50hertz
| Elia Group

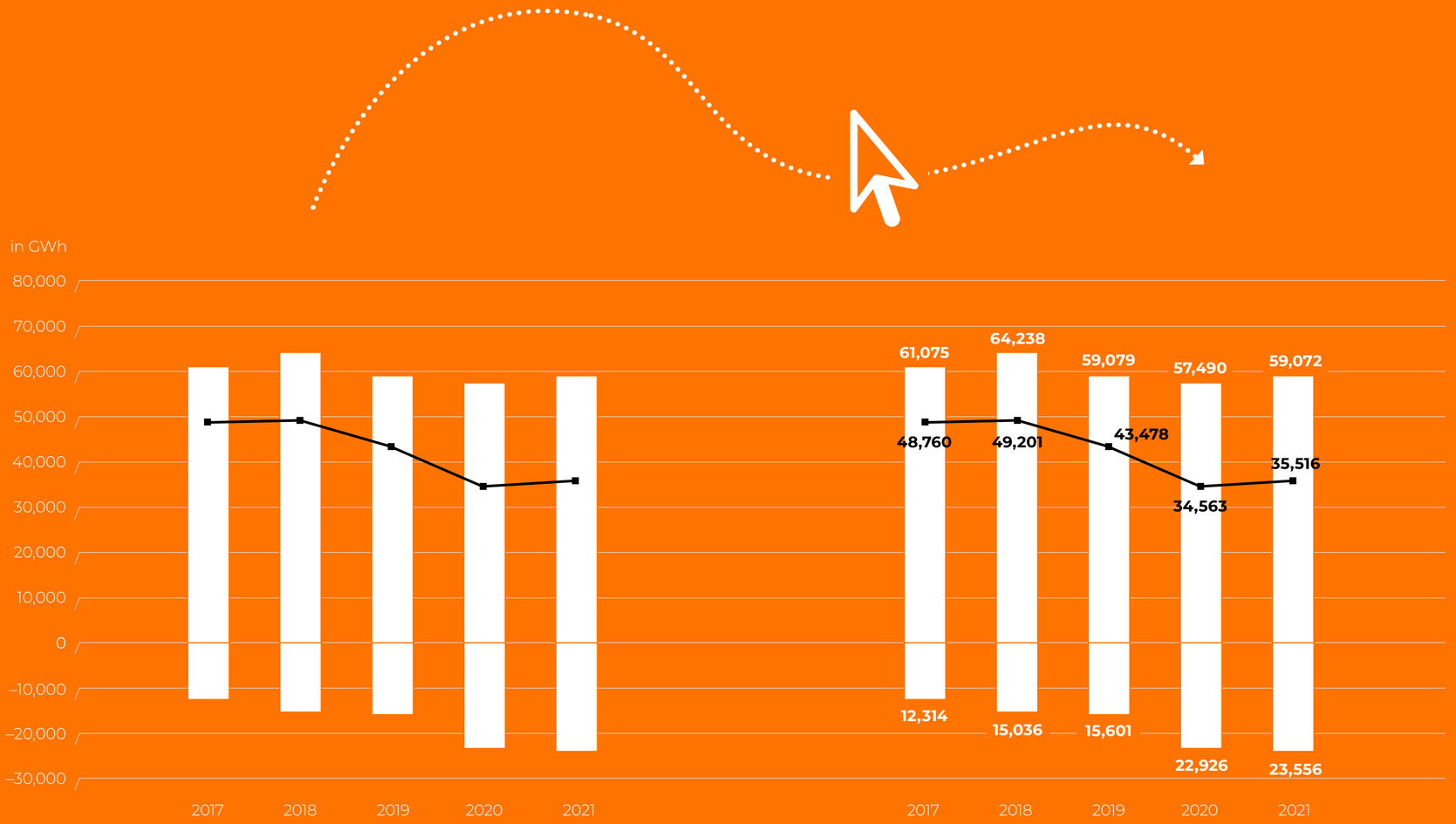
Almanac 2021

New energy for a strong economy

About this document

This interactive document uses mouse-over effects. Key figures in diagrams and tables can be displayed or hidden simply by moving the mouse pointer over them. The icon on the left indicates where this feature is available.

Where external sources are referenced, they are mentioned underneath the corresponding graphic.



Contents

Key data for 50Hertz

As a transmission system operator in the heart of Europe, 50 Hertz is committed to the secure integration of renewable energy sources, the development of the European electricity market and the maintenance of a high standard of supply security.

We operate the electricity transmission system in the north and east of Germany, and are expanding it to meet the requirements of the energy transition. We are leaders in the secure integration of renewable energy sources – by 2032, we aim to reliably incorporate 100 per cent renewable energy sources into our grid and system, calculated over the course of a year.

The 50Hertz grid area covers the federal states of Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt and Thuringia, as well as the federal city states of Berlin and Hamburg. In these regions, the 50Hertz team of roughly 1,400 employees ensures the power supply for 18 million people around the clock. Our extra-high-voltage grid has a total circuit length of around 10,330 kilometres – that is the distance from Berlin to Rio de Janeiro.

The shareholders of 50Hertz are the listed Belgian holding company Elia Group (80 per cent) and the KfW banking group with a stake of 20 per cent.

Transparent and non-discriminatory business practices are at the core of our commitment to social responsibility. For us, this means that we also provide a clear explanation and data to back up what we do, as well as presenting the energy industry framework in which we operate. Our Almanac provides a concise overview of the most important data and facts on the 50Hertz transmission system and grid area in a German and European context.

More information: www.50Hertz.com

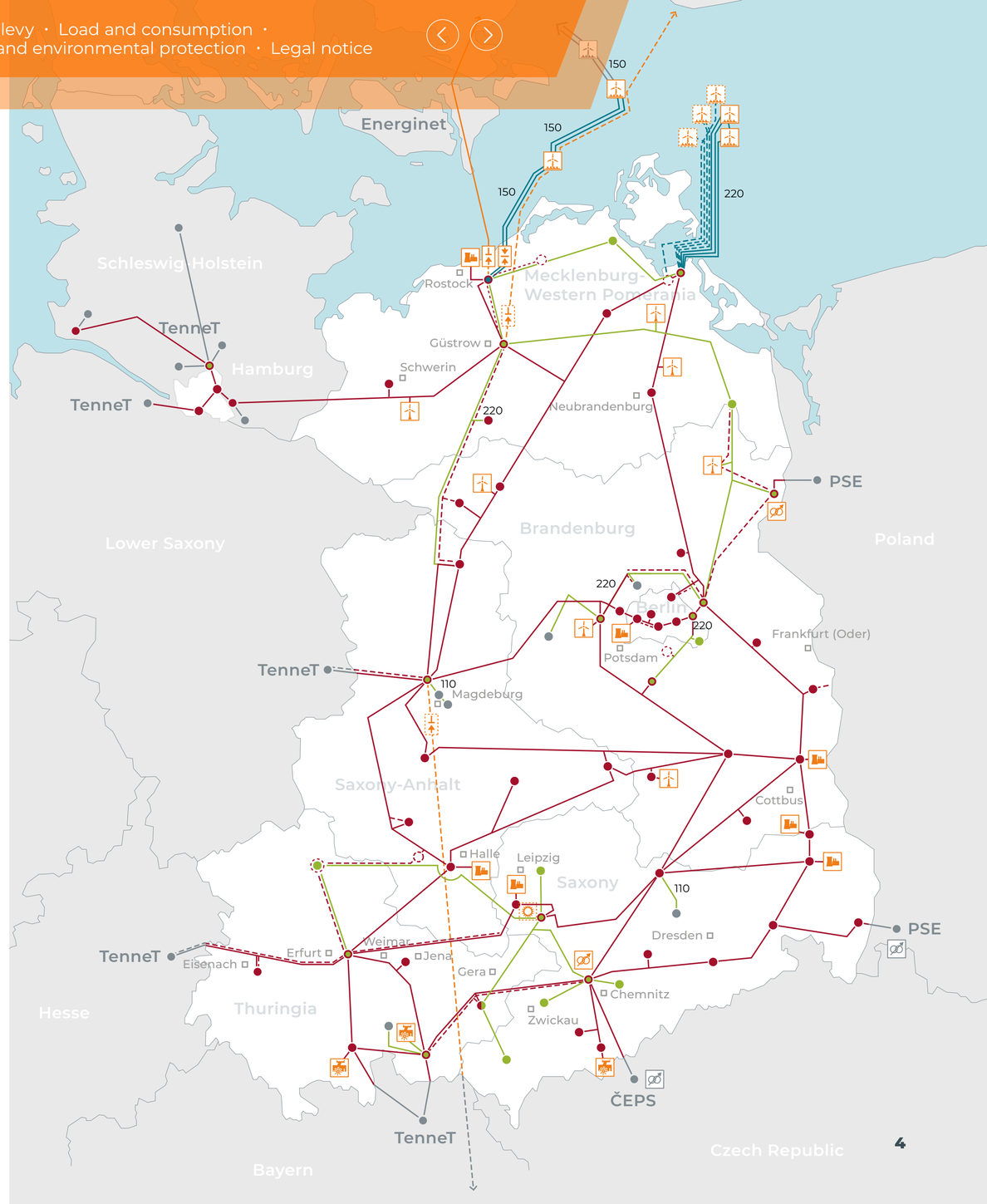
Key data for 2021

Circuit length [km]	**10,330**	**(~ 28%*)**
Circuit length of 380 kV AC overhead lines	7,330	
Circuit length of 220 kV AC overhead lines	2,342	
Circuit length of 380 kV AC cables	55	
Circuit length of 400 kV DC cables (HVDC)	15	
Circuit length of 220 kV AC cables	3	
Circuit length of 150 kV AC offshore cables	295	
Circuit length of 220 kV AC offshore cables	290	
Number of installations	**79**	
Substations	66	
Switching stations	9	
Third-party substations and switching stations	4	
Transformer capacity [MVA]	**59,620**	
EHV/EHV (Extra-High Voltage/Extra-High Voltage)	18,550	
EHV/HV (Extra-High Voltage/High Voltage)	41,070	
General information		
Geographical area [km²]	109,708	(~ 31%*)
Population [millions]	18	(~ 22%*)

Conversion table

kV (kilovolt)	1,000 volts, voltage
kW (kilowatt)	1,000 watts, power
MW (megawatt)	1,000 kilowatts
GW (gigawatt)	1 million kilowatts
kWh (kilowatt-hour)	1,000 watt-hours, work
MWh (megawatt-hour)	1,000 kilowatt-hours
GWh (gigawatt-hour)	1 million kilowatt-hours
TWh (terawatt-hour)	1 billion kilowatt-hours

* Proportion of total for Germany



Capacity and generation

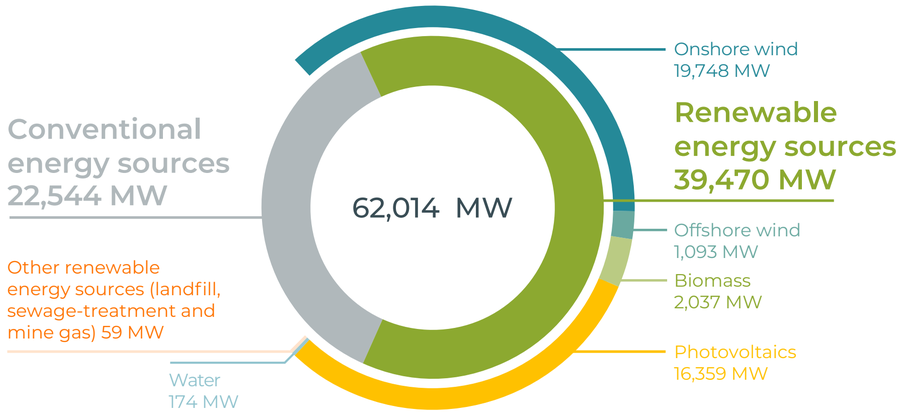
Net installed capacity in the 50Hertz grid area

Installed capacity

Figures in MW	**2017**	**2018**	**2019**	**2020**	**2021**
Renewable energy sources					
Wind, onshore	17,866	18,346	18,711	19,138	19,748*
Wind, offshore	690	1,068	1,068	1,068	1,093*
Water	282	279	284	281	174*
Photovoltaics	10,385	11,219	12,204	13,552	16,359*
Landfill, sewage-treatment and mine gas	70	71	70	67	59*
Biomass	1,884	1,912	1,980	2,023	2,037*
Total for renewable energy sources	**31,177**	**32,895**	**34,316**	**36,129**	**39,470***
Conventional energy sources					
Lignite	9,888	9,885	9,762	9,729	10,234
Coal	3,355	3,355	3,234	3,234	1,624
Natural gas	5,112	5,297	5,738	5,680	5,900
Oil	1,013	1,042	979	795	1,089
Nuclear energy	0	0	0	0	0
Waste	421	421	419	473	473
Pumped-storage plants	2,793	2,793	2,793	2,793	2,793
Battery-storage plants	–	–	–	–	237
Other energy sources	323	216	192	192	195
Total for conventional energy sources	**22,905**	**23,009**	**23,116**	**22,896**	**22,544**
Total	**54,082**	**55,904**	**57,432**	**59,025**	**62,014**

Sources: Installed capacity of renewable energy sources: 50Hertz's EEG database for the reporting years 2017 to 2020, Core Energy Market Data Register (MaStR) of the German Federal Network Agency for the reporting year 2021, data extracted in May 2022 as at a reporting date of 31/12/2021; installed capacity of conventional energy sources: German Federal Network Agency power plant list, data extracted in November 2021, and Core Energy Market Data Register, data extracted in January 2022, as at a reporting date of 31/12/2021

Installed capacity in the 50Hertz grid area by energy source, 2021

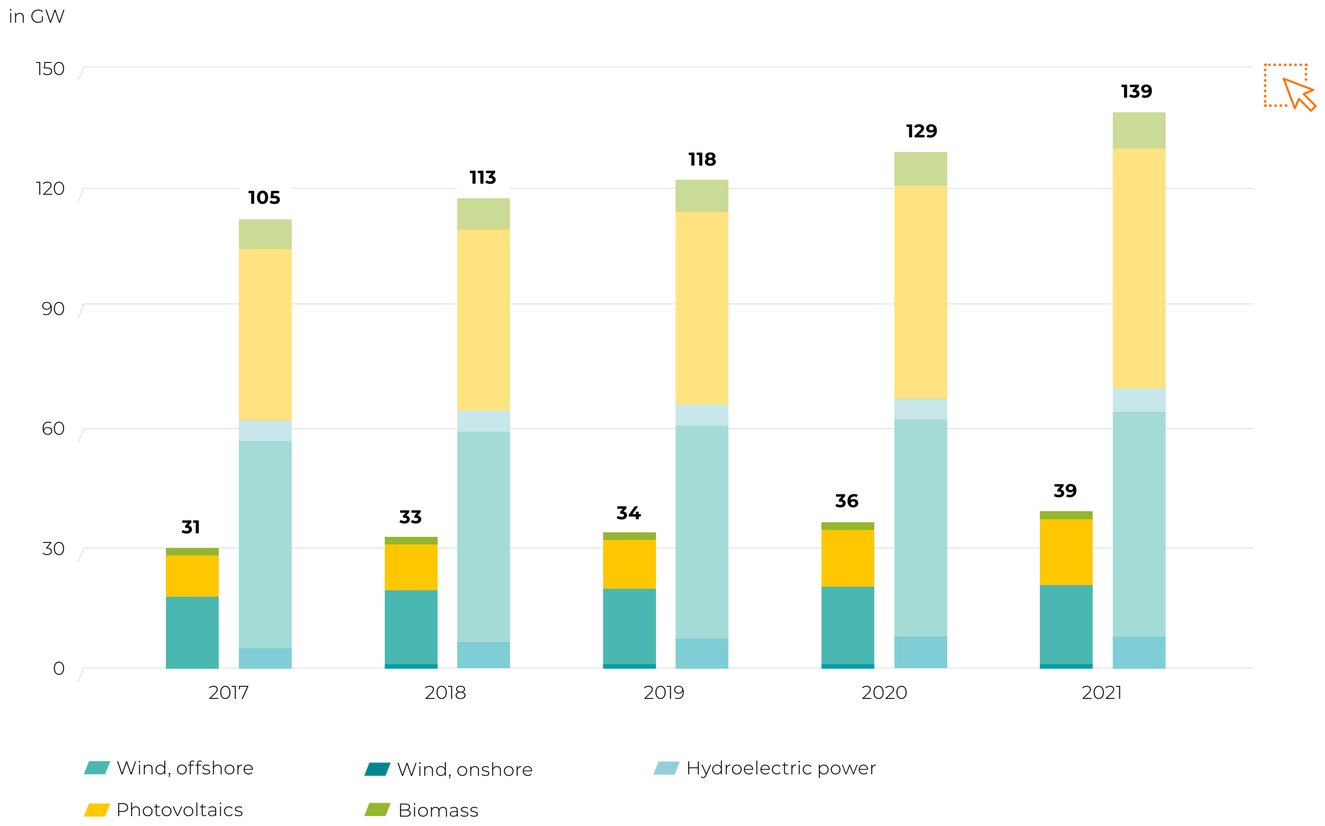


* In the 2021 reporting year, the source used for the installed capacity of renewable energy sources was changed to the gross installed capacity from the Core Energy Market Data Register (MaStR). The Core Energy Market Data Register is maintained by the German Federal Network Agency and is the central data source for master data relating to all plant operators and installations on the basis of Sections 111e and 111f of the German Energy Industry Act and the German Ordinance on the Registration of Energy Industry Data (MaStRV). The increase in installed capacity in 2021 cannot therefore be seen here due to the use of different data sources. The increase in the installed capacity of wind turbines and photovoltaic plants in 2021 as per MaStR can be seen on pages 11 and 12.

There may be rounding differences in the summing up of the individual values.

Capacity and generation

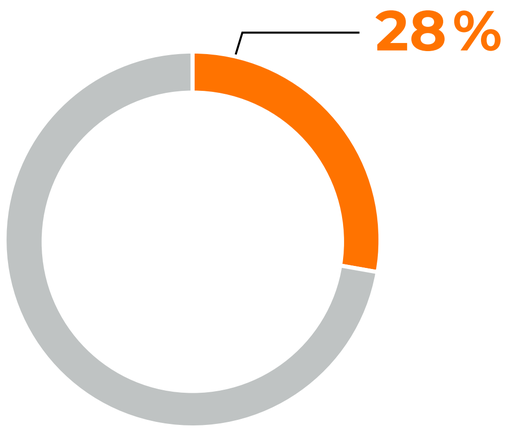
Development of the installed capacity of renewable energy sources in the 50Hertz grid area and in Germany



ⓘ The left-hand bar of each pair indicates the values for 50Hertz, and the slightly transparent right-hand bar indicates the values for Germany.

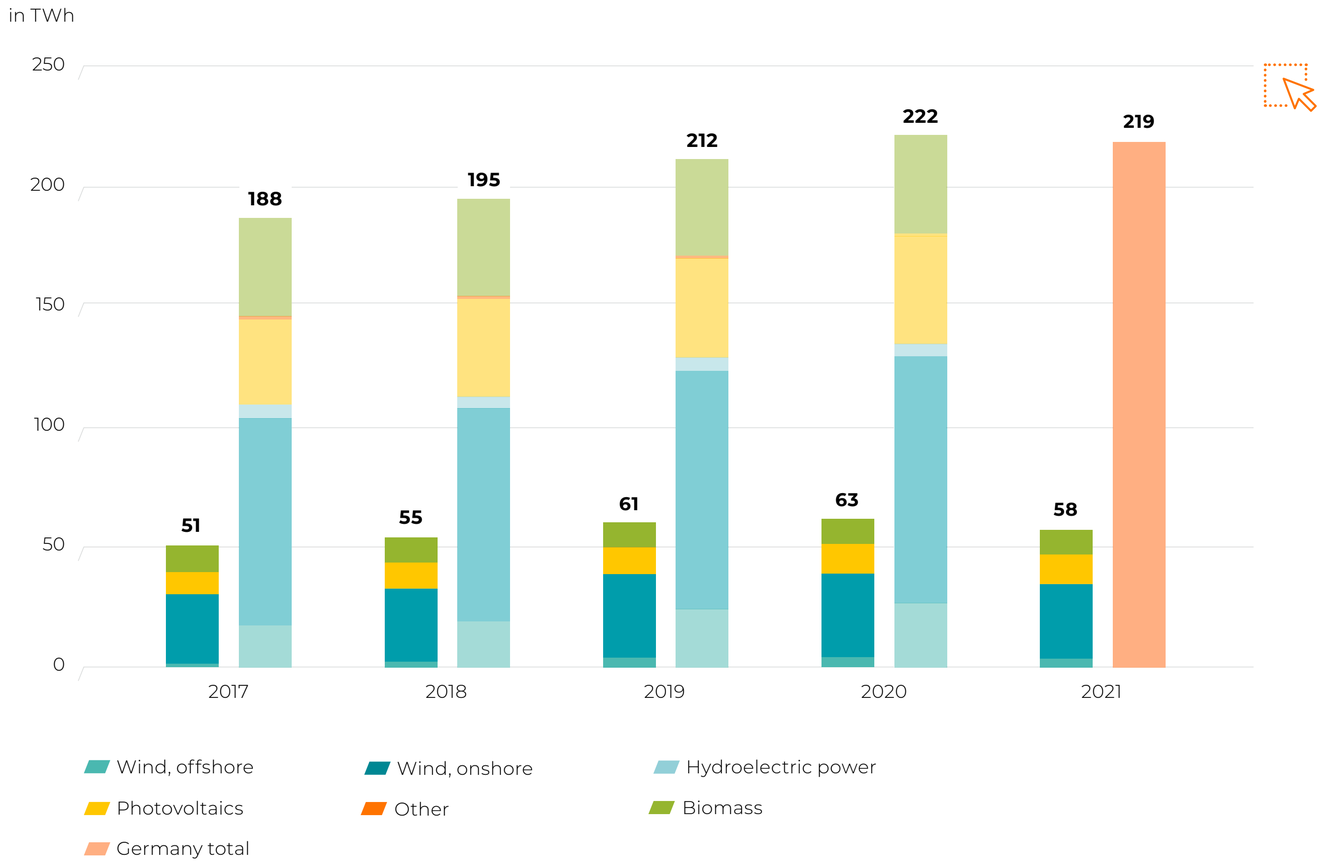
Source for Germany values: ENTSO-E Transparency Platform for 2017 to 2020, gross installed capacity from the Core Energy Market Data Register (MaStR) of the German Federal Network Agency from 2021 onwards

50Hertz's share of the installed capacity of renewable energy sources in Germany in 2021



Capacity and generation

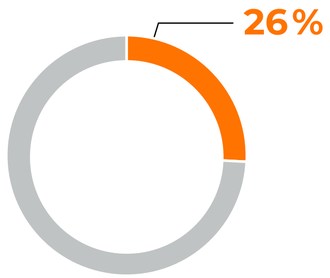
Development of the input from renewable energy sources in the 50Hertz grid area and in Germany



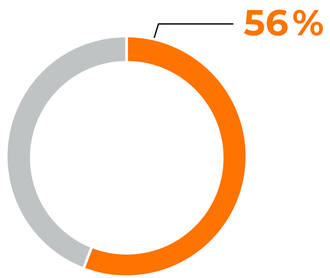
ⓘ The left-hand bar of each pair indicates the values for 50Hertz, and the slightly transparent right-hand bar indicates the values for Germany.

Source for Germany values: EEG annual account for 2017 to 2020, German Federal Statistical Office for 2021

50Hertz's share of the input from renewable energy sources in Germany in 2021

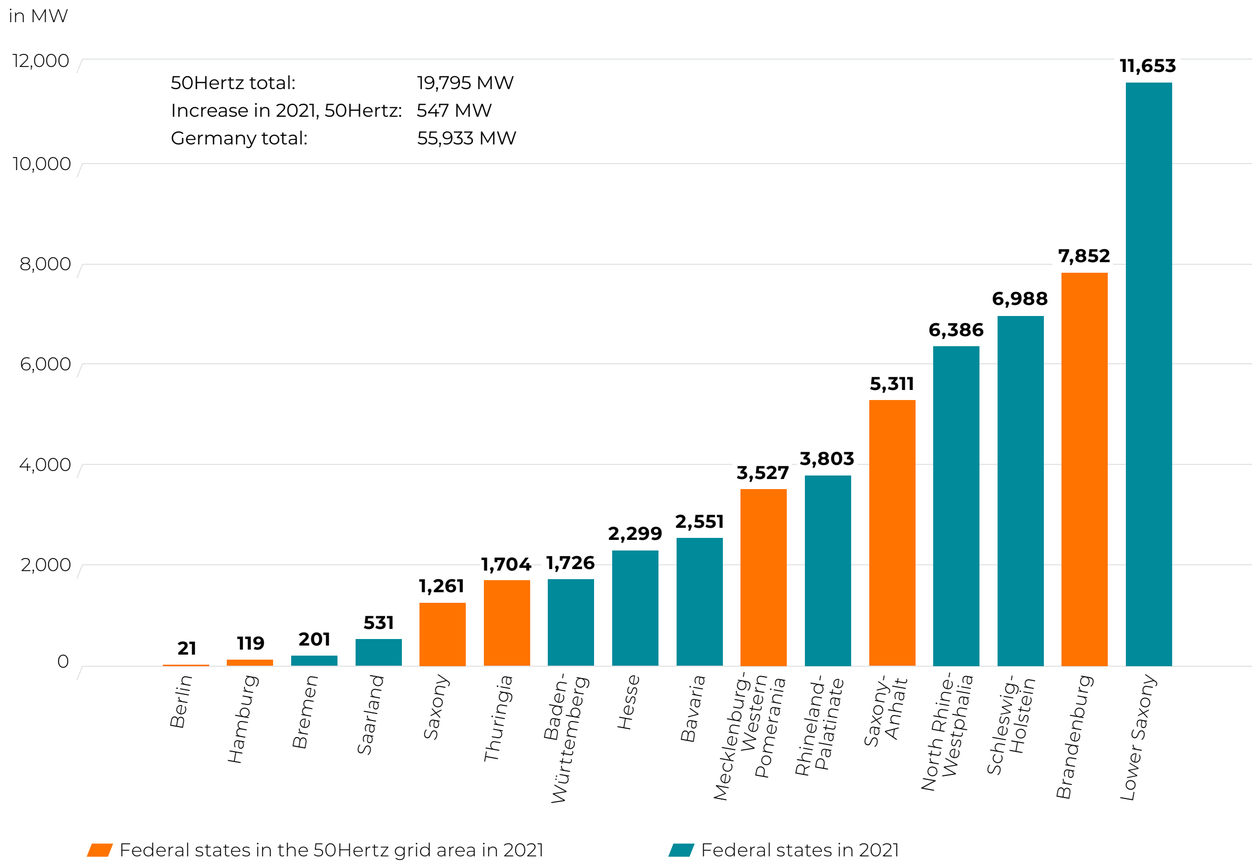


Share of the input from renewable energy sources as a proportion of end consumption in the 50Hertz grid area in 2021



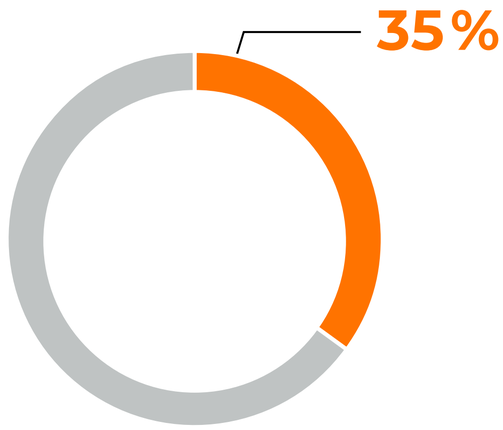
Capacity and generation

Geographical distribution of the installed onshore wind-power capacity in Germany by federal states in 2021



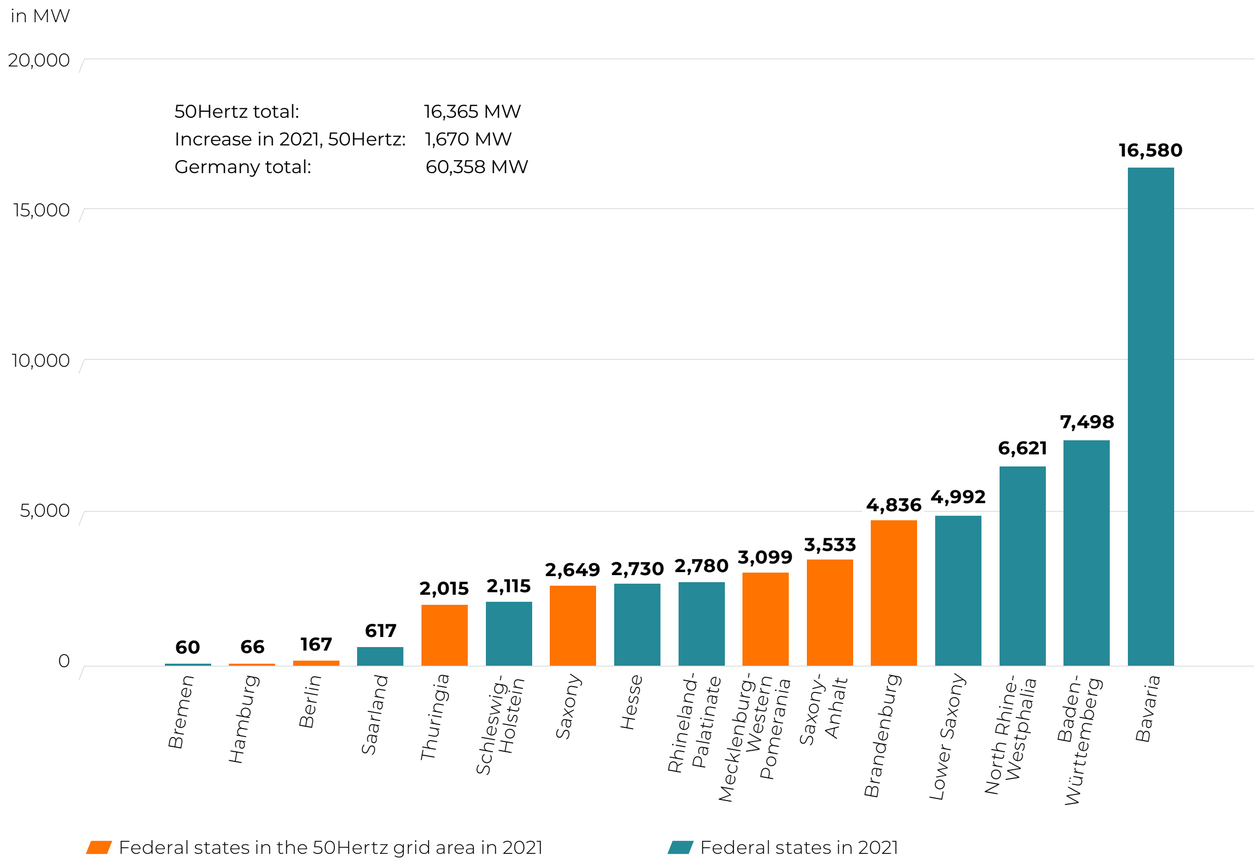
Source: Core Energy Market Data Register (MaStR), extracted in May 2022 as at a reporting date of 31/12/2021

50Hertz's share of installed onshore wind-power capacity in Germany in 2021



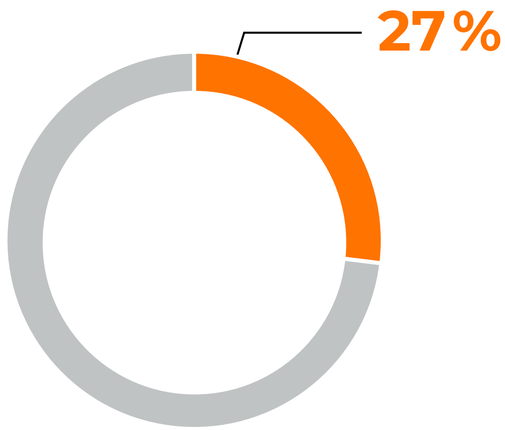
Capacity and generation

Geographical distribution of the installed photovoltaic capacity in Germany by federal states in 2021



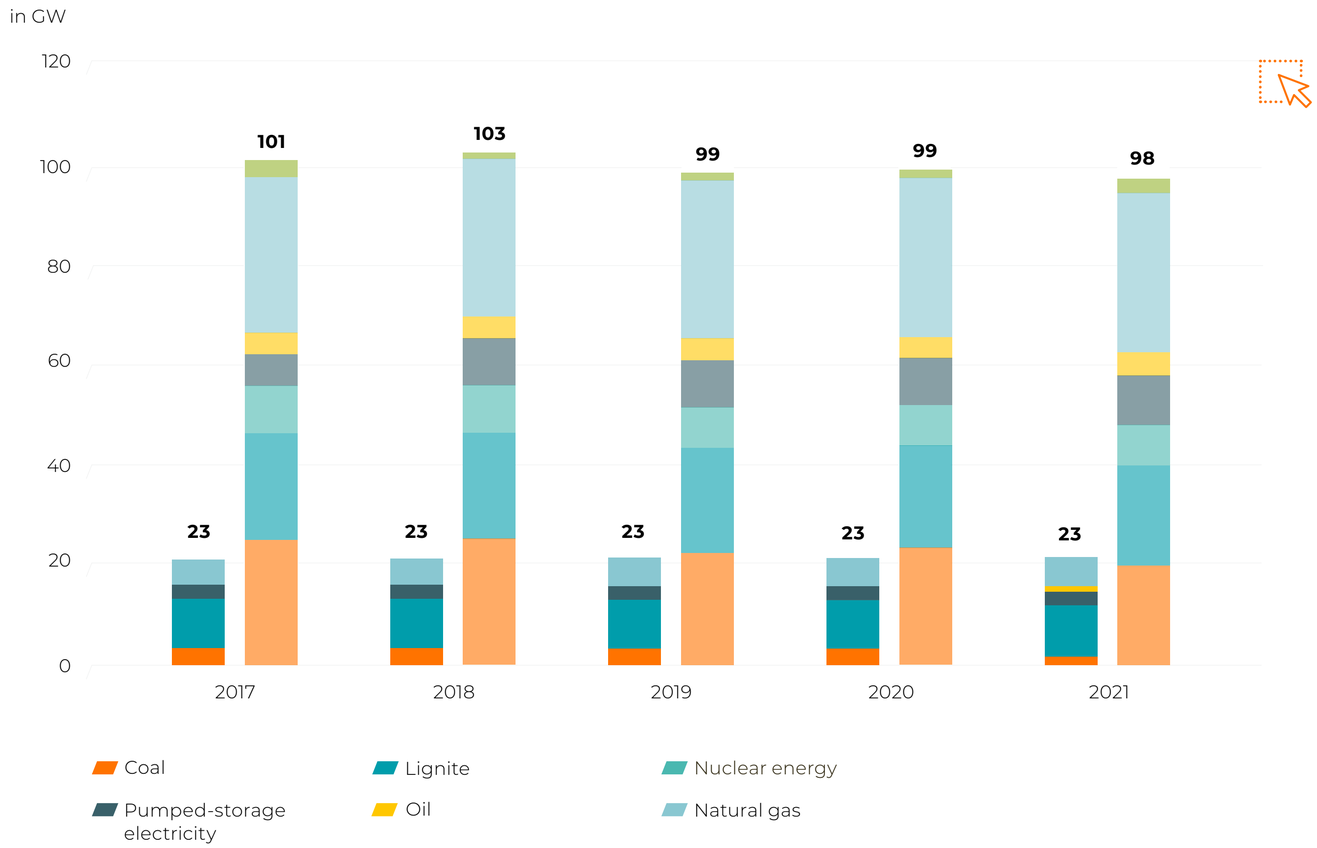
Source: Core Energy Market Data Register (MaStR), extracted in May 2022 as at a reporting date of 31/12/2021

50Hertz's share of installed photovoltaic capacity in Germany in 2021



Capacity and generation

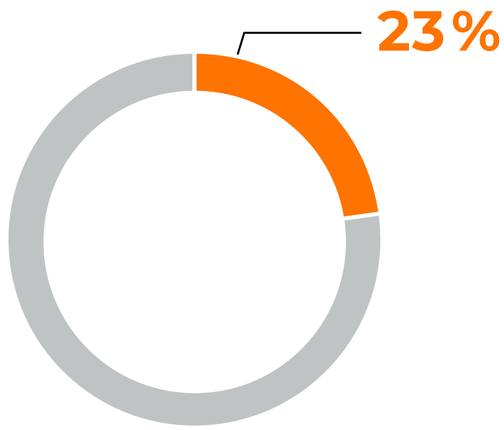
Development of the installed net capacity of conventional power plants in the 50Hertz grid area and in Germany



ⓘ The left-hand bar of each pair indicates the values for 50Hertz, and the slightly transparent right-hand bar indicates the values for Germany. No figures are shown for values < 1 GW.

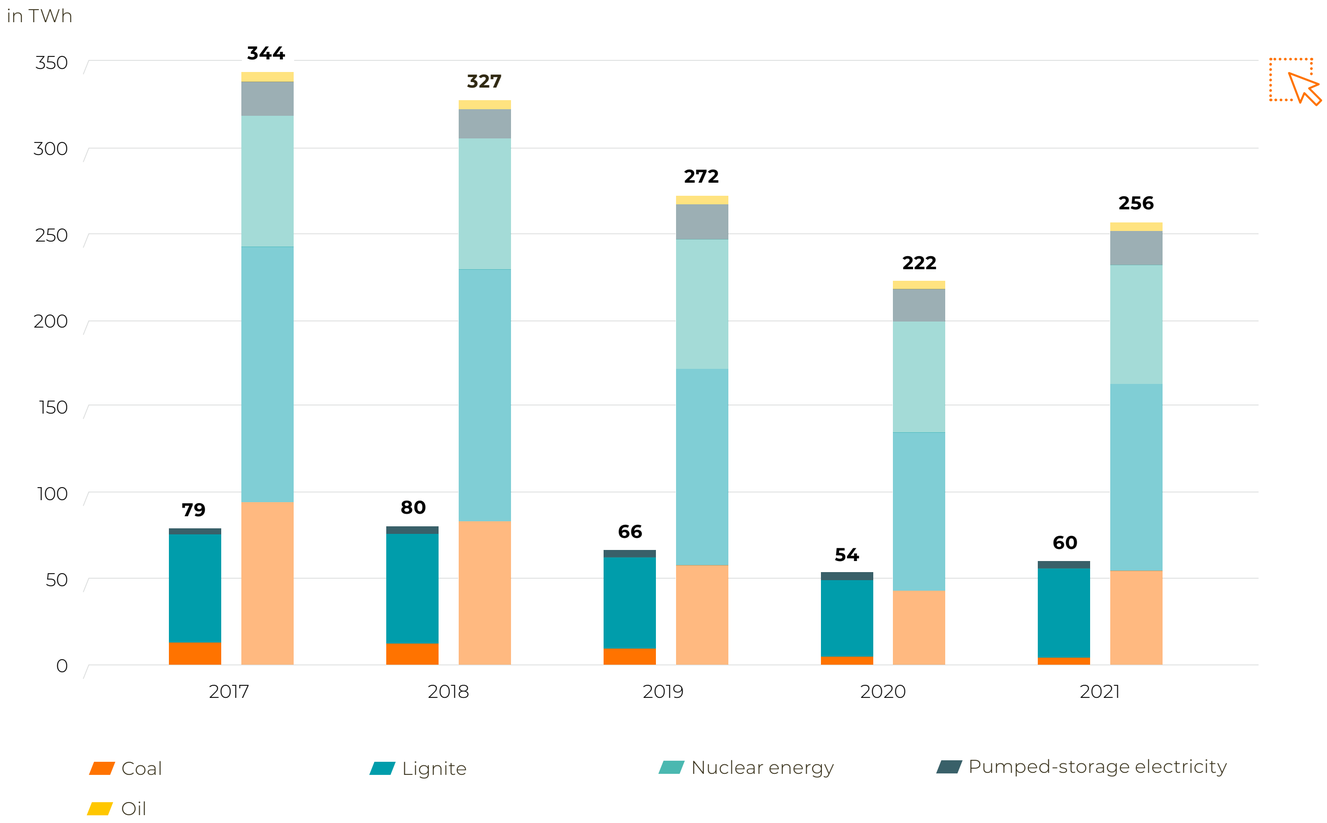
Source for Germany values: Power plant list and Core Energy Market Data Register (MaStR) of the German Federal Network Agency

50Hertz's share of the installed net capacity of conventional power plants in Germany in 2021



Capacity and generation

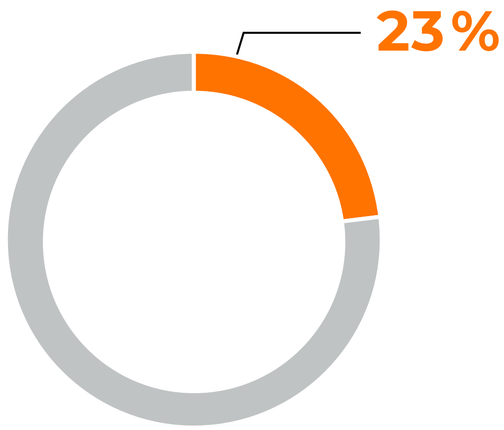
Development of the input from conventional energy sources to the 50Hertz extra-high-voltage grid and in Germany



ⓘ The left-hand bar of each pair indicates the values for 50Hertz, and the slightly transparent right-hand bar indicates the values for Germany.

Source for Germany values: BDEW [German Association of Energy and Water Industries]

50Hertz's share of the input from conventional energy sources in Germany in 2021



Capacity and generation

Key figures for the input from wind turbines (onshore and offshore) in the 50Hertz grid area

Figures in MW	2021	2020
Maximum simultaneous input	16,728	16,270
Minimum input	5	3
Biggest one-hour drop	-3,562	-2,655
Biggest one-hour spike	3,230	3,190
Biggest 15-minute drop	-1,344	-1,754
Biggest 15-minute spike	1,179	1,687
Biggest one-day spike	13,878	14,030

ⓘ Data based on extrapolated figures (15-minute mean capacity figures), including direct marketing.

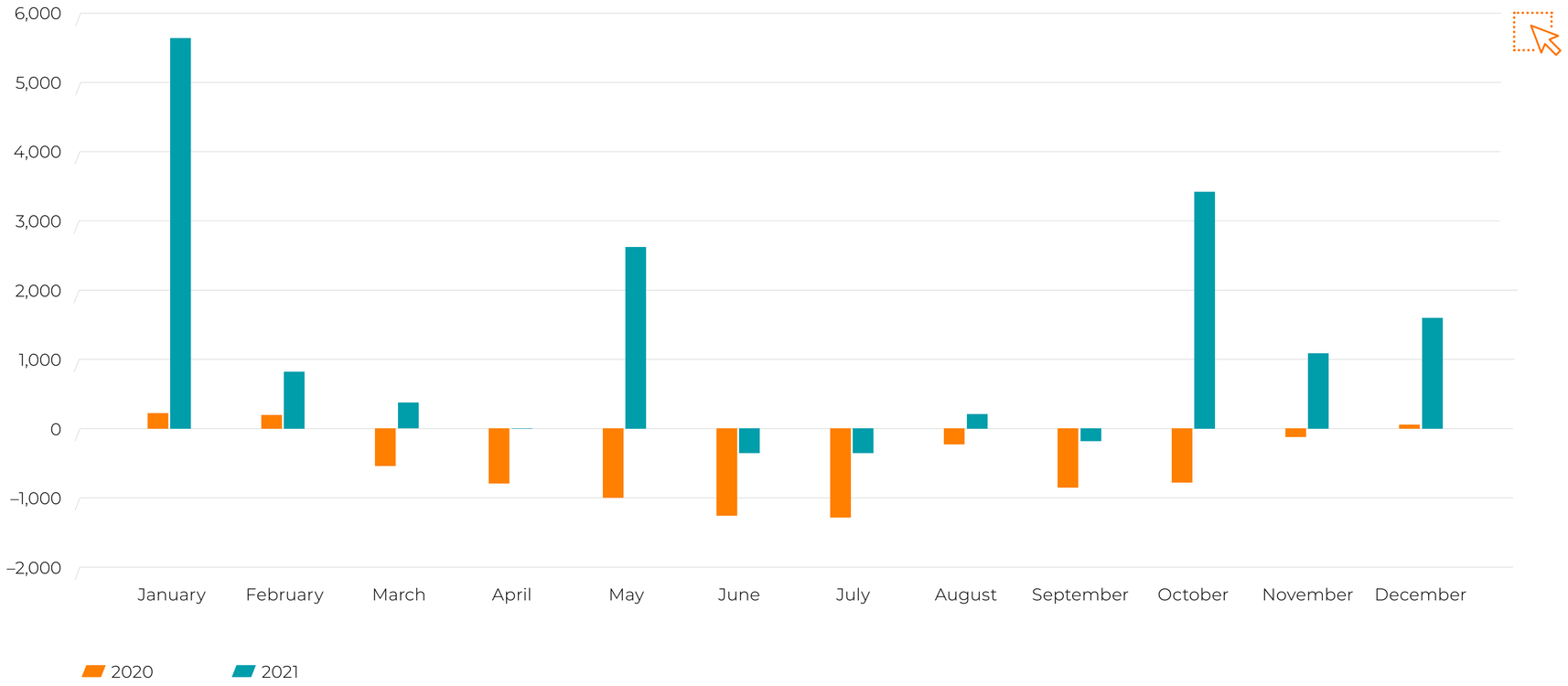
Key figures for the input from photovoltaic plants in the 50Hertz grid area

Figures in MW	2021	2020
Maximum simultaneous input	10,471	9,166
Minimum input	0	0
Biggest one-hour spike	2,725	2,412
Biggest one-hour drop	-2,658	-2,345
Biggest 15-minute spike	751	1,054
Biggest 15-minute drop	-732	-769
Biggest one-day spike	10,471	9,166

ⓘ Data based on extrapolated figures (15-minute mean capacity figures), including direct marketing.

EEG account and levy

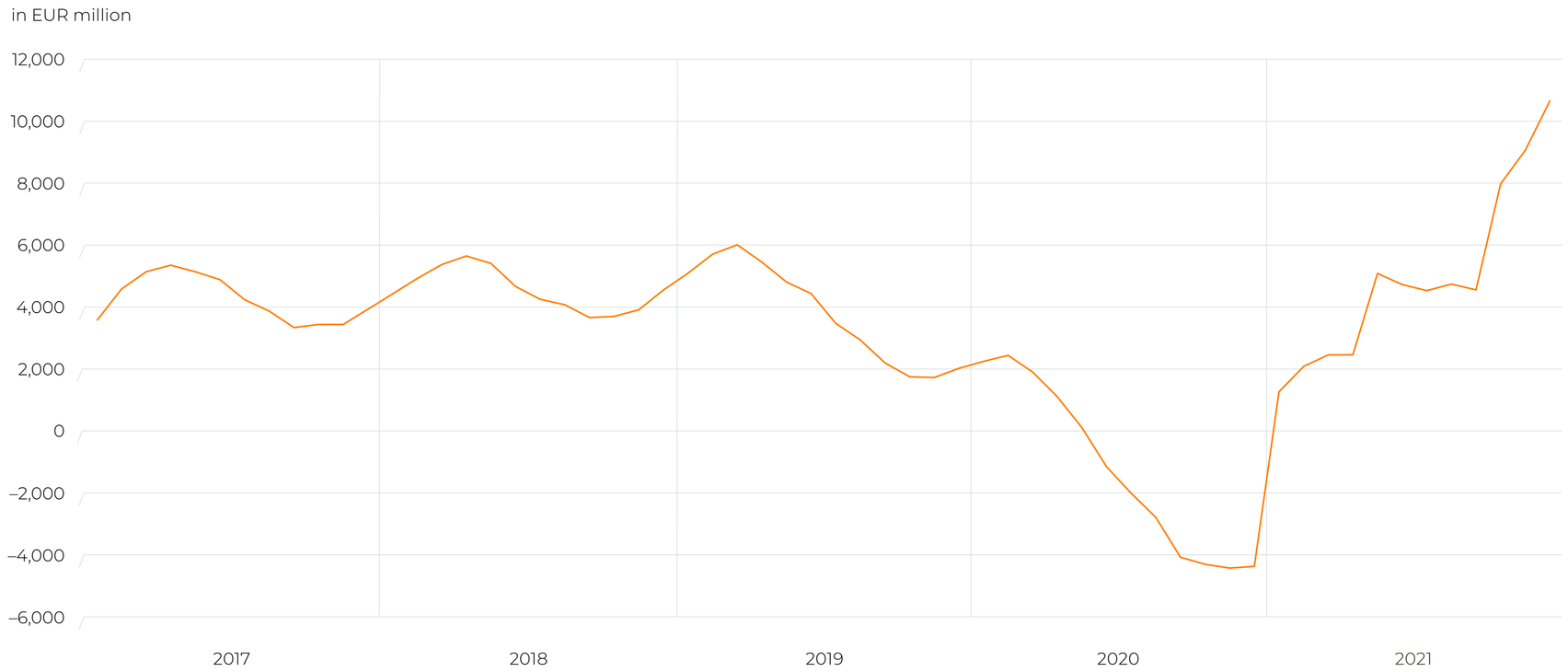
Monthly balance of income and outgoings for the EEG account



More information and source of the above figures can be found at: www.netztransparenz.de

EEG account and levy

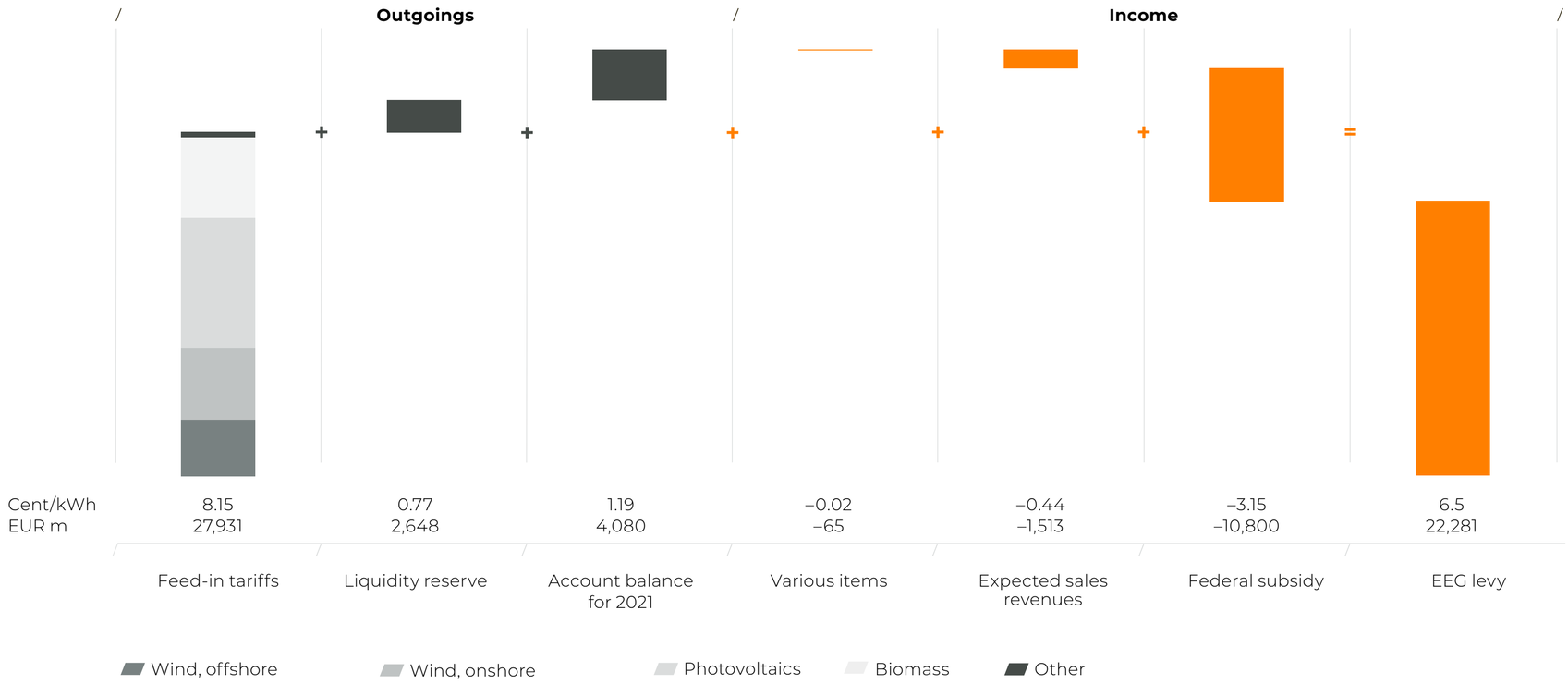
Development of the EEG account



More information and source of the above figures can be found at: www.netztransparenz.de

EEG account and levy

Composition of the EEG levy

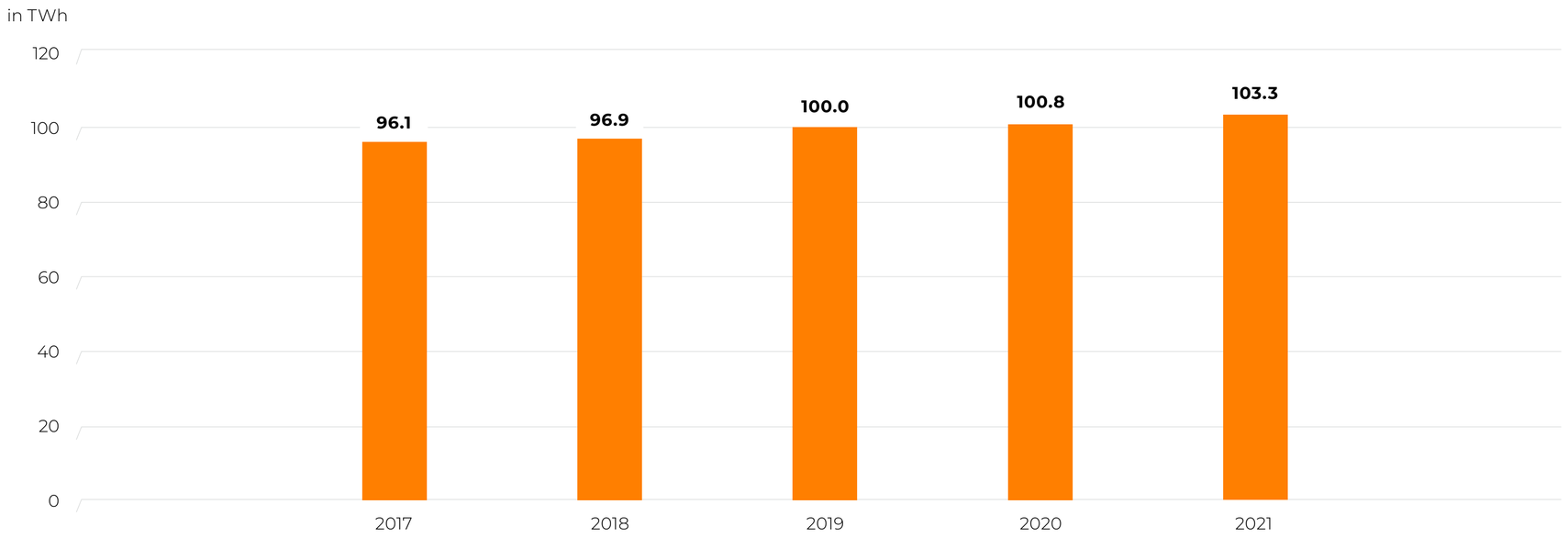


ⓘ Due to rounding differences, the total of the individual values does not correspond exactly to the EEG levy.

More information and source of the above figures can be found at: www.netztransparenz.de

Load and consumption

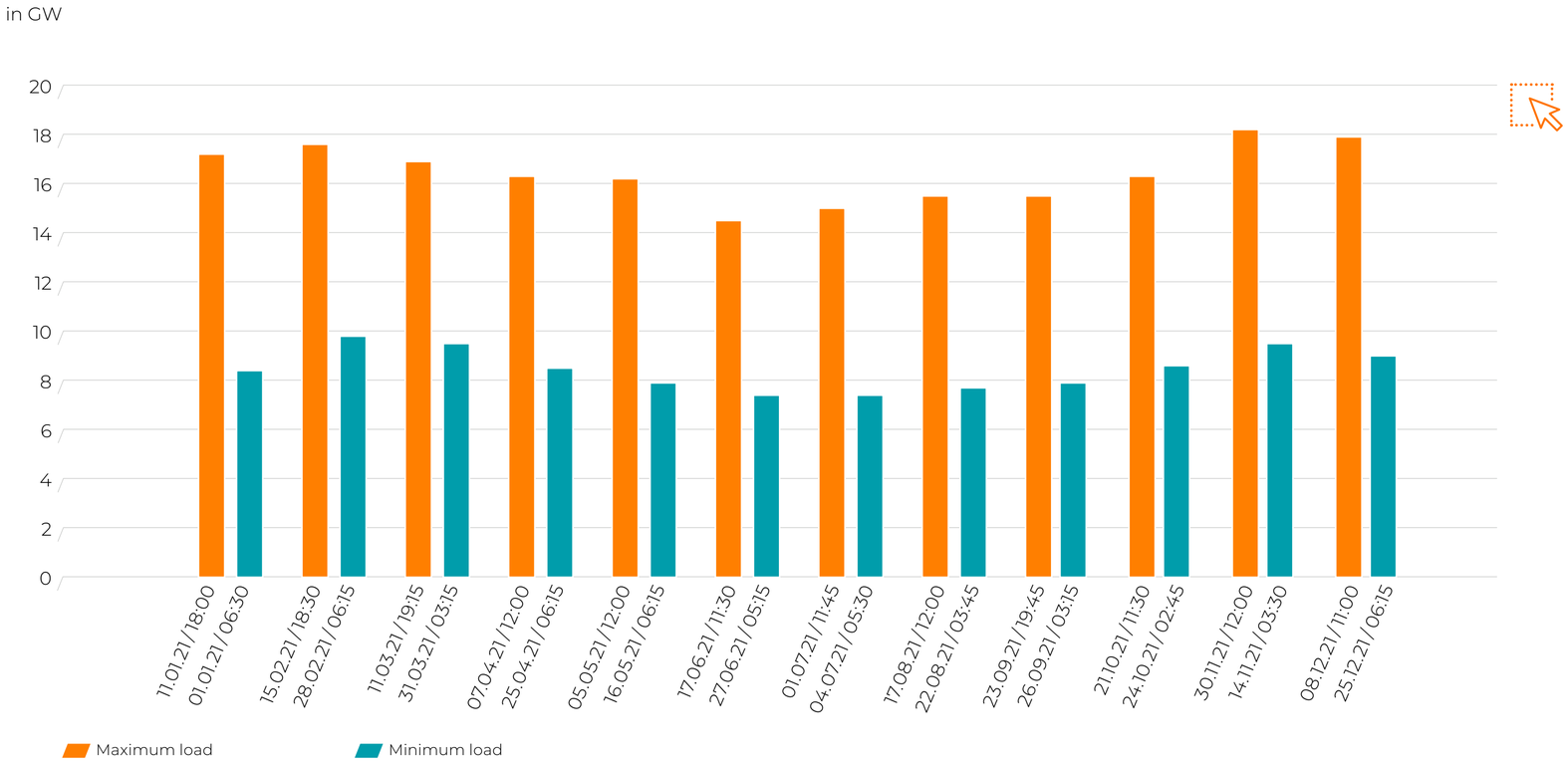
Development of electricity consumption in the 50Hertz grid area



ⓘ For the years 2017 to 2019, electricity consumption consisted of end consumption in accordance with the EEG and self-supply subject to the EEG levy.
Since 01/01/2020, the network losses of transmission system operators and distribution system operators have also been taken into account, as have pumped-storage plant losses.

Load and consumption

Monthly maximum and minimum load in the 50Hertz grid area



Annual maximum	18,216 MW on 30/11/2021 at 12:00 noon
Annual minimum	7,373 MW on 04/07/2021 at 5:30 a.m.

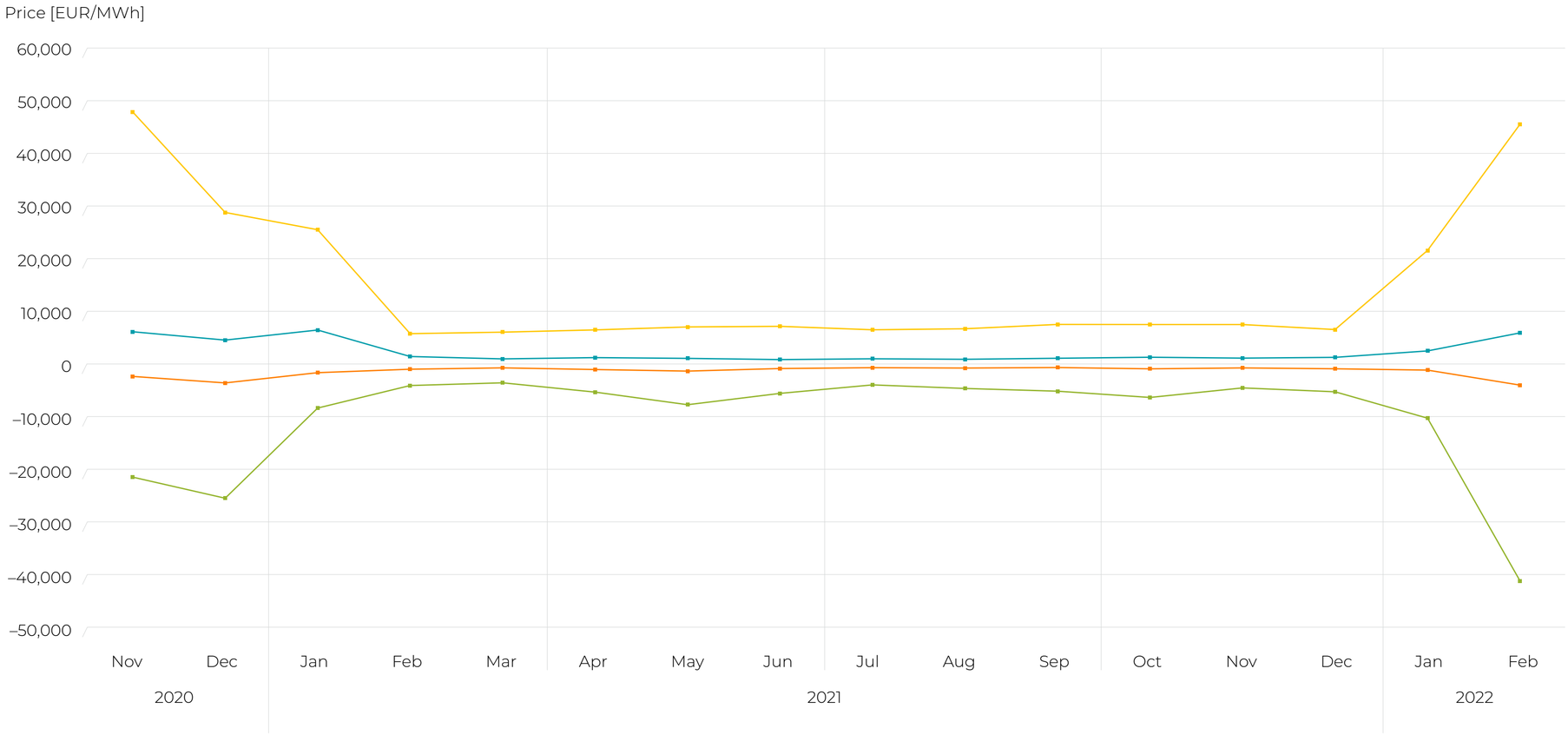
Balancing capacity

Development of costs by type of balancing capacity in Germany

More information and source of the above figures can be found at: www.regelleistung.net

Balancing capacity

Development of prices for allocated secondary balancing energy in Germany

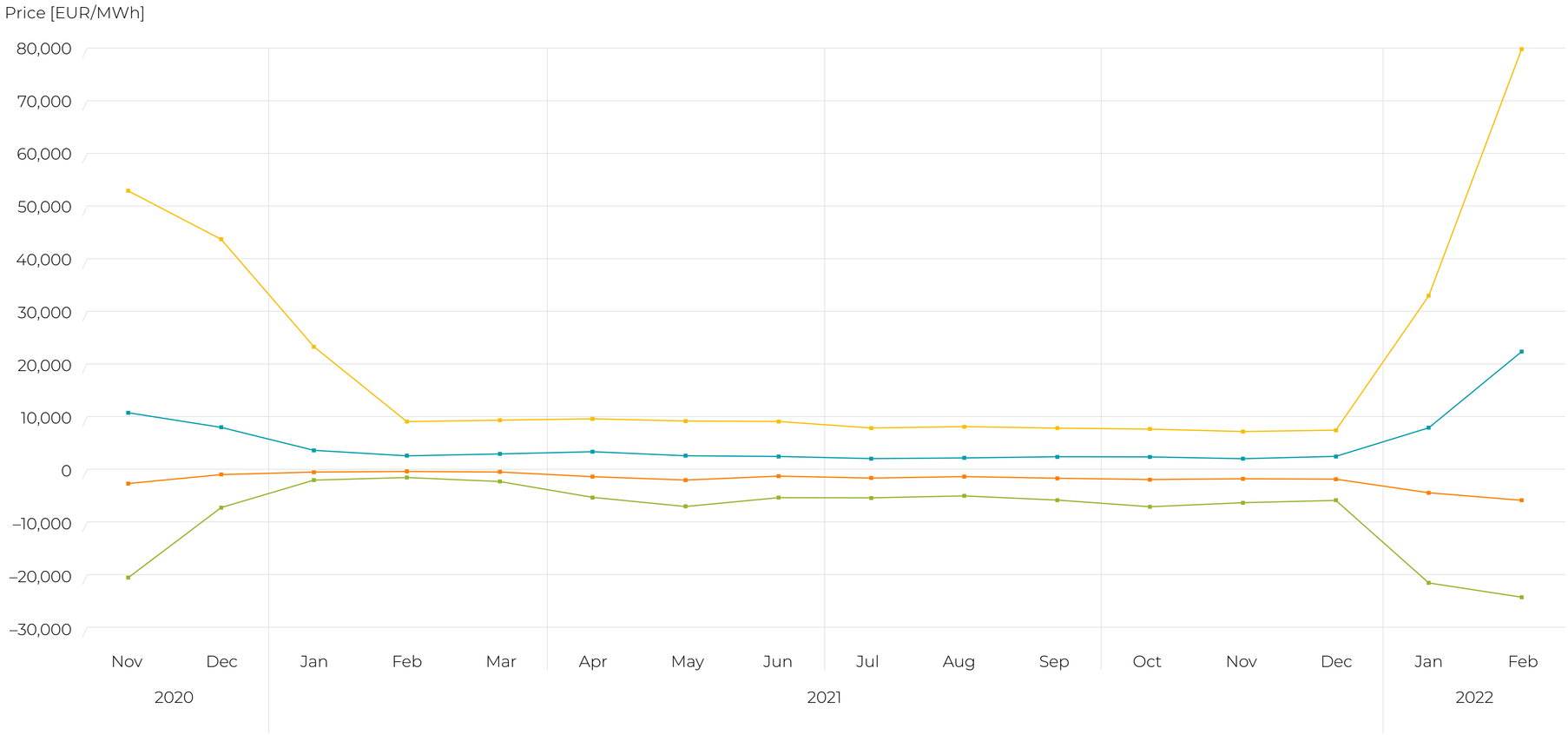


ⓘ Between 19 January 2021 and 20 January 2022, there was a reduced upper price limit of EUR 9,999.99/MWh. Before and after this period, the upper price limit is EUR 99,999.99/MWh.

More information and source of the above figures can be found at: www.regelleistung.net

Balancing capacity

Development of prices for allocated minute operating reserve energy in Germany

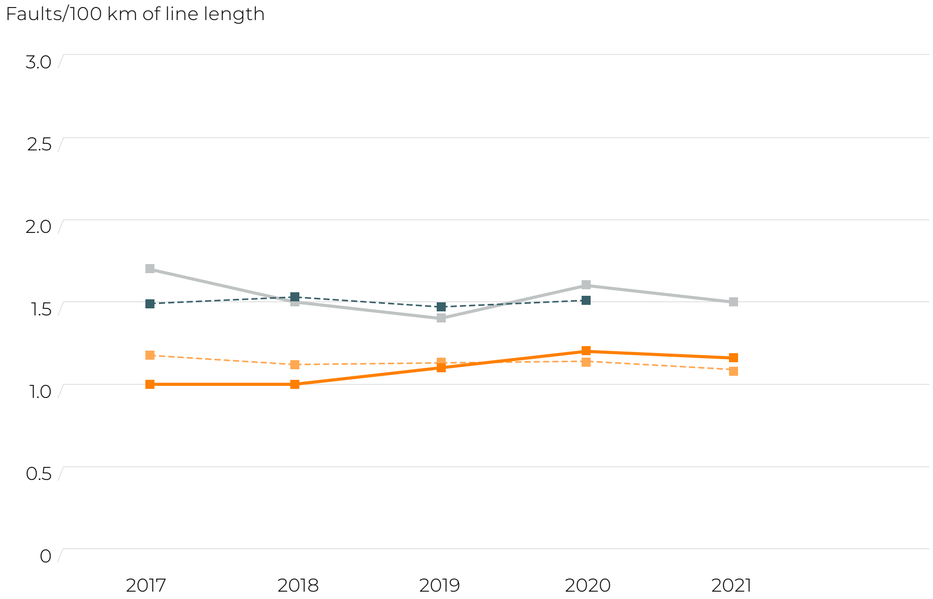


ⓘ Between 19 January 2021 and 20 January 2022, there was a reduced upper price limit of EUR 9,999.99/MWh. Before and after this period, the upper price limit is EUR 99,999.99/MWh.

More information and source of the above figures can be found at: www.regelleistung.net

System managment

Comparison between the 50Hertz fault rate and that of the German transmission system operators

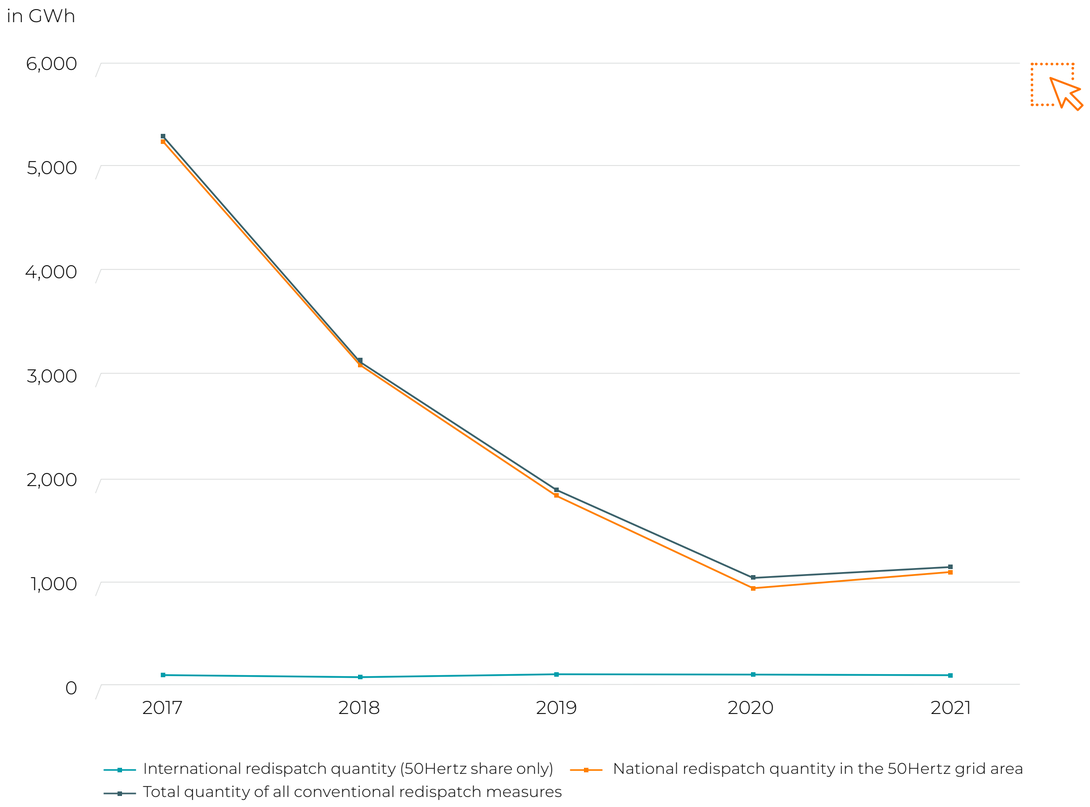


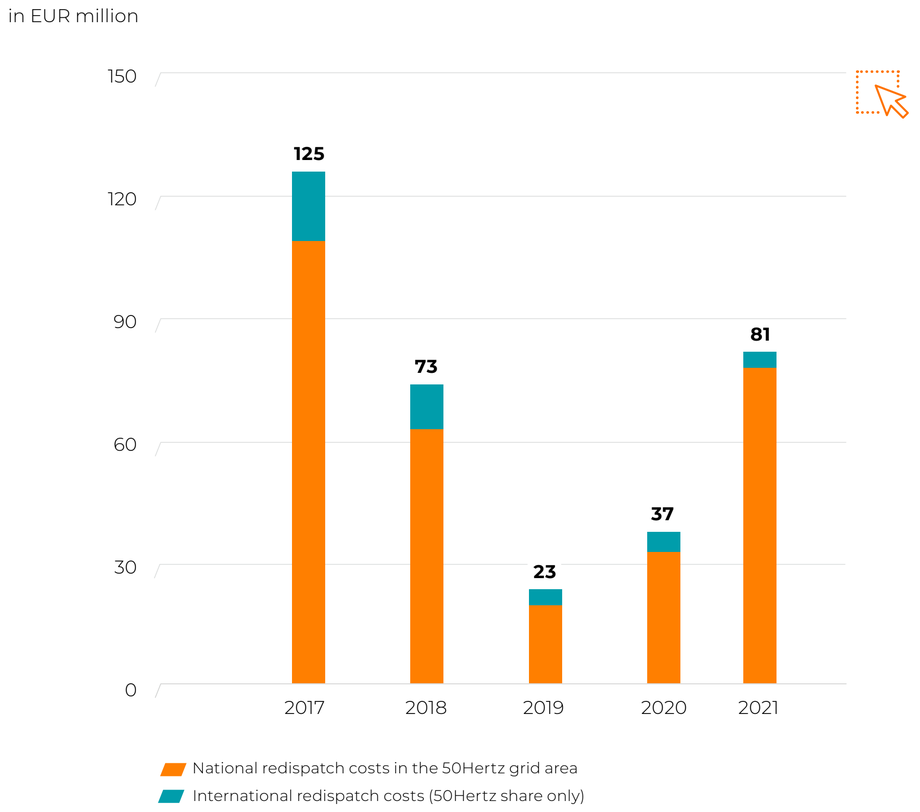
ⓘ An unwanted change of the “normal operating state” is classed as an error that leads to a fault. This takes into account incidents that occur in the active grid used for transmission. Other errors are only recorded if they lead to an unwanted change of the normal operating state of the grid concerned.

Source for the value for all German transmission system operators: FNN annual report
The current value is published at the mid-year of the following year.

System managment

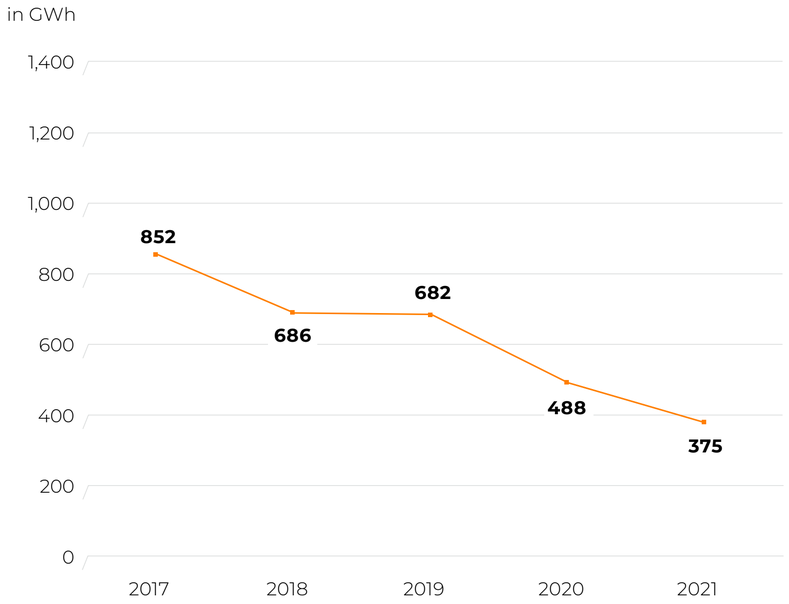
Development of congestion management measures (conventional redispatch) – quantities and costs

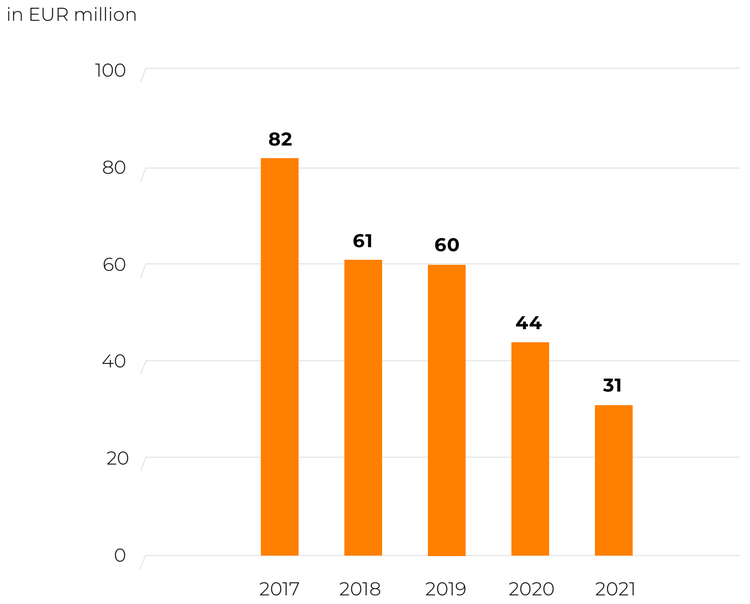




System managment

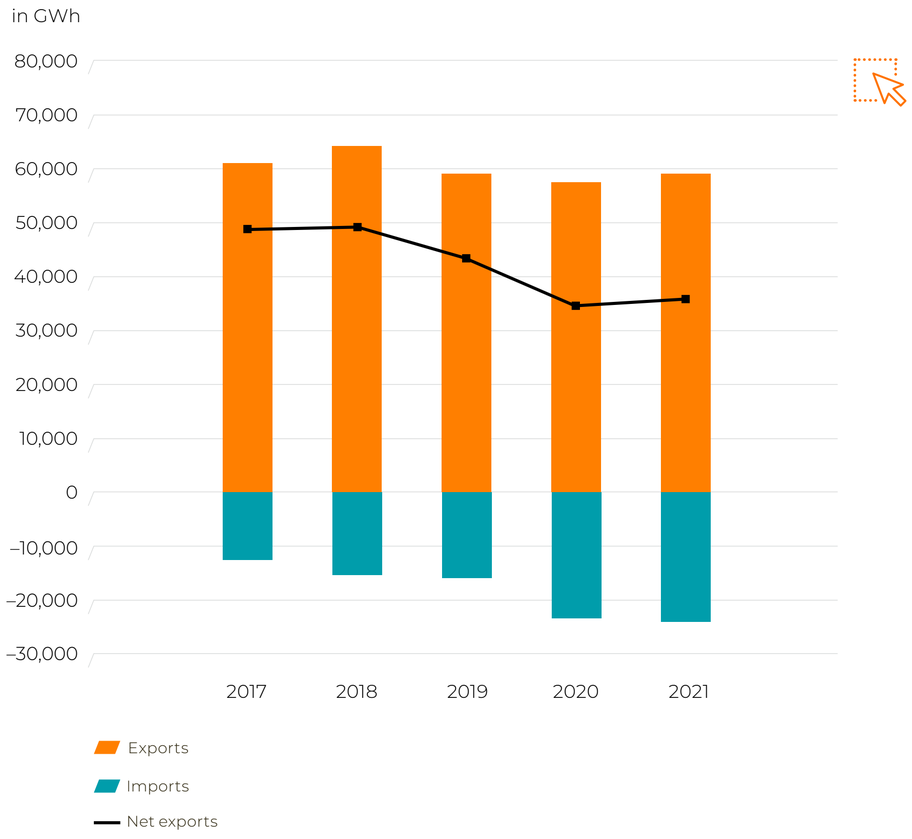
Development of the input reduction for renewable energy plants (for 50Hertz directly and the distribution network) – quantities and costs





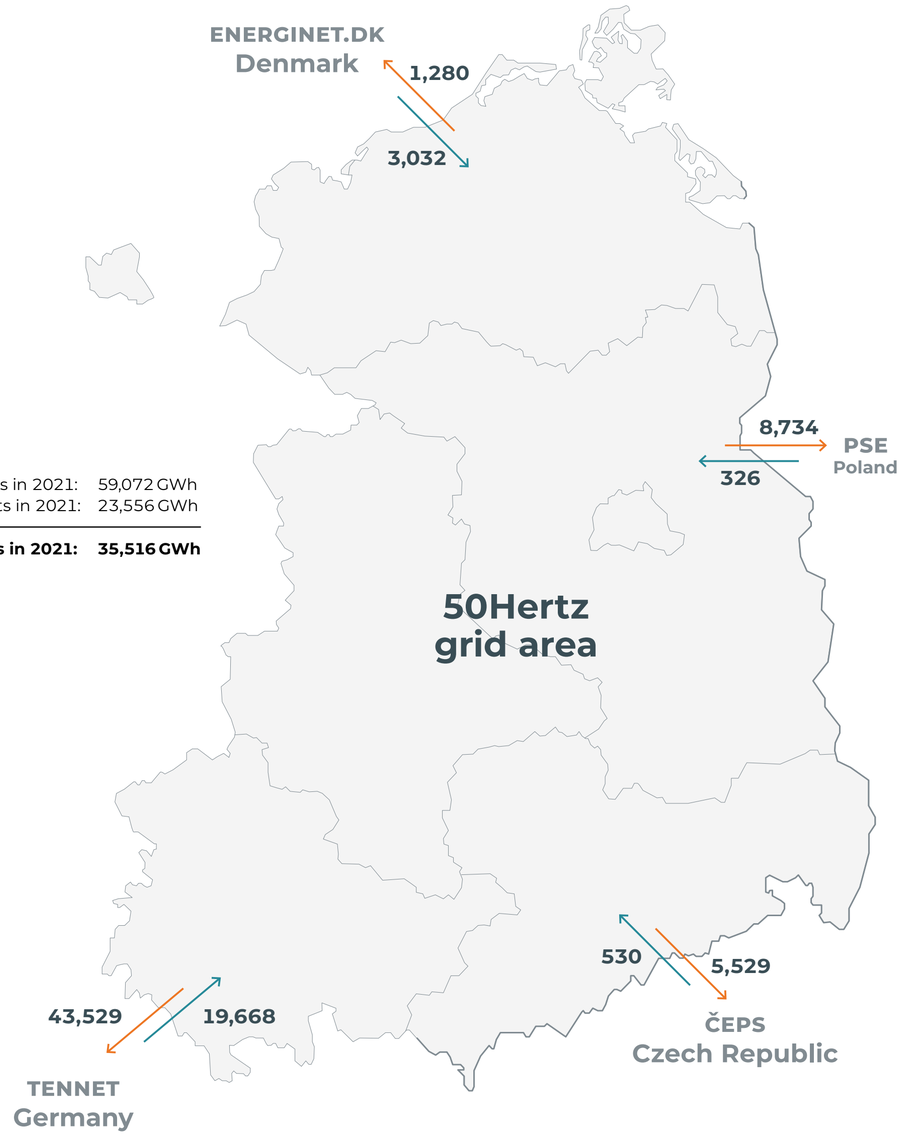
Exchange and transport

Development of exports and imports at the 50Hertz grid area boundaries



Total exports in 2021: 59,072 GWh
Total imports in 2021: 23,556 GWh

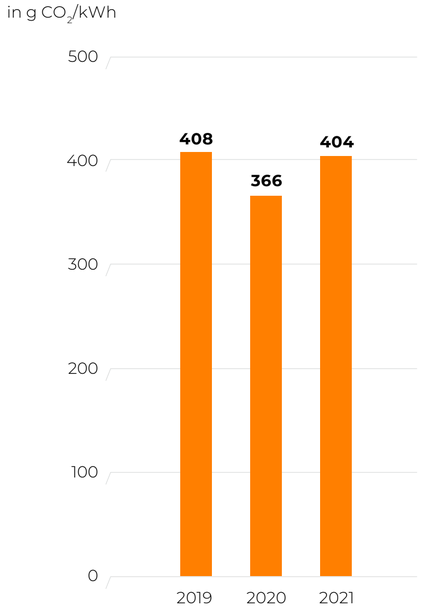
Net exports in 2021: 35,516 GWh



Climate and environmental protection

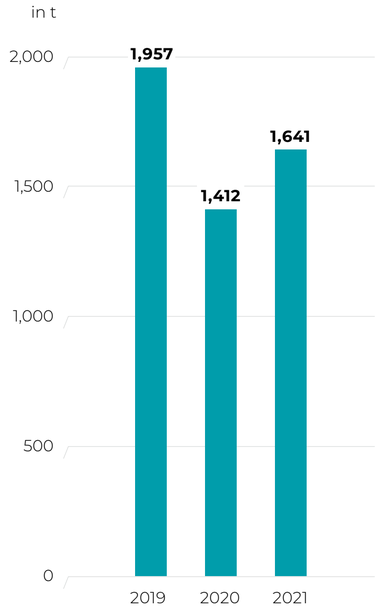
Climate protection:

Greenhouse gas emissions from the German electricity mix

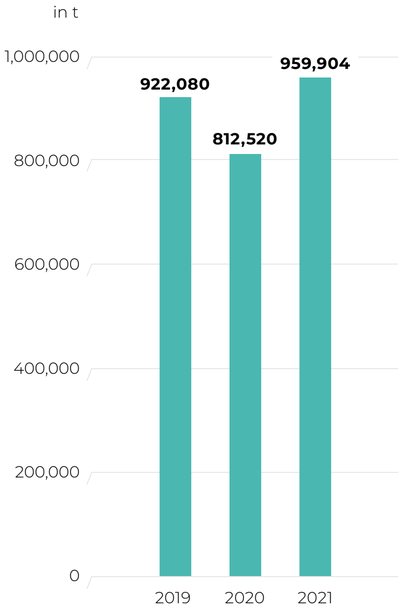


Source: German Federal Statistical Office for 2019 and 2020, own calculations for 2021

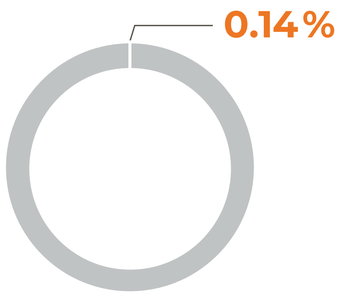
Mobility-related CO_2 emissions of 50Hertz



CO_2 emissions from grid losses in the 50Hertz grid



SF6 leak rate (sulfur hexafluoride)

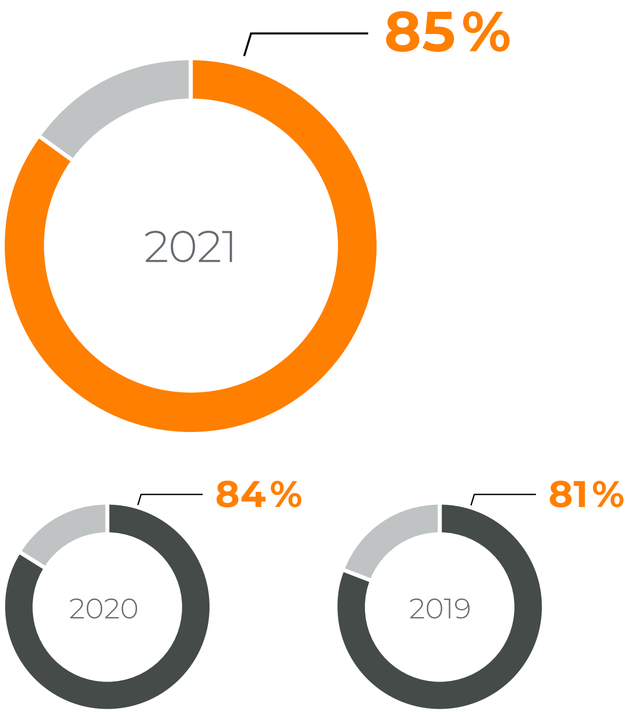


More information can be found at: csr.50hertz.com

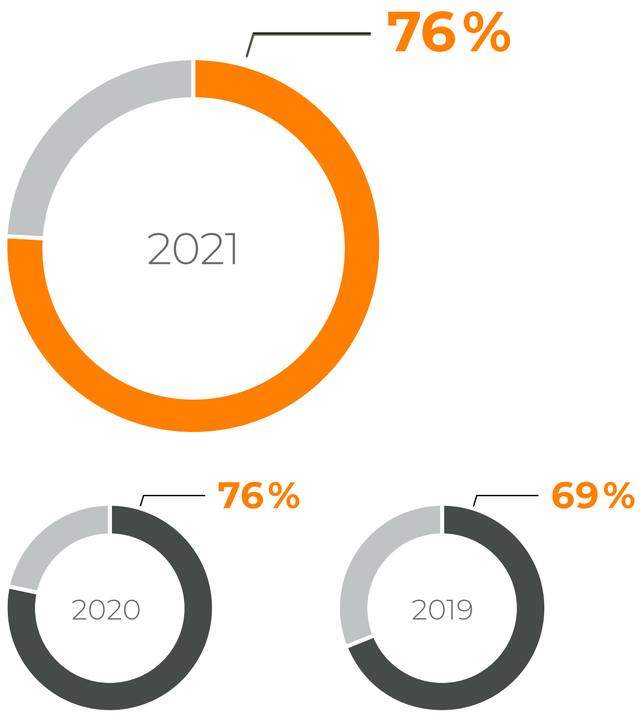
Climate and environmental protection

Environmental protection:

Share of ecologically managed forest routes



Share of line sections fitted with bird-protection markers over the entire line length, e.g. in European Bird Sanctuaries or migration and resting sites



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