Agorameter Documentation

Version 10

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Introduction

This documentation describes the functionality of the Agorameter tool, including in particular its methodology, calculation techniques, balance sheets and data sources. The Agorameter was developed by Agora Energiewende with the scientific support of Öko-Institut. The source data underlying the presented figures for electricity generation, demand, exports, imports, and wholesale prices can be accessed at www.agora-energiewende.de.

The Agorameter provides charts displaying current electricity generation and demand in Germany. This allows visitors to track progress being made in the transition to renewables. The charts, which are accessible to the general public, are updated on an hourly basis (with a time delay of about one to two hours). A key aim of the Agorameter is to display electricity generation from renewables broken down by source (wind, sun, water and biomass). The charts also show generation from conventional power plants, subdivided by type (nuclear energy, lignite, hard coal, natural gas, pumped storage, and others). Furthermore, the Agorameter details domestic electricity demand, commercial electricity imports and exports, the day-ahead exchange price and the greenhouse gas emissions from electricity generation.

All of the charts are based on data from third parties and, in cases where complete data sources are not available, on our own calculations and estimates. The individual metrics are presented according to their current availability. All data are presented for identical points in time, even if individual data groups (e.g. price data) are available earlier than others. Agorameter data are revised up to 28 days retroactively when source data undergo correction. The calculation methods and data sources used by the Agorameter are discussed in detail in this documentation. The data set extends back to 1 January 2012.

For display periods of up to 30 days, the time resolution of the diagram is one hour. For longer display periods, the temporal resolution is reduced to one day in order to ensure the diagram is displayed rapidly. To this end, hourly values are extrapolated to calculate daily mean values. Data gaps are not closed by interpolation, but treated as blanks, such that mean values are calculated based on a correspondingly reduced number of figures. In general, it takes longer to generate a chart for a given time period when longer time periods are selected.

Agora Energiewende aims to continuously improve its presentation of current electricity generation and demand. All data sources and calculations are documented below, in order to augment transparency and understanding. We welcome suggestions on how to improve our data set and estimation methods.

1 Methodological approach

Electricity generation can be reported in terms of gross or net generation. Gross generation includes on-site consumption by the generating facility, while net generation excludes this consumption. Our charts are based on net generation figures – that is, on the quantity of electricity that is actually made available to the electricity grid. As the precise level of on-site consumption by electricity providers is irrelevant to the current supply situation in Germany, we do not show on-site consumption in our charts. However, this documentation does given due consideration to this aspect of the energy system. It should be noted that the German government's targets for renewable energy are based on gross electricity generation as a share of gross domestic consumption.

Agora Energiewende does not collect any of its own primary data. All of the raw data used by the Agorameter originate from the publicly accessible transparency platforms that are maintained by the European transmission system operators (ENTSO-E; data for 2018 onward) and the Leipzig European Energy

Exchange (EEX; data for 2012–2017). The data are gathered from the transparency platforms directly after their publication and feed into the Agorameter. Since the transparency platforms make subsequent corrections to the data at regular intervals, the raw data of the last 28 days are checked once per day and updated accordingly, if necessary.

Since the data available from the transparency platforms offer a partially incomplete picture of the generation system, adjustments are performed by Agora Energiewende. Our adjustment methods, which are necessary for various reasons, are documented in the foregoing.

2 Calculation of key parameters

The key parameters that flow into the Agorameter are determined using the following methods:

- *Power generation:* Power generation data are based on the hourly figures released by the ENTSO-E (2018 onward) and EEX (2012–2017), which are broken down by energy source. However, the ENTSO-E and EEX data usually only express a fraction of actual generation. The size of the discrepancy between reported and actual generation varies by energy carrier and associated reporting requirements. To address this problem, we adjust the ENTSO-E and EEX data series.

- *Electricity demand:* Domestic electricity demand is calculated as the difference between hourly net electricity generation and the corresponding balance of trade with foreign countries.

- *Electricity imports and exports:* The day-ahead electricity import and export data originate from the ENTSO-E and are adopted unchanged. These data reflect market transactions and not physical flows.

- *Electricity exchange prices*: Our electricity exchange prices are drawn from day-ahead EPEX spot market. Data prior to 1 October 2018 are for the market area of Germany, Luxembourg, and Austria; subsequent data omits Austria. These hourly data are provided by the ENTSO-E and adopted unchanged.

- *Carbon dioxide emissions:* The emissions data reflect carbon emissions that result directly from power generation in Germany. The revised, hourly electricity generation data from the ENTSO-E and EEX are multiplied by emissions factors in order to determine total emissions. The Agorameter only displays the direct CO_2 emissions that result from fossil fuel combustion for the purpose of electricity generation.

3 Power generation

In the following, the generation and emissions data are broken down by energy source. Our calculation methods vary somewhat for each energy type, primarily owing to divergence in data availability. Data availability issues also cause past periods to be handled differently than current periods, as explained in the following.

a. Wind power

Gross electricity generation from onshore and offshore wind turbines rose from 51.6 terawatt hours in 2012 to 126 terawatt hours in 2019. As wind turbines consume very little of the electricity they generate, gross generation is essentially identical to net generation.
The wind energy generation data presented here originate from the ENTSO-E (2018 onward) and EEX (2012–2017) and are updated hourly, as soon as they are available. The data are based on measurements by the transmission system operators (TSOs) at various reference locations. The TSOs extrapolate these data to produce generation estimates for all of Germany. These data are used by the TSOs to balance grid loads.

Our method of calculating and presenting wind power generation has changed over the years, first and foremost due to data availability:

2012 to 2014: Onshore and offshore wind generation quantities are presented as a single figure in this period. Our data are based on the EEX hourly feed-in time series for all wind turbines. The hourly values are then calculated using a monthly correction factor based on the available monthly generation data (see Table 3 in the Appendix).

2015: Onshore and offshore wind generation is reported separately from 2015 onward. However, due to data availability issues, a supplemental calculation must be performed for 2015 data. As was done with 2012–2014 data, we adjust the feed-in figures for all wind turbines using a monthly correction factor in order to calculate total wind energy generation with an hourly resolution. The 2015 EEX feed-in data for offshore turbines are then multiplied by an annual correction value (namely, 2.04, which is based on the real generation ratio in 2016). As this calculation method can generate a figure that is higher than actual offshore turbine capacity in Germany, the output figure is capped at 3,294.9 megawatts (available capacity at the end of 2015). In order to obtain the feed-in figures for onshore wind power, estimated offshore generation is then deducted from the total generation on an hourly basis.

Since 2016: Separate time series for onshore and offshore feed-in have been available since 2016. To determine hourly feed-in, the hourly generation data for onshore and offshore wind turbines published by the ENTSO-E (2018 onward) and EEX (2012–2017) are adjusted using monthly correction factors.

The annual correction factors of the previous year are used to calculate the current year (for 2020: onshore wind power: 1.02; offshore wind power: 1.02). An overview of the monthly generation figures, on-site consumption and correction factors can be found in the Appendix (Table 3).

b. Photovoltaics

Gross electricity generation from photovoltaic (PV) systems rose from 26.4 terawatt hours in 2012 to 47.5 terawatt hours in 2019. As PV systems consume virtually no power themselves, gross generation corresponds to net generation.

The PV generation data presented here originate from ENTSO-E (2018 onward) and EEX (2012–2017) and are updated hourly, as soon as they are available. The data are based on measurements by the transmission system operators (TSOs) at various reference locations. The TSOs extrapolate these data to produce generation estimates for all of Germany. These data are used by the TSOs to balance grid loads.

Our hourly feed-in data are based on the PV generation figures released by the ENTSO-E (2018 onward) and EEX (2012–2017). Prior years are estimated on a monthly basis using a correction factor. To calculate the current year, the feed-in time series provided by ENTSO-E is used and offset against the annual total correction factor of the previous year (2020: 1.13). An overview of the data can be found in the Appendix (Table 4).

c. Hydropower

According to the Working Group on Energy Balances (AG Energiebilanzen), hydropower consists of run-of-river and storage hydropower plants as well as generation from natural inflow in pumped-storage power plants. Gross electricity generation from hydropower plants remained largely stable between 2012 and 2017 and fell slightly in 2018 due to low rainfall (2012: 21.8 terawatt hours; 2018: 18.0; 2019: 20.2). Given on-site consumption of approximately 2%, net electricity generation was approximately 21.4 terawatt hours in 2012 and 19.8 terawatt hours in 2019.

The feed-in figures for hydropower plants are calculated based on the time series for run-of-river plants published by the ENTSO-E (2018 onward) and EEX (2012–2017). To calculate hourly feed-in for the current year, the generation figures for run-of-river power plants published by the ENTSO-E are adjusted using an annual correction factor based the previous year (2019: 1.25). Past years are calculated using month-specific factor. An overview of the data is provided in the Appendix (Table 5).

d. Biomass

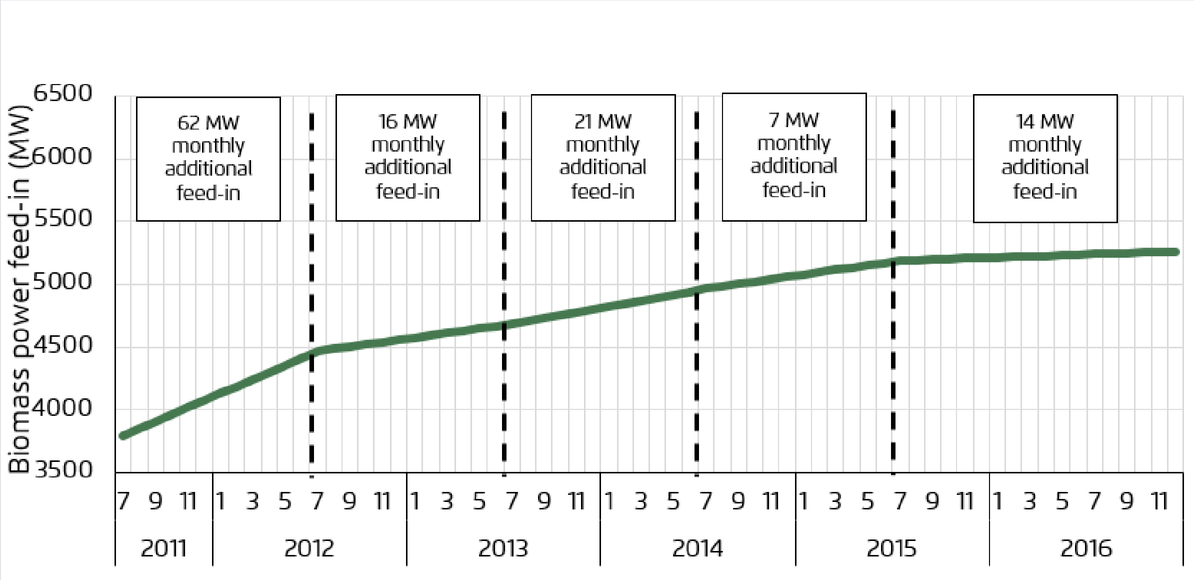
Between 2012 and 2019, gross electricity generation from biomass (including biogenic household waste) rose from 43.4 terawatt hours to 50.4 terawatt hours. Given on-site consumption of approximately 9 per cent (or 20 per cent in the case of household waste), this corresponds to net electricity generation of 39.0 in 2012 and 45.5 terawatt hours in 2019.

Prior to 2017, data on electricity production from biomass (including biogenic household waste) was spotty, as no current and regularly updated time series existed. Accordingly, generation figures for the period 2012–2016 have been estimated based on known total electricity production in past years. From an economic standpoint, biomass and waste incineration plants are generally most efficient when they operate on a continuous basis. It was therefore assumed that biomass plants furnish a marginally variable base load of electricity over the entire year.

In order to more accurately estimate power production on certain days in the past, however, we must also take into account the commissioning of new biomass plants within a given year. To this end, we distributed the annual increase in output evenly across the year, with a step-wise addition each month. Average mean production is assumed to have taken place at the middle of the year (specifically, in July). Accordingly, the annual increase is spread over 12 months from the middle of one year to the middle of the following year. Our data yield a monthly increase of 63 megawatts in 2011/12, 16 MW in 2012/13 and 19 MW in 2013/14 (see Figure 1).
In order to forecast production from July 2014 onward, we drew on the expansion foreseen by the 2014 Renewable Energy Sources Act, but limited the increase to 100 MW per year. If we assume an average of 6,000 full utilization hours per plant, this corresponded to a monthly increase in generation capacity of 5.3 MW per month.

To calculate the hourly feed-in from biomass plants from 2017 onward, we draw on the hourly feed-in data from biomass plants published by ENTSO-E. To calculate figures for the current year, the feed-in data provided by ENTSO-E are adjusted using an annual total correction factor based on the previous year (2020: 1.11). An overview of the data is provided in Table 6 of the Appendix.

Figure 1: Agorameter data on average feed-in from biomass generation



e. Nuclear power

Between 2012 and 2019, gross electricity generation from nuclear power plants fell from 99.5 terawatt hours to around 75.1 terawatt hours. Given on-site consumption of around five per cent, net electricity generation from nuclear was around 94.5 terawatt hours in 2012 and 71.3 terawatt hours in 2019.

To calculate the hourly feed-in from nuclear power plants, we first draw on the hourly feed-in time series for the nuclear power plants published by the ENTSO-E (from 2018 onward) and EEX (between 2012 and 2017). The hourly values are then calculated using a monthly correction factor based on the available monthly generation data. As full monthly generation data are not available for 2012, an annual correction factor is used (see Table 7 in Appendix).

The same applies to the calculation of the current year: the annual total correction factor from the previous year is used to adjust the feed-in time series provided by the ENTSO-E (in 2020, this correction factor is 1.00).

f. Lignite

Between 2012 and 2019, gross electricity generation from lignite-fired power plants fell from around 160.7 terawatt hours to around 113.9 terawatt hours. Given on-site consumption of around 8 per cent, this corresponds to net electricity generation of around 147.8 in 2012 and 104.8 terawatt hours in 2019.

To calculate the hourly feed-in from lignite-fired power plants from 2012 to 2017, a distinction is first made between CHP and non-CHP electricity generation (see Table 8 in the Appendix). For the calculation of generation that is not CHP-based – i.e. which does not occur in a combined heat and power plant – we draw on the hourly feed-in time series for lignite-fired power plants published by EEX. In 2017, non-CHP generation was 132 terawatt hours. An annual correction factor (2017: 0.99) is applied to correct deviations. The feed-in time series for CHP electricity generation is determined as the sum of two feed-in time series. In this connection, it is assumed for simplicity's sake that the CHP generation is heat-driven:

- The first feed-in time series is modelled on the basis of process heat production. Due to limited data availability, it must be assumed for simplicity's sake that production volumes are distributed evenly throughout the year.

- The second feed-in time series is for electricity generation coupled to heating, which is modelled dynamically on the basis of the hourly temperature curve.

Electricity generation with the simultaneous production of heating energy dominates CHP generation with lignite, accounting for 3.7 terawatt hours in 2017, compared to 0.01 terawatt hours for generation with simultaneous production of process heat. Net electricity generation from lignite-fired power plants is shown in the Agorameter as a total quantity despite divergent underlying calculation methods.

In order to calculate the hourly feed-in from 2018, no differentiation is made between non-CHP and CHP generation. Instead, for past years (between 2018 and the current year), the hourly feed-in time series for lignite-fired power plants published by the ENTSO-E is adjusted using a monthly correction factor based on the available monthly generation data (see Table 8 in the Appendix). For the calculation of the current year, the annual total correction factor from the previous year is used (2020: 1.02).

g. Hard coal

Between 2012 and 2019, gross electricity generation from coal-fired power plants fell from around 116.4 terawatt hours to around 57.3 terawatt hours Given on-site consumption of around eight per cent, this corresponds to net electricity generation of approximately 107.1 terawatt hours in 2012 and 52.7 terawatt hours in 2019.

In order to calculate hourly feed-in from hard coal-fired power plants from 2012 to 2017, a distinction is made between non-CHP and CHP electricity generation (as was done for lignite; see Table 9 in the Appendix). To calculate non-CHP generation (2017: 69.9 terawatt hours), we use the hourly feed-in time series for hard coal-fired power plants published by the EEX. An annual correction factor (2017: 0.87) is applied to resolve deviations. The feed-in time series for CHP generation is determined based on the sum of two feed-in time series:

- The first feed-in time series is modelled assuming production of process heat. Due to limited data availability, it must be assumed for simplicity's sake that production volumes are distributed evenly throughout the year. We also assume that CHP generation is heat-driven.

- The second feed-in time series is for electricity generation coupled to heat production, which is modelled dynamically on the basis of the hourly ambient temperature curve.

Electricity generation with the simultaneous production of heating energy dominates CHP generation with hard coal, accounting for 12.7 terawatt hours in 2017, compared to 2.6 terawatt hours for generation with simultaneous production of process heat. Net electricity generation from hard coal is shown in the Agorameter as a sum quantity, despite divergent underlying calculation methods.

In order to calculate the hourly feed-in from 2018, no differentiation is made between non-CHP and CHP generation. Instead, for past years (between 2018 and the current year), the hourly feed-in time series for hard coal-fired power plants published by the ENTSO-E is adjusted with a monthly correction factor based on the available monthly generation data (see Table 9 in the Appendix). To calculate the current year, the annual total correction factor from the previous year is used (2020: 1.17).

h. Natural gas

Gross electricity generation based on natural gas stood at 76.4 terawatt hours in 2012 and then fell significantly for a number of years to 62 terawatt hours in 2015. In 2017, however, natural gas generation increased significantly to around 86.7 terawatt hours, and stood at 91 terawatt hours in 2019. Given on-site consumption of around three per cent, net generation from natural gas was 74.1 terawatt hours in 2012 and 88.3 terawatt hours in 2019.

To calculate the hourly feed-in from natural gas power plants between 2012 to 2019, a distinction is made as to whether the electricity is generated by a public utility or by industrial firms (specifically, in the manufacturing and mining sector).

→ To calculate the net electricity generation from public utilities (2019: 51.9 terawatt hours), we draw on the hourly feed-in time series for natural gas power plants published by the ENTSO-E (2018 onward) and EEX (2012 to 2017). We then add an hourly feed-in time series in order to correct deviations in the calculation. For simplicity's sake, it is assumed that the remaining generation by public utilities is heat-driven, i.e. the generation simultaneously produces heating energy. The level of generation is modelled dynamically on the basis of the hourly ambient temperature curve.

→ To calculate net electricity generation from industrial plants (2019: 36.3 terawatt hours), we draw on the hourly feed-in time series for natural gas power plants published by the EEX (2012 to 2017) and ENTSO-E (2018 onward). We then add an hourly feed-in time series in order to correct deviations in the calculation. This time series is estimated based on the assumption that process heat is being produced. Due to limited data availability, it must be assumed for simplicity's sake that production volumes are distributed evenly throughout the year.

In order to calculate hourly feed-in for the current year, it is necessary to differentiate between generation by public utilities and industry, since the use of a general correction factor would otherwise lead us to significantly overestimate the generation from natural gas power plants in individual hours. For this reason, we use the same method to calculate current year generation as we do to calculate historical generation. In each case, we draw on data from the previous year for net generation from public utilities (2019: 51.9 terawatt hours) and from industrial plants (2019: 36.3 terawatt hours). Net electricity generation from gas-fired power plants is shown in the Agorameter as a sum quantity despite differences in the underlying calculation methods. Production quantities and correction factors are provided in Table 10 of the Appendix.

i. Pumped storage

We are unaware of a source of comprehensive data on electricity generation from pumped storage power plants. However, since pumped storage power plants generally optimise their operations based on market sales, it is reasonable to assume that net electricity generation is fully covered by the feed-in time series for pumped storage power plants provided by the ENTSO-E (2018 onward) and EEX (from 2012 to 2017). Accordingly, we adopt unchanged the feed-in time series provided by the ENTSO-E (2018 onward) and EEX (from 2012 to 2017), both for historical and current generation. Some of the plants allocated to the German system by ENTSO-E are not actually placed on German grounds but are (primarily) connected to the German electricity system.

j. Other generation sources

The figures presented for the category of "Other" include generation data from oil-fired power plants as well as other plants (conventional and industrial waste incineration plants, etc.). For the purpose of enhanced clarity, generation from these sources is presented as an aggregate figure. The production and correction factors for this category are summarised in the Appendix (Table 13).

In recent years, gross electricity generation from oil-fired power plants has gradually fallen from around 7.6 terawatt hours in 2012 to around 5.1 terawatt

hours in 2019. Given on-site consumption of around nine per cent on average, this yields net electricity generation of around 6.9 terawatt hours in 2012 and 4.6 terawatt hours in 2019.
To calculate hourly feed-in from oil-fired power plants between 2012 and 2017, a distinction is made between non-CHP and CHP power generation (as was done for lignite and hard coal).

To calculate non-CHP generation (which in 2017 stood at 3.6 terawatt hours), we draw on the hourly feed-in time series for oil-fired power plants published by EEX. An annual correction factor (2017: 1.8) is applied to correct deviations in the figures. The feed-in time series for CHP electricity generation calculated based on the sum of two feed-in time series. In this connection, it is assumed for simplicity's sake that CHP generation is heat-driven:

→ The first feed-in time series is modelled assuming the production of process heat. Due to limited data availability, it must be assumed for simplicity's sake that production volumes are distributed evenly throughout the year.

→ The second feed-in time series assumes generation coupled to heat production. This generation is modelled dynamically on the basis of the hourly ambient temperature curve.

In total, CHP electricity generation with simultaneous heat generation amounted to about 0.2 terawatt hours in 2017. By contrast, the volume of electricity generated in tandem with process heat production was somewhat higher at 1.5 terawatt hours. Production quantities from oil, including associated correction factors, are documented in Table 11 in the Appendix.
From 2012 to 2019, gross electricity generation in the category of "Other" remained relatively constant, ranging between 16.6 and 16.7 terawatt hours. Given average on-site consumption of around ten per cent, this yields net electricity generation of approximately 15.0 terawatt hours in 2012 and 15.1 terawatt hours in 2019.

To calculate hourly feed-in from other plants in the period 2012 to 2017, one source of data is the feed-in time series provided by the EEX for waste incineration plants and other types of plants. However, these plants only account for a very small share of the actual remaining electricity generation in this category (see Table 12 in the Appendix). Since a large proportion of the remaining generation units – including for the most part waste and CCG incineration plants – tend to generate electricity at very uniform rates, the "missing" generation in 2012 to 2014 is filled with a uniform generation band. As the EEX feed-in time series represents an increasingly large share of net electricity generation from 2015 onward, a uniform scaling factor is used starting in this year. This scaling factor is also used to calculate hourly feed-in in the current year.
When calculating hourly feed-in in 2018, we do not distinguish between non-CHP and CHP generation for oil. Instead, for past years (between 2018 and the current year), the hourly feed-in time series published by the ENTSO-E for oil and other power plants, based on the available monthly generation data, is adjusted using a monthly correction factor (see Table 11). To calculate the current year, the total annual correction factor from the previous year for both energy sources is used (20: 1.25).

4 Electricity demand

Gross domestic electricity consumption (gross electricity generation minus physical load flow surpluses with foreign countries) fell from around 606.6 terawatt hours in 2012 to around 579.8 terawatt hours in 2019. After deducting on-site consumption and grid losses, net electricity consumption in 2019 was around 518 terawatt hours.

A simple deduction method is used to calculate current hourly net electricity demand. First, the generation of all energy sources is added up. This figure is then adjusted based on the hourly electricity trade balance.

5 Imports and exports

ENTSO-E's transparency data are used to determine imports and exports. These data, which we adopt unchanged, express the reported day-ahead cross-border commercial exchanges.[1]

The only exception is the electricity trade flows between Germany and Luxembourg (from 2012 to 2015), as hourly time series for these flows have only been available since March 2016. Net exports from Germany to Luxembourg in recent years have consistently amounted to 4.6 to 4.8 terawatt hours per year and also fluctuate only very slightly during the year (cf. Öko-Institut 2013). Exports to Luxembourg are therefore presented up to 2015 as a continuous generation band based on total generation in the previous year (see Table 1). From 2016 onward, we adopt the ENTSO-E data unchanged.

6 Electricity prices

The Agorameter shows day-ahead electricity prices on the EPEX Spot Electricity Exchange for the market area of Germany, Luxembourg and Austria (up to September 2018). Austria departed from this market area on 1 October 2018. Accordingly, from this date onward, only the day-ahead electricity market prices for the market area of Germany and Luxembourg are shown. The data are taken from the ENTSO-E database.
At 12 noon each day EPEX holds an auction for electricity deliveries and purchases on the following day (EPEX Spot 2013). The prices for each hour are determined on this day-ahead market. These electricity prices are used because the majority of renewable energy is sold in the day-ahead market, which has greater liquidity than the intraday market. To display longer periods (more than 30 days), the hourly prices are converted to daily average prices.

Table 1: Annual export balance and hourly production band to Luxembourg

	2012	2013	2014	2015
Export balance from Germany to... [1)]	**TWh**			
Luxembourg	4.6	4.6	4.8	4.8
Hourly generation band	**MW**			
Luxembourg	524	524	551	546

[1)] ENTSO-E 2015

[1] Physical flows are not used because the declared trade flows for exports and imports are economic variables that reflect commercial electricity transactions. The physical current flows that actually occur at any given time can deviate due to varying voltage and control energy situations. In addition, the ring flows that occasionally occur (e.g. electricity transport from France to Switzerland via Germany) should not be regarded as imports and exports in a real sense, but rather as transit flows. However, the Final Cross-Border Schedule is only available seven days after the fact and therefore cannot be used. Moreover, since 15 January 2014, the ENTSO-E no longer publish these data.

7 Emissions

Between 2012 and 2019, direct emissions from electricity generation in Germany fell from 322 million tonnes to 219 million tonnes of CO_2. The decline is attributable to a decline in coal-fired power generation in combination with an increasing share of renewables in the energy mix.

To calculate total hourly emissions from electricity generation (in tonnes of CO_2), the hourly feed-in time series for fossil fuels published by the ENTSO-E (from 2018) and EEX (from 2012 to 2017) are multiplied by an emissions factor (see Table 2) and then added after adjustment in accordance with the methods described above. The specific emissions factors are taken from publications released by Germany's Environmental Agency (UBA), and are continuously updated.[2]

The hourly emission factor of the electricity mix (in g/kWh) is calculated according to an UBA formula. For this purpose, the hourly emissions from electricity generation are divided by total net electricity generation (excluding pumping) less grid losses. Since no known public source publishes hourly grid losses, we apply a grid loss rate that is calculated as a share of net electricity demand based on the previous year's data (in 2019, this loss rate was 0.5% per hour). The emissions per energy source are then added up and expressed both as a specific summary value per kilowatt-hour and in absolute tonnes.

Other greenhouse gases that may be emitted during electricity production or in the upstream and downstream stages (e.g. during the installation or dismantling of a power plant) are not taken into account. In addition, neither the CO_2 emissions from imports nor those from exports are added or subtracted. Accordingly, only the CO_2 emissions that ultimately affect the overall German CO_2 balance are displayed. An overview is given in Table 2.

[2] The average emission factor of an energy carrier changes as a result of the addition or elimination of generation plants, as the generation plants usually have different efficiencies and emission factors.

Table 2: Annual emissions from fossil power generation and emission factors

Emissions [1]	2012	2013	2014	2015	2016	2017	2018	2019	2020 [2]
	Mt CO_2								
Lignite	166	163	159	157	153	151	146	114	-
Hard coal	94	104	97	92	86	71	62	43	-
Natural gas	27	24	22	22	28	30	30	33	-
Other (incl. fossil waste and oil)	34	35	34	34	33	33	31	29	-
Emission factor of electricity generation per energy source [1]	t CO_2/MWh								
Lignite	1.12	1.10	1.11	1.10	1.11	1.11	1.11	1,09	1,09
Hard coal	0.88	0.89	0.89	0.85	0.85	0.81	0.80	0,82	0,82
Natural gas	0.37	0.37	0.37	0.37	0.37	0.34	0.35	0,37	0,37
Other (incl. fossil waste and oil)	1.56	1.57	1.63	1.59	1.68	1.76	1.75	1,50	1,50
Average emission factor of the electricity mix [1]	g/kWh								
	574	573	557	527	523	486	474	401	-

[1] UBA 2019

[2] The annual value of the previous year is used for the extrapolation of the current year.

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BDEW (2012-2020): *Aktuelle Daten der Elektrizitätswirtschaft*

EEX (2012-2017): Marktdaten zur Stromerzeugung; (for presentation in the Agorameter, data are obtained directly from EEX through a fee-based server; however, all data on electricity generation from the plants reporting to EEX are also published at the EEX transparency page at: http://www.eex-transparency.com/)

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Appendix

The following tables provide information on historical production data and correction factors. The latter are given monthly or annually, depending on their relevance.

Table 3: Annual and monthly electricity generation and correction factors for wind energy. Cumulative generation figures for onshore and offshore wind energy

Wind energy	2012	2013	2014	2015	2016	2017	2018	2019	2020 [1]
					TWh				
Gross power generation [2]	**51.6**	**52.7**	**58.5**	**80.6**	**79.9**	**105.7**	**110.0**	**126.0**	
onshore	50.9	51.8	57.0	72.3	67.7	88.0	90.5	101.3	
offshore	0.7	0.9	1.5	8.3	12.3	17.7	19.5	24.7	
Self consumption [3]					**0%**				
Net power generation [4]	**51.6**	**52.7**	**58.5**	**80.6**	**79.9**	**105.7**	**110.0**	**126.0**	
onshore	50.9	51.8	57.0	72.3	67.7	88.0	90.5	101.3	
offshore	0.7	0.9	1.5	8.3	12.3	17.7	19.5	24.7	
January	7.8	5.5	6.9	9.6	9.3	8.1	14.9	14.9	
February	5.1	3.5	6.9	5.4	9.9	10.3	8.2	11.0	
March	4.4	5.1	5.1	7.4	6.0	9.7	11.0	16.5	
April	3.7	3.6	4.0	5.4	5.9	8.4	9.2	9.1	
May	3.2	3.1	4.1	5.4	6.1	5.9	7.4	8.3	
June	3.2	3.7	2.8	4.2	3.4	7.4	5.9	6.7	
July	2.9	1.9	2.6	6.0	4.7	5.7	4.6	6.7	
August	2.4	2.6	3.7	4.0	4.8	5.7	6.3	5.9	
September	3.3	3.7	2.7	5.6	4.2	6.5	8.2	9.4	
October	4.1	6.0	4.2	4.0	5.6	13.0	11.0	11.9	
November	4.3	4.7	4.4	10.6	8.1	10.7	10.2	10.3	
December	6.2	8.2	9.9	11.5	9.3	15.3	14.8	15.5	
Generation by fuel source EEX/ENTSO-	**45.9**	**47.2**	**50.9**	**78.9**	**77.0**	**102.5**	**108.6**	**123.8**	
onshore				76.0	65.0	85.1	89.5	99.6	
offshore				3.0	11.9	17.4	19.1	24.2	
January	7.0	5.0	6.2	9.6	9.3	7.8	14.5	14.7	
February	4.6	3.2	5.8	5.2	9.8	9.9	7.9	10.8	
March	4.0	4.7	4.6	7.4	6.0	9.3	10.7	16.2	
April	3.4	3.3	3.6	5.4	5.9	8.0	8.9	9.0	
May	2.9	2.9	3.7	5.4	6.1	5.7	7.2	8.2	
June	2.9	3.4	2.5	4.2	3.3	7.1	5.7	6.6	
July	2.6	1.7	2.3	6.1	4.7	5.5	4.4	6.6	
August	2.2	2.3	3.3	4.0	4.8	5.4	6.1	5.8	
September	3.0	3.4	2.5	5.5	4.2	6.3	8.0	9.1	
October	3.7	5.5	3.8	4.0	5.6	12.5	10.7	11.6	
November	3.9	4.3	4.0	10.6	8.0	10.3	9.9	10.1	
December	5.6	7.5	8.8	11.7	9.3	14.7	14.4	15.2	
Correction factor [6]	**1.12**	**1.12**	**1.15**						
onshore				**0.95**	**1.04**	**1.03**	**1.03**	**1.02**	**1.02**
offshore				**2.79**	**1.03**	**1.02**	**1.01**	**1.02**	**1.02**
January	1.10	1.10	1.11	1.00	1.01	1.04	1.03	1.01	
February	1.10	1.10	1.19	1.05	1.00	1.04	1.03	1.02	
March	1.10	1.10	1.11	1.01	1.00	1.04	1.03	1.02	
April	1.10	1.10	1.11	1.00	1.01	1.05	1.03	1.01	
May	1.10	1.10	1.12	1.00	1.01	1.04	1.03	1.01	
June	1.11	1.09	1.11	1.00	1.01	1.04	1.03	1.02	
July	1.10	1.10	1.12	1.00	1.01	1.04	1.03	1.02	
August	1.10	1.09	1.14	1.00	1.01	1.05	1.03	1.02	
September	1.10	1.10	1.12	1.00	1.02	1.04	1.03	1.03	
October	1.10	1.10	1.13	1.01	1.01	1.04	1.03	1.02	
November	1.10	1.10	1.12	1.00	1.01	1.04	1.03	1.02	
December	1.11	1.10	1.12	0.99	1.00	1.04	1.03	1.02	

[1] For the extrapolation of the current year, the annual value from the previous year is used in each case
[2] AG Energiebilanzen 2020
[3] Oeko-Institut 2013
[4] Own calculation based on BDEW 2012-2020
[5] EEX 2012-2017, ENTSO-E from 2018
[6] Own calculation based on the degree of coverage

Table 4: Annual and monthly electricity generation and correction factors for photovoltaics

Photovoltaics	2012	2013	2014	2015	2016	2017	2018	2019	2020[1]
					TWh				
Gross power generation[2]	**26.4**	**31.0**	**36.1**	**38.7**	**38.1**	**39.4**	**45.8**	**47.5**	
Self consumption[3]					**0%**				
Net power generation[4]	**26.4**	**31.0**	**36.1**	**38.7**	**38.1**	**39.4**	**45.8**	**47.5**	
January	0.5	0.4	0.8	0.6	0.7	0.9	0.8	0.8	
February	1.0	0.7	1.8	1.5	1.4	1.6	2.0	2.3	
March	2.2	2.4	3.6	3.1	2.6	3.5	2.9	3.3	
April	2.5	3.3	4.0	4.9	4.2	4.3	5.4	5.5	
May	3.8	3.7	4.5	4.9	5.2	5.7	6.7	5.4	
June	3.4	4.5	5.3	5.1	5.3	6.0	6.0	7.0	
July	3.6	5.4	4.9	5.5	5.5	5.5	6.9	6.2	
August	3.7	4.3	4.3	5.1	5.2	5.1	5.8	5.7	
September	2.8	2.8	3.2	3.6	4.3	3.4	4.6	4.2	
October	1.7	2.0	2.2	2.2	1.9	2.4	3.1	2.7	
November	0.8	0.8	1.1	1.3	1.1	0.9	1.3	1.1	
December	0.3	0.8	0.4	1.0	0.9	0.6	0.6	1.0	
Generation by fuel source EEX/ENTSO-	**27.7**	**29.7**	**32.7**	**34.9**	**34.5**	**35.9**	**41.2**	**41.9**	
January	0.5	0.3	0.7	0.6	0.7	0.8	0.7	0.7	
February	1.0	0.7	1.6	1.4	1.3	1.5	1.8	2.2	
March	2.3	2.3	3.3	2.9	2.3	3.2	2.7	3.1	
April	2.6	3.2	3.7	4.4	3.9	3.9	4.8	5.1	
May	4.0	3.5	4.1	4.4	4.7	5.1	5.9	5.0	
June	3.6	4.3	4.8	4.6	4.7	5.4	5.3	6.5	
July	3.7	5.1	4.4	4.9	4.8	4.9	6.2	5.7	
August	3.9	4.1	3.9	4.6	4.7	4.6	5.2	5.3	
September	2.9	2.6	2.9	3.2	3.8	3.1	4.1	3.9	
October	1.8	1.9	2.0	1.9	1.7	2.1	2.7	2.4	
November	0.8	0.8	1.0	1.1	1.0	0.8	1.2	1.0	
December	0.4	0.7	0.4	0.8	0.8	0.5	0.5	0.9	
Correction factor[6]									**1.13**
January	0.95	1.04	1.09	1.08	1.08	1.08	1.09	1.07	
February	0.96	1.03	1.14	1.08	1.08	1.08	1.09	1.05	
March	0.96	1.03	1.09	1.08	1.15	1.08	1.09	1.08	
April	0.95	1.04	1.10	1.11	1.07	1.12	1.12	1.08	
May	0.95	1.04	1.10	1.11	1.11	1.12	1.12	1.08	
June	0.95	1.04	1.10	1.11	1.12	1.12	1.12	1.08	
July	0.95	1.05	1.10	1.11	1.15	1.12	1.12	1.08	
August	0.95	1.05	1.11	1.11	1.11	1.12	1.12	1.08	
September	0.95	1.05	1.10	1.12	1.11	1.12	1.12	1.07	
October	0.95	1.05	1.11	1.12	1.11	1.12	1.12	1.11	
November	0.96	1.05	1.10	1.12	1.11	1.12	1.12	1.05	
December	0.78	1.23	1.11	1.12	1.11	1.12	1.13	1.07	

[1] For the extrapolation of the current year, the annual value from the previous year is used in each case

[2] AG Energiebilanzen 2020

[3] Oeko-Institut 2013

[4] Own calculation based on BDEW 2012-2020

[5] EEX 2012-2017, ENTSO-E from 2018

[6] Own calculation based on the degree of coverage

Table 5: Annual electricity production and correction factors for hydropower

Hydropower	2012	2013	2014	2015	2016	2017	2018	2019	2020[1]
					TWh				
Gross power generation[2]	**21.8**	**23.0**	**19.6**	**19.0**	**20.5**	**20.2**	**18.0**	**20.2**	
Self consumption[3]					**2%**				
Net power generation[4]	**21.4**	**22.5**	**19.2**	**18.6**	**20.1**	**19.8**	**17.6**	**19.8**	
January							1.8	1.7	
February							1.5	1.5	
March							1.5	2.1	
April							1.7	1.7	
May							1.7	1.9	
June							1.5	1.9	
July							1.3	1.6	
August							1.1	1.8	
September							1.1	1.4	
October							0.9	1.6	
November							0.8	1.5	
December							1.5	1.5	
Generation by fuel source EEX/ENTSO-	**5.0**	**4.7**	**5.1**	**4.4**	**5.5**	**6.5**	**15.3**	**15.8**	
January							1.4	1.2	
February							1.2	1.0	
March							1.1	1.4	
April							1.4	1.3	
May							1.7	1.5	
June							1.6	1.6	
July							1.4	1.6	
August							1.2	1.6	
September							1.2	1.2	
October							1.0	1.2	
November							1.0	1.2	
December							1.1	1.1	
Correction factor[6]	**4.31**	**4.75**	**3.79**	**4.27**	**3.64**	**3.06**			**1.25**
January							1.3	1.4	
February							1.3	1.5	
March							1.3	1.5	
April							1.2	1.2	
May							1.0	1.2	
June							0.9	1.2	
July							0.9	1.0	
August							0.9	1.1	
September							1.0	1.1	
October							0.9	1.3	
November							0.8	1.3	
December							1.4	1.3	

[1] For the extrapolation of the current year, the annual value from the previous year is used in each case
[2] AG Energiebilanzen 2020
[3] Oeko-Institut 2013
[4] Own calculation based on AG Energiebilanzen 2020 and BDEW 2012-2020
[5] EEX 2012-2017, ENTSO-E from 2018
[6] Own calculation based on the degree of coverage

Table 6: Annual electricity generation and average feed-in for biomass

Biomass (incl. biogenic municipal waste)	2012	2013	2014	2015	2016	2017	2018	2019	2020[1]
					TWh				
Gross power generation[2]	**43.3**	**45.5**	**48.3**	**50.4**	**50.9**	**51.0**	**50.9**	**50.4**	
Self consumption[3]					**9% bis 20%**				
Net power generation[4]	**39.0**	**41.0**	**43.5**	**45.4**	**45.9**	**45.9**	**45.9**	**45.5**	
Mean feed-in[4] (GW)	**4.5**	**4.7**	**5.0**	**5.2**	**5.2**				
Net power generation[5]									
January						4.0	4.0	3.9	
February						3.7	3.8	3.8	
March						4.0	4.0	3.9	
April						3.9	3.8	3.7	
May						3.9	4.0	3.9	
June						3.7	3.7	3.6	
July						3.8	3.8	3.7	
August						3.8	3.9	3.7	
September						3.8	3.7	3.6	
October						3.9	4.0	3.8	
November						3.9	3.9	3.8	
December						4.1	4.1	3.9	
Generation by fuel source ENTSO-E[6]						**38.4**	**40.2**	**41.0**	
January						3.4	3.6	3.7	
February						3.2	3.2	3.3	
March						3.5	3.4	3.6	
April						3.3	3.3	3.5	
May						3.3	3.4	3.6	
June						3.1	3.2	3.3	
July						3.1	3.2	3.3	
August						3.1	3.3	3.2	
September						2.8	3.1	3.1	
October						3.1	3.4	3.5	
November						3.2	3.5	3.4	
December						3.3	3.6	3.6	
Correction factor[7]									**1.11**
January						1.16	1.11	1.07	
February						1.16	1.17	1.14	
March						1.16	1.17	1.09	
April						1.16	1.17	1.07	
May						1.18	1.16	1.08	
June						1.20	1.16	1.08	
July						1.21	1.19	1.13	
August						1.23	1.18	1.15	
September						1.34	1.19	1.17	
October						1.28	1.18	1.09	
November						1.24	1.13	1.11	
December						1.22	1.16	1.09	

[1] For the extrapolation of the current year, the annual value from the previous year is used in each case
[2] AG Energiebilanzen 2020
[3] Own calculation based on Oeko-Institut 2013
[4] Own calculation
[5] Own calculation based on AG Energiebilanzen 2020 and BDEW 2012-2020
[6] ENTSO-E 2017-2020
[7] Own calculation based on the degree of coverage

Table 7: Annual and monthly electricity production and correction factors for nuclear power

Nuclear	2012	2013	2014	2015	2016	2017	2018	2019	2020[1]
					TWh				
Gross power generation[2]	**99.5**	**97.3**	**97.1**	**91.8**	**84.6**	**76.3**	**76.0**	**75.1**	
Self consumption[3]					**5%**				
Net power generation[4]	**94.5**	**92.4**	**92.2**	**87.2**	**80.4**	**72.5**	**72.2**	**71.3**	
January	8.3	8.9	8.5	8.7	7.8	5.7	6.7	6.8	
February	8.0	8.1	8.0	8.0	7.2	4.6	6.1	6.2	
March	8.2	8.9	8.4	7.7	7.7	4.9	6.2	6.7	
April	5.5	7.0	7.4	7.2	5.1	4.8	5.2	5.7	
May	6.4	6.3	6.1	7.4	4.9	5.7	4.9	4.7	
June	6.4	6.6	6.7	6.7	6.0	6.4	5.8	4.6	
July	6.4	6.2	6.2	5.1	6.2	5.4	6.2	5.4	
August	8.1	7.1	7.4	7.1	7.0	7.1	6.7	5.5	
September	7.6	7.8	7.5	7.3	6.9	6.4	5.6	5.8	
October	7.6	8.3	8.8	6.7	7.8	7.4	5.8	6.7	
November	7.8	8.4	8.6	7.5	7.4	6.9	6.5	6.5	
December	7.6	8.8	8.7	7.7	6.3	7.3	6.8	6.6	
Generation by fuel source EEX[5]	**92.9**	**91.3**	**91.0**	**86.8**	**80.0**	**72.1**	**71.8**	**71.0**	
January	8.8	8.9	8.4	8.7	7.8	5.7	6.7	6.8	
February	8.4	7.6	8.0	7.9	7.2	4.5	6.1	6.2	
March	8.6	8.8	8.3	7.7	7.3	4.8	6.2	6.7	
April	5.8	6.9	7.3	7.2	5.5	4.8	5.2	5.7	
May	6.7	6.3	6.1	7.4	4.9	5.6	4.9	4.6	
June	6.7	6.6	6.6	6.7	6.0	6.3	5.7	4.6	
July	6.7	6.2	6.2	5.1	6.2	5.3	6.2	5.4	
August	8.6	7.1	6.9	7.1	6.9	7.1	6.5	5.5	
September	8.0	7.5	7.5	7.3	6.8	6.4	5.6	5.8	
October	8.2	8.2	8.8	6.7	7.8	7.4	5.7	6.7	
November	8.4	8.3	8.5	7.4	7.4	6.9	6.3	6.5	
December	8.1	8.8	8.4	7.7	6.3	7.2	6.8	6.5	
Correction factor[6]									**1.00**
January	0.94	1.01	1.01	1.00	1.01	1.01	1.00	1.00	
February	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
March	0.95	1.07	1.00	1.00	1.00	1.00	1.00	1.00	
April	0.95	1.01	1.00	1.01	1.06	1.00	1.00	1.00	
May	0.95	1.00	1.01	1.01	0.94	1.01	1.01	1.01	
June	0.95	1.00	1.01	1.00	1.01	1.01	1.02	1.00	
July	0.95	1.01	1.02	1.01	1.01	1.01	1.01	1.00	
August	0.95	1.01	1.01	1.01	0.99	1.01	1.02	1.01	
September	0.95	1.01	1.07	1.01	1.02	1.00	1.00	1.00	
October	0.95	1.04	1.01	1.00	1.00	1.01	1.00	1.00	
November	0.93	1.00	1.00	1.00	1.00	1.01	1.02	1.00	
December	0.93	1.00	1.01	1.00	1.00	1.01	1.01	1.00	

[1] For the extrapolation of the current year, the annual value from the previous year is used in each case
[2] AG Energiebilanzen 2020
[3] Oeko-Institut 2013
[4] Own calculation based on AG Energiebilanzen 2020 and BDEW 2012-2020
[5] EEX 2012-2017, ENTSO-E from 2018
[6] Own calculation based on the degree of coverage

Table 8: Annual electricity generation and correction factors for lignite

Lignite	2012	2013	2014	2015	2016	2017	2018	2019	2020[1]
					TWh				
Gross power generation[2]	**160.7**	**160.9**	**155.8**	**154.5**	**149.5**	**148.4**	**145.6**	**113.9**	
Self consumption[3]					**8%**				
Net power generation[4]	**147.8**	**148.0**	**143.3**	**142.1**	**137.5**	**136.5**	**134.0**	**104.8**	
Non-CHP[5]	143.5	143.4	139.5	138.1	133.5	132.8			
CHP[5]	4.4	4.6	3.9	4.1	4.0	3.8			
Non-CHP net power generation[6]	**143.5**	**143.4**	**139.5**	**138.1**	**133.5**	**132.8**			
Generation by fuel source EEX[7]	135.1	144.2	137.3	139.0	132.8	133.3			
Correction factor[5]	1.06	0.99	1.02	0.99	1.00	1.00			
CHP net power generation[6]	**4.4**	**4.6**	**3.9**	**4.1**	**4.0**	**3.8**			
Process heat driven fraction[6]	0.0	0.0	0.0	0.0	0.0	0.0			
Thermal heat driven fraction[6]	4.4	4.6	3.9	4.1	4.0	3.8			
January							11.6	10.3	
February							11.7	10.1	
March							11.8	8.6	
April							10.8	9.4	
May							10.6	9.0	
June							11.5	7.2	
July							12.0	8.4	
August							11.4	8.1	
September							10.9	7.9	
October							10.9	8.5	
November							11.1	10.0	
December							9.5	7.7	
Generation by fuel source ENTSO-E[7]							**128.5**	**102.9**	
January							11.1	9.8	
February							11.2	9.8	
March							11.3	8.3	
April							10.2	9.1	
May							10.2	8.7	
June							11.1	7.0	
July							11.6	8.2	
August							11.0	8.0	
September							10.4	7.8	
October							10.7	8.5	
November							10.7	10.1	
December							9.1	7.7	
Correction factor[7]									**1.02**
January							1.05	1.05	
February							1.05	1.03	
March							1.05	1.04	
April							1.05	1.04	
May							1.04	1.04	
June							1.04	1.03	
July							1.04	1.03	
August							1.04	1.02	
September							1.04	1.01	
October							1.02	1.01	
November							1.04	1.00	
December							1.04	1.00	

[1] For the extrapolation of the current year, the annual value from the previous year is used in each case
[2] AG Energiebilanzen 2020
[3] Oeko-Institut 2013
[4] Own calculation based on AG Energiebilanzen 2020 and BDEW 2020
[5] Own calculation/estimate based on Statistisches Bundesamt 2012-2017
[6] Own calculation based on the degree of coverage
[7] EEX 2012-2017, ENTSO-E as of 2018

Table 9: Annual electricity generation and correction factors for hard coal

Hard coal	2012	2013	2014	2015	2016	2017	2018	2019	2020[1]
					TWh				
Gross power generation[2]	**116.4**	**127.3**	**118.6**	**117.7**	**112.2**	**92.9**	**82.6**	**57.3**	
Self consumption[3]					**8%**				
Net power generation[4]	**107.1**	**117.1**	**109.1**	**108.3**	**103.2**	**85.5**	**76.0**	**52.7**	
Non-CHP[5]	92.1	100.9	95.5	95.2	90.5	70.1			
CHP[5]	15.0	16.2	13.6	13.0	12.7	15.3			
Non-CHP net power generation[5]	**92.1**	**100.9**	**95.5**	**95.2**	**90.5**	**70.1**			
Generation by fuel source EEX[7]	64.8	74.0	73.4	96.9	98.4	80.3			
Correction factor[6]	1.42	1.36	1.30	0.98	0.92	0.87			
CHP net power generation[5]	**15.0**	**16.2**	**13.6**	**13.0**	**12.7**	**15.3**			
Process heat driven fraction[5]	2.6	2.3	2.1	2.0	2.6	2.6			
Thermal heat driven fraction[5]	12.4	13.9	11.5	11.0	10.2	12.8			
January							5.8	8.1	
February							8.6	6.1	
March							8.5	3.5	
April							4.9	3.9	
May							4.3	3.9	
June							4.7	2.7	
July							6.4	3.4	
August							6.1	3.1	
September							6.1	2.8	
October							7.2	4.1	
November							7.9	6.7	
December							5.9	4.3	
Generation by fuel source ENTSO-E[7]							**72.2**	**44.9**	
January							5.0	7.5	
February							8.3	5.4	
March							8.0	2.7	
April							4.0	3.2	
May							3.6	3.2	
June							4.6	2.2	
July							6.6	3.0	
August							5.5	2.6	
September							5.9	2.2	
October							7.2	3.6	
November							7.9	6.0	
December							5.6	3.3	
Correction factor[6]									**1.17**
January							1.18	1.08	
February							1.04	1.12	
March							1.06	1.29	
April							1.23	1.22	
May							1.20	1.23	
June							1.02	1.23	
July							0.96	1.14	
August							1.11	1.19	
September							1.03	1.29	
October							0.99	1.14	
November							1.00	1.13	
December							1.06	1.27	

[1] For the extrapolation of the current year, the annual value from the previous year is used in each case
[2] AG Energiebilanzen 2020
[3] Oeko-Institut 2013
[4] Own calculation based on AG Energiebilanzen 2020 and BDEW 2020
[5] Own calculation/estimate based on Statistisches Bundesamt 2012-2017
[6] Own calculation based on the degree of coverage
[7] EEX 2012-2017, ENTSO-E as of 2018

Table 10: Annual electricity generation and correction factors for natural gas

Natural gas	2012	2013	2014	2015	2016	2017	2018	2019	2020[1]
	TWh								
Gross power generation[2]	**76.4**	**67.5**	**61.1**	**62.0**	**81.3**	**86.7**	**82.5**	**91.0**	
Self consumption[3]	**3%**								
Net power generation[4]	**74.1**	**65.5**	**59.3**	**60.1**	**78.9**	**84.1**	**80.0**	**88.3**	
Public supply[6]	47.7	37.8	30.3	26.8	43.7	46.7	43.7	51.9	51.9
Industry[6]	26.4	27.7	29.0	33.3	35.1	37.4	36.3	36.3	36.3
Generation by fuel source EEX/ENTSO-	**16.8**	**12.3**	**13.0**	**23.1**	**30.0**	**31.4**	**33.9**	**44.3**	
Public supply[6]	15.1	11.0	11.7	20.8	27.0	28.3	30.4	39.9	
Industry[6]	1.7	1.2	1.3	2.3	3.0	3.1	3.5	4.4	
Additional load per year[6]	**57.3**	**53.2**	**46.3**	**37.1**	**48.8**	**52.7**	**46.2**	**44.0**	**44.0**
Public supply[6]	32.6	26.8	18.6	6.1	16.7	18.4	13.3	12.0	12.0
Industry[6]	24.7	26.4	27.7	31.0	32.1	34.2	32.9	31.9	31.9

[1] For the extrapolation of the current year, the annual value from the previous year is used in each case
[2] AG Energiebilanzen 2020
[3] Oeko-Institut 2013
[4] Own calculation
[5] EEX 2012-2017, ENTSO-E from 2018
[6] Own calculation/estimate based on Statistisches Bundesamt 2012-2020

Table 11: Annual electricity production and correction factors for oil until 2017

Oil	2012	2013	2014	2015	2016	2017
	TWh					
Gross power generation[2]	**7.6**	**7.2**	**5.7**	**6.2**	**5.8**	**5.6**
Self consumption[3]	**9%**					
Net power generation[4]	**6.9**	**6.6**	**5.2**	**5.6**	**5.3**	**5.1**
Non-CHP	5.2	4.9	3.7	4.0	3.5	3.4
CHP	1.7	1.7	1.5	1.6	1.8	1.7
Non-CHP net power generation[6]	**5.2**	**4.9**	**3.7**	**4.0**	**3.5**	**3.4**
Generation by fuel source EEX[7]	2.3	2.5	1.9	2.3	11.9	17.4
Correction factor[5]	2.22	1.96	1.98	1.78	0.29	0.19
CHP net power generation[6]	**1.7**	**1.7**	**1.5**	**1.6**	**1.8**	**1.7**
Process heat driven fraction[6]	1.5	1.5	1.3	1.4	1.5	1.5
Thermal heat driven fraction[6]	0.3	0.2	0.2	0.2	0.3	0.2

[1] For the extrapolation of the current year, the annual value from the previous year is used in each case
[2] AG Energiebilanzen 2020
[3] Oeko-Institut 2013
[4] Own calculation
[5] Own calculation based on the degree of coverage
[6] Own calculation/estimate based on Statistisches Bundesamt 2012-2017
[7] EEX 2017

Table 12: Annual electricity production and correction factors for Others until 2017

Others	2012	2013	2014	2015	2016	2017
	TWh					
Gross power generation [2)]	16.6	17.4	18.1	16.5	16.6	16.1
Self consumption [3)]	10%					
Net power generation [4)]	15.0	15.7	16.2	14.9	15.0	14.5
Generation by fuel source EEX [5)]	0.3	1.4	0.6	79.7	2.2	2.0
Correction factor [6)]				0.19	6.85	7.33
Additional hourly generation volume [7)] (in GW)	1.68	1.62	1.79			

[1)] For the extrapolation of the current year, the annual value from the previous year is used in each case

[2)] AG Energiebilanzen 2020

[3)] Own estimate based on Oeko-Institut 2013

[4)] Own calculation

[5)] EEX 2017

[6)] Own calculation based on the degree of coverage

[7)] Own estimate based on Statistisches Bundesamt 2012-2017

Table 13: Annual electricity production and correction factors for Others from 2018 onward

Oil + Others	2018	2019	2020[1]
		TWh	
Gross power generation[2]	**21.9**	**21.8**	
Oil	**5.2**	**5.1**	
Others (including non-organic waste)	**16.7**	**16.7**	
Self consumption[3]		**0.0**	
Oil		**9%**	
Others (including non-organic waste)		**10%**	
Net power generation Oil + Others[4]	**19.8**	**19.7**	
January	1.7	1.6	
February	1.6	1.6	
March	1.7	1.7	
April	1.6	1.6	
May	1.6	1.6	
June	1.6	1.6	
July	1.8	1.7	
August	1.8	1.7	
September	1.6	1.6	
October	1.7	1.7	
November	1.7	1.6	
December	1.6	1.6	
Generation by fuel source ENTSO-E[5]	**17.5**	**32.2**	
January	1.5	2.8	
February	1.3	2.5	
March	1.4	2.7	
April	1.5	2.7	
May	1.3	2.7	
June	1.2	2.5	
July	1.3	2.5	
August	1.9	2.7	
September	1.4	2.6	
October	1.5	2.9	
November	1.7	2.7	
December	1.6	2.7	
Correction factor[6]			**1.25**
January	1.10	0.99	
February	1.27	1.01	
March	1.20	1.15	
April	1.08	1.21	
May	1.25	1.22	
June	1.40	1.35	
July	1.37	1.35	
August	0.91	1.41	
September	1.15	1.43	
October	1.13	1.44	
November	1.01	1.23	
December	1.02	1.25	

[1] For the extrapolation of the current year, the annual value from the previous year is used in each case
[2] AG Energiebilanzen 2020
[3] Oeko-Institut 2013
[4] Own calculation based on AG Energiebilanzen 2020 and BDEW 2020
[5] ENTSO-E 2012-2020
[6] Own calculation based on the degree of coverage

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