
	Total	34.613	5,3	7.391

Renewable energy sources in the year 2018

Status: February 2020

		RE 2018	Share of renewable energy	avoided GHG-emissions
		[GWh]	[%]	[1.000 t CO ₂ -eq.]
Gross electricity production	Hydropower	17.974	3,0	13.407
	Wind energy onshore	90.484	15,2	63.841
	Wind energy offshore	19.467	3,3	13.867
	Solar Photovoltaic	45.784	7,7	28.110
	Solid biofuels & sewage sludge	10.840	1,8	7.343
	Liquid biofuels	452	0,1	225
	Biogas	28.952	4,9	11.769
	Biomethane	2.602	0,4	1.201
	Sewage gas	1.555	0,3	932
	Landfill gas	306	0,1	186
	Biogenic fraction of waste	6.163	1,0	4.590
	Geothermal energy	178	0,03	102
	Total	224.757	37,8	145.572
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	63.889	5,4	11.553
	Solid biofuels & charcoal (TCS sector)	16.638	1,4	4.660
	Solid biofuels & sewage sludge (industry)	24.522	2,1	6.614
	Solid biofuels & sewage sludge (HP/CHP)	5.740	0,5	1.215
	Liquid biofuels	2.276	0,2	508
	Biogas	13.148	1,1	2.307
	Biomethane	3.191	0,3	466
	Sewage gas	2.503	0,2	566
	Landfill gas	114	0,01	34
	Biogenic fraction of waste	14.508	1,2	3.131
	Solar thermal energy	8.875	0,7	2.195
	Deep geothermal energy	1.308	0,1	373
	Near-surface geothermal energy & ambient heat	13.504	1,1	1.586
Total	170.216	14,3	35.208	
Final energy consumption transport	Biodiesel	22.340	3,4	5.415
	Vegetable oil	10	0,002	2
	Bioethanol	8.707	1,3	2.226
	Biomethane	389	0,1	82
	RE electricity consumption transport	4.569	0,7	
	Total	36.015	5,6	7.726

Renewable energy sources in the year 2019

Status: February 2020

	RE 2019 [GWh]	Share of renewable energy [%]	avoided GHG-emissions [1.000 t CO ₂ -eq.]	
Gross electricity production	Hydropower	20.192	3,5	15.061
	Wind energy onshore	101.270	17,5	71.451
	Wind energy offshore	24.705	4,3	17.597
	Solar Photovoltaic	47.517	8,2	29.176
	Solid biofuels & sewage sludge	10.486	1,8	7.102
	Liquid biofuels	422	0,1	210
	Biogas	29.203	5,0	11.877
	Biomethane	2.680	0,5	1.237
	Sewage gas	1.550	0,3	932
	Landfill gas	289	0,0	176
	Biogenic fraction of waste	5.783	1,0	4.307
	Geothermal energy	196	0,03	113
	Total	244.293	42,1	159.240
Final energy consumption for heating and cooling	Solid biofuels & charcoal (households)	68.865	5,7	12.532
	Solid biofuels & charcoal (TCS sector)	17.705	1,5	4.970
	Solid biofuels & sewage sludge (industry)	23.786	2,0	6.428
	Solid biofuels & sewage sludge (HP/CHP)	5.702	0,5	1.207
	Liquid biofuels	2.261	0,2	505
	Biogas	13.394	1,1	2.349
	Biomethane	3.262	0,3	477
	Sewage gas	2.496	0,2	565
	Landfill gas	112	0,01	33
	Biogenic fraction of waste	14.396	1,2	3.106
	Solar thermal energy	8.483	0,7	2.098
	Deep geothermal energy	1.305	0,1	372
	Near-surface geothermal energy & ambient heat	14.655	1,2	1.727
Total	176.422	14,5	36.371	
Final energy consumption transport	Biodiesel	22.512	3,4	5.457
	Vegetable oil	10	0,002	2
	Bioethanol	8.537	1,3	2.182
	Biomethane	660	0,1	124
	RE electricity consumption transport	5.189	0,8	
	Total	36.908	5,6	7.766

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, www.geotis.de .
RWI	Leibniz Institute for Economic Research, Essen.
StBA	Federal Statistical Office, Wiesbaden.
TI	Institute of International Forestry and Forest Economics, Hamburg.
UBA	Federal Environment Agency, Dessau-Roßlau.
UL	UL International GmbH, DEWI, Wilhelmshaven.
ÜNB	Information platform of the German Transmission System Operators, www.netztransparenz.de
ZSW	Centre for Solar Energy and Hydrogen Research Baden-Württemberg, Stuttgart.

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