



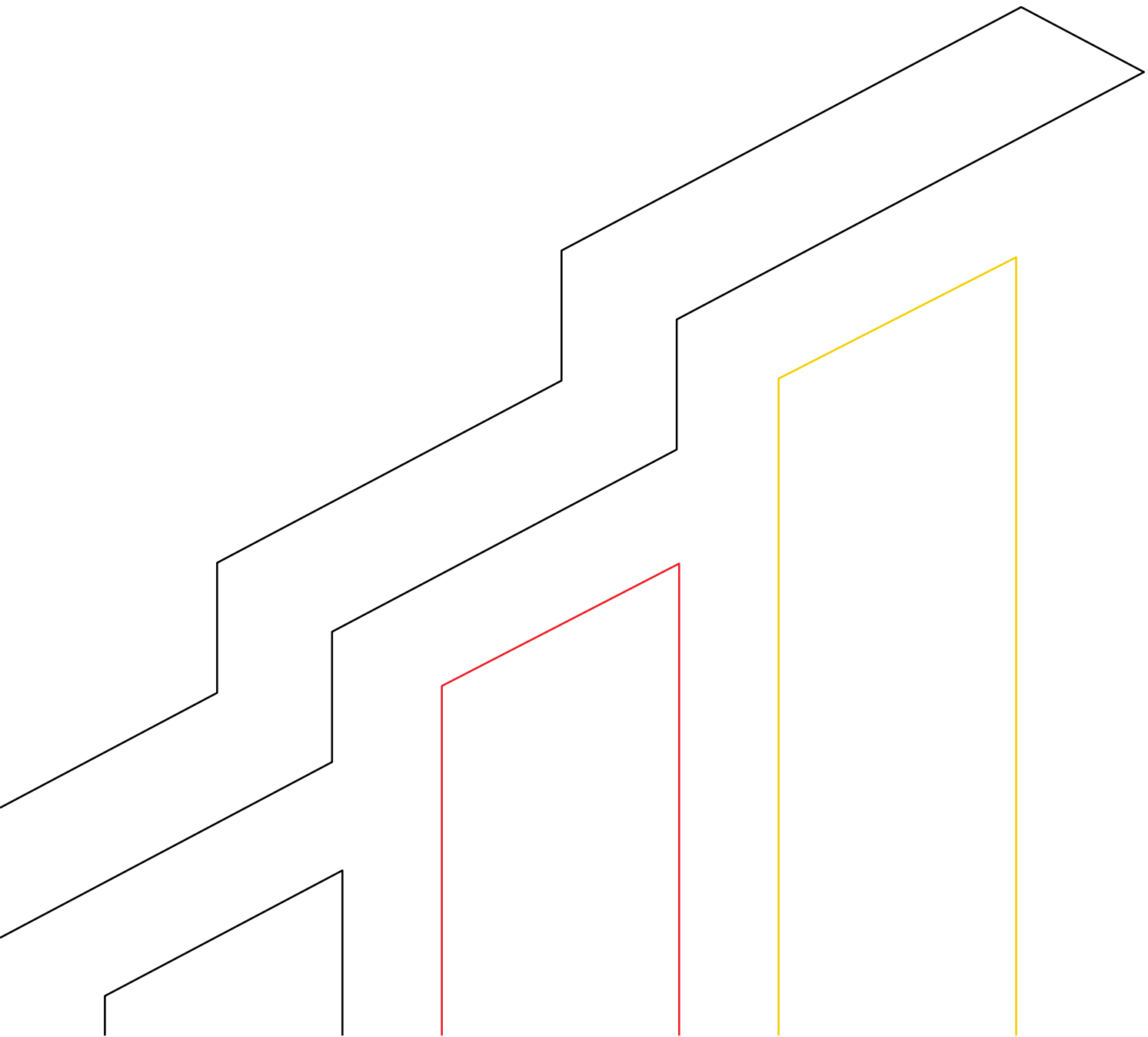
Bundesnetzagentur



SMARD.de

User guide

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Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen

Section 614

Market Transparency Unit for Wholesale Electricity and Gas Markets; Tasks under REMIT;
SMARD electricity market data

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List of abbreviations

AT	Austria
CEST	Central European Summer Time
CET	Central European Time
DE	Germany
DSO	distribution system operator
ENTSO-E	European Network of Transmission System Operators for Electricity
EnWG	Energy Industry Act
EU	European Union
GDPR	General Data Protection Regulation
km	kilometre
LU	Luxembourg
MaBiS	market rules for electricity imbalance settlement
MW	megawatt
MWh	megawatt hour
reBAP	uniform imbalance price applicable to all control areas
SMARD	electricity market data
TSO	transmission system operator
UTC	Universal Time Coordinated

A Introduction

SMARD is taken from the German word StromMARKtDaten (electricity market data) and is a data and information platform that aims to create more transparency on the German electricity market. The platform presents key electricity market data for Germany and in part also for Europe in nearly real time. Platform users can extract and individually combine data on generation, consumption, importing and exporting of electricity as well as data on balancing services for different time periods to create graphics. All content is available in German and English.

The legal basis for the development and operation of SMARD is section 111d of the [Energy Industry Act](#) (EnWG). The SMARD platform uses data in accordance with what is referred to as the electricity transparency Regulation ([Commission Regulation \(EU\) No 543/2013](#)). This Regulation requires German transmission system operators (TSOs) and electricity market exchanges to report electricity market data to the European Network of Transmission System Operators for Electricity ([ENTSO-E](#)) and then to publish the data on the ENTSO-E Transparency Platform. SMARD automatically collects these data from the ENTSO-E Transparency Platform. Data are first examined for correctness and completeness, then further processed, laid out in a clear manner and published on the SMARD website.

In addition to the transparency data, detailed information about generating facilities in Germany, Austria and Luxembourg is also listed on SMARD using core data from the Bundesnetzagentur's regularly updated [list of power plants](#).

The data published on SMARD and the market data visuals based on the data have been made freely available for public use in accordance with section 111d EnWG. They can be downloaded, saved and used free of charge under the [Creative Commons Attribution 4.0 International Licence](#).

The methodology regarding the data provided, how the platform functions, its sections, and the defining description of the data published on SMARD are presented below in detail.

B Methodology

1 Data basis

1.1 Automatically received data

SMARD gathers most of the data in the [Market data visuals](#) section directly from the ENTSO-E Transparency Platform. Each European TSO as well as the electricity market exchanges are required to report data to ENTSO-E in accordance with, among other things, the Regulation on the submission and publication of data in electricity markets ([Commission Regulation \(EU\) No 543/2013](#)) and then to publish the data on the ENTSO-E Transparency Platform.

Only data verified by the Bundesnetzagentur are published on SMARD. The Bundesnetzagentur is constantly exchanging information with the TSOs in order to continuously improve data quality.

1.2 Manually maintained data

In addition to the transparency data, detailed information about generating facilities is also listed on SMARD in the [German electricity market](#) section using core data from the [Bundesnetzagentur's list of power plants](#). The individual power plant data are based on the Bundesnetzagentur's annual [monitoring surveys](#). The key data published do not include any confidential information.

1.3 Updating the data

All data on SMARD are updated on the basis of new findings. For this reason it is possible that better data used for calculating a current time series can also be used to re-calculate historical data more accurately. Generally there is no set revision process for this.

Depending on whether the TSOs update the transparency data on the ENTSO-E Transparency Platform, the time series on SMARD will also be adjusted. Reasons for an update can be, for example, when publication requirements change or the TSOs independently close a data gap in consultation with the Bundesnetzagentur. Quality-assured data can also later replace preliminary data. You will find more detailed information about this in D Description of the data categories.

The [Bundesnetzagentur's list of power plants](#) is updated regularly.

1.4 Times

All times indicated on SMARD relate to the Central European Standard Time (CET or UTC+1) or Central European Summer Time (CEST or UTC+2) in effect at the time.

- The switch from standard time to summer time always takes place on the last Sunday in March at 2am by skipping the hour between 2am and 3am.
- The switch from summer time to standard time always takes place on the last Sunday in October at 3am by repeating the hour between 2am and 3am.

The times in the charts and tables each indicate a starting point. For example, if "Resolution: Hour" is selected for a chart and the cursor is moved to a data point at 12pm on 1 January 2021 on the x-axis, then the data point relates to the time period from 12pm to 1pm on 1 January 2021. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

2 Data preparation

The source data are first validated and then further processed in preparation for SMARD. As part of the processing, the system makes the data available as needed, both scaled and aggregated.

The data on SMARD have different original levels of detail (referred to as granularity) at which the data are prepared and transmitted with regard to the respective time interval. The finest granularity in which, for example, electricity generation values are listed, is a quarter hourly resolution. Data of other data categories are published by hour, week, month or year.

In order to be able to show various electricity market data at different granularities together in one chart, the data must have the same level of aggregation, in other words must be uniformly calculated per quarter hour, hour, etc. The system automatically adjusts the chart. For example, quarter hourly megawatt hour (MWh) output values from a certain hour week, month or year are added up.

3 Data use

In accordance with section 111d EnWG, the data published on SMARD have been made freely available for public use. Therefore, data from this website can be downloaded in various file formats and saved free of charge. More detailed information about export options is located in each section's description.

The Bundesnetzagentur strives to maximise usage of the data. That is why all data published in [Market data visuals](#) fall under the [Creative Commons Attribution 4.0 International Licence](#). The same applies to market data that can be downloaded from the [Data download](#) pages.

For both the market data visuals and the downloaded data, platform users can:

- Share the data. Provided that the source is named, the data may be shared and reproduced in any media and format. "Bundesnetzagentur | SMARD.de" is to be used as the source.
- Edit the data. Downloaded data may be used, combined and changed in parts.

Under the following conditions:

- Attribution – users must provide appropriate copyright and legal information, include a link to the licence and indicate whether any changes were made. This information may be provided in any appropriate way, but not in such a way as to make the impression that the licensor especially supports these users or their use.
- No further restrictions – users may not apply any additional clauses or technical procedures that prohibit others from anything that the licence allows.




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C Description of the sections


The SMARD website is divided into five main sections: [Electricity market topics](#), [Market data visuals](#), [German electricity market](#), [Electricity market explained](#) and [Data download](#).




Information about the SMARD website is also available in sign language  and in plain language . You can register free of charge for a user account to access the [Login](#)  area on the website (see **7 User account**). You can find these symbols at the top right.

You can copy a URL link quickly by clicking  at the top right.



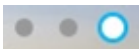
The SMARD RSS feed  at the top right keeps you informed of new content on the SMARD website. You can use it free of charge. More information on how to set up the RSS feed is in **8 RSS feed**.

All the content on the SMARD website is available in German and English. You can switch languages by clicking ENGLISH  or DEUTSCH  at the top right.




If you use the mobile version or if you use the desktop version and reduce the size of the browser window, the symbols described above are listed in a MENU  and the layout adapts to the size of your screen or window.

Wherever you are on the SMARD website, the [More](#)  button lets you print, export, share on social media or email  links to content on the website. You can also use the [More](#)  button to access the feedback form and send the SMARD team questions or comments about the website.





The start page has various boxes with links to some of the content on the website. If you use the desktop version, the boxes are side by side; if you use the mobile version, the boxes are arranged from top to bottom.

The top left-hand box has pictures and headlines with links to articles in the [Electricity market topics](#) section and sometimes has rotating items. You can pause the rotation by clicking  and restart it by clicking  and you can use the grey circles  to switch between the items.

The dark blue box at the top right is the SMARD ticker box. It has rotating items about various topics to do with the SMARD website. If an item has more information, it will have a "more" button that you can click to get to a longer article.

You can pause the rotation by clicking  and restart it by clicking  and you can use the grey circles  to switch between the items. All the news tickers are listed in a news archive. You can access the list by clicking "News archive" at the bottom of a page.

The light blue box underneath the SMARD ticker box contains up-to-date data on the electricity market in Germany. The data are for a period of one hour – so "January 1, 2021 12:00 PM" means the data are for the time from 12pm to 1pm on 1 January 2021 – and are posted three hours later. The box contains the following data:




-  renewable generation (MWh)
-  consumption (MWh)
-  conventional generation (MWh)
-  day-ahead price (€/MWh).

More information on these data is in **D Description of the data categories**. If you click the content in the light blue box, you will get to the "Bidding zone" pages in the [German electricity market](#) section (see **3.2 Bidding zone**).

If you scroll halfway down the start page, you will see a pre-configured chart showing hourly electricity generation and consumption in Germany on the current day and the previous 10 days. If you click "Compare market data interactive", you will get to the [Market data visuals](#) section and can view and change the chart (see **2.1 Viewing charts**).

Underneath the chart on the start page there are two maps from the [German electricity market](#) section. These are examples of the maps you can view on the "Power plants" and "Bidding zone" pages. If you click "Explore control areas and bidding zones", you will get to the "Power plant map/list" page (see **3.1 Power plants**).

The bottom of the start page is about "Market data for Germany" and has pre-configured charts showing certain market data such as renewable generation and consumption. If you click the title of a chart, you will get to the [Market data visuals](#) section and can view and change the chart (see **2.1 Viewing charts**).

You can switch between the market data charts on the start page by clicking  or  or by clicking the grey circles  underneath the charts.


1 Electricity market topics

The [Electricity market topics](#) section has links to articles about developments in Germany's electricity market. The articles are usually published monthly and provide a descriptive summary of the data posted on the SMARD website. For example, they have details of when renewable generation was at its peak and why, and compare the monthly data year-on-year.

The [Electricity market topics](#) section also has links to articles explaining certain aspects of the German electricity market. All of the articles are available in English.

2 Market data visuals

The [Market data visuals](#) section lets you view, customise and export charts showing various data. You can view and download the data you select in a table as well as a chart.

You can use an interactive guide explaining how to create a chart by clicking [Help](#) .

2.1 Viewing charts

To create a chart, you need to select at least one data category in the [Market data visuals](#) section together with a region, a period of time and a resolution. The default setting is "Electricity generation" with "Country: Germany" as the region, the current date plus the previous 10 days as the period, and "Resolution: Hour" as the resolution:

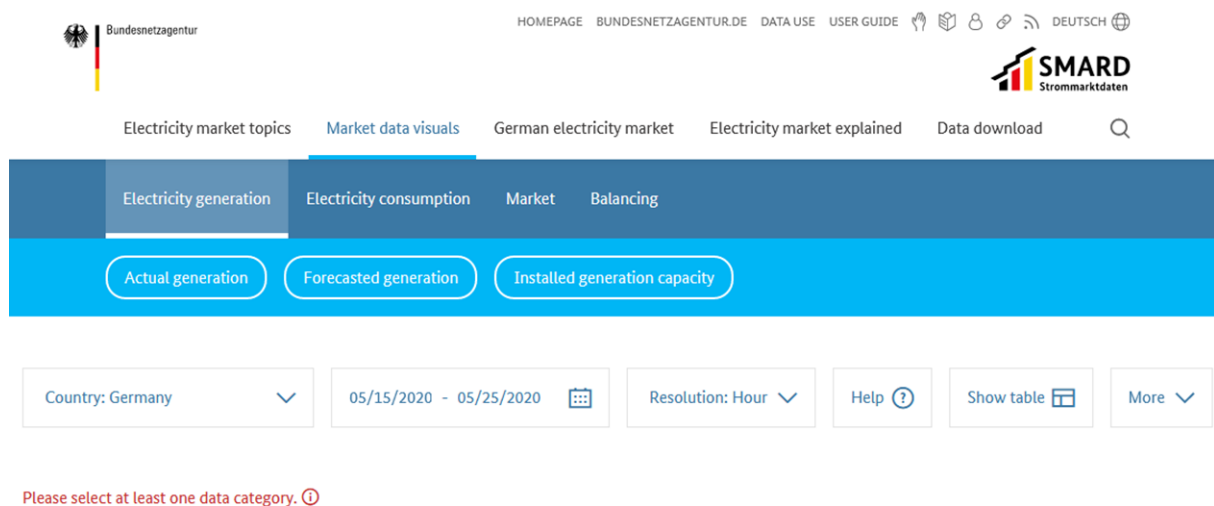


Figure 1: How to select a data category

2.1.1 Selecting data categories

You first need to select a main category in the dark blue line by clicking it. The default setting is "Electricity generation". Then you need to select at least one subcategory in the light blue line. You can select one or more main categories and/or subcategories by clicking the

categories and can deselect them by clicking them again. More information on the categories you can select is in **D Description of the data categories**.

The following figure shows a chart with a combination of the subcategories "Actual generation" (in the main category "Electricity generation") and "Actual consumption" (in the main category "Electricity consumption"). The subcategory/subcategories you have selected in the light blue line will have a white background. The main category/categories you have selected will have a white tick next to it/them.



You can add more data categories in the menu and use other configuration options (filters and scaling etc). You can use the time slider under the diagram to easily change the time display.

Figure 2: Example of a combination of different categories

Underneath the chart there will be a preview of the chart with your settings for a different time period. You can move the shaded bar on the preview by clicking and holding down the left mouse button to view the data for a different period.

Customising charts

You can customise a chart by adding/removing individual components to/from the chart.

The following figure shows a chart with a combination of the subcategories "Actual generation" and "Actual consumption". Underneath the chart you can see "Electricity generation – Actual generation" and the different energy sources as individual components.

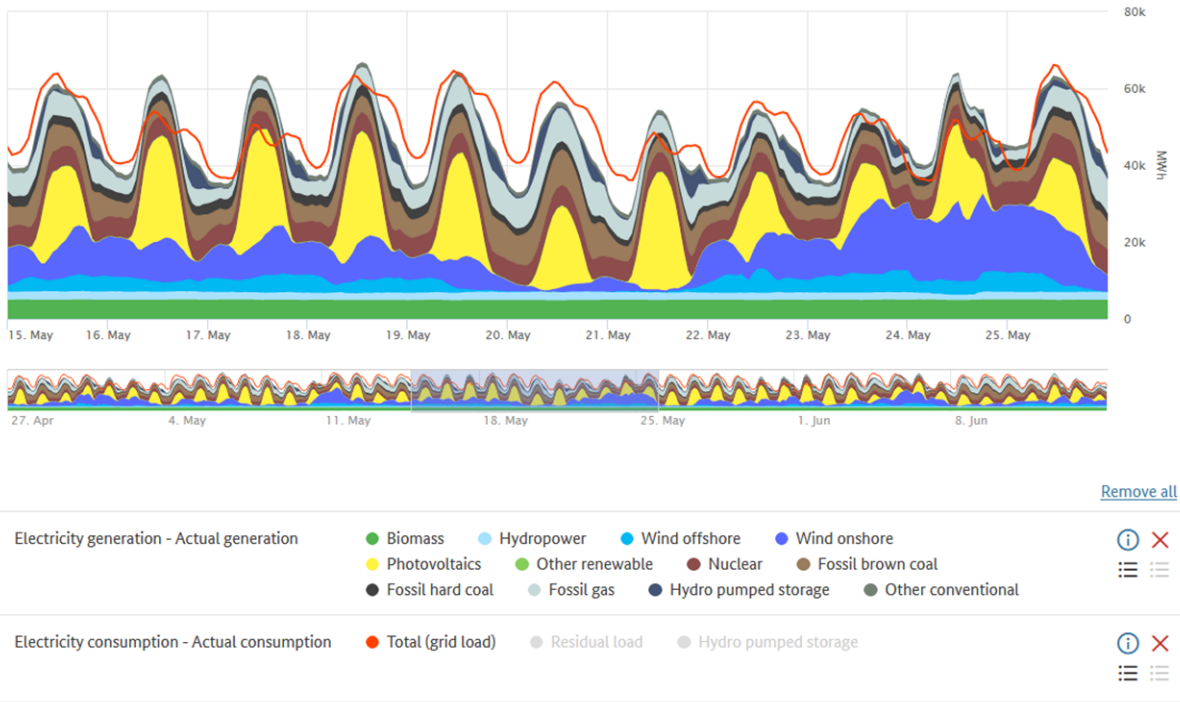


Figure 3: List of components

The default setting is all components. You can select and deselect individual components by clicking them and clicking them again and you can select and deselect all the components together by clicking the icons on the right of the list. The following figure shows the same chart with all the conventional energy sources deselected (light grey in the list):

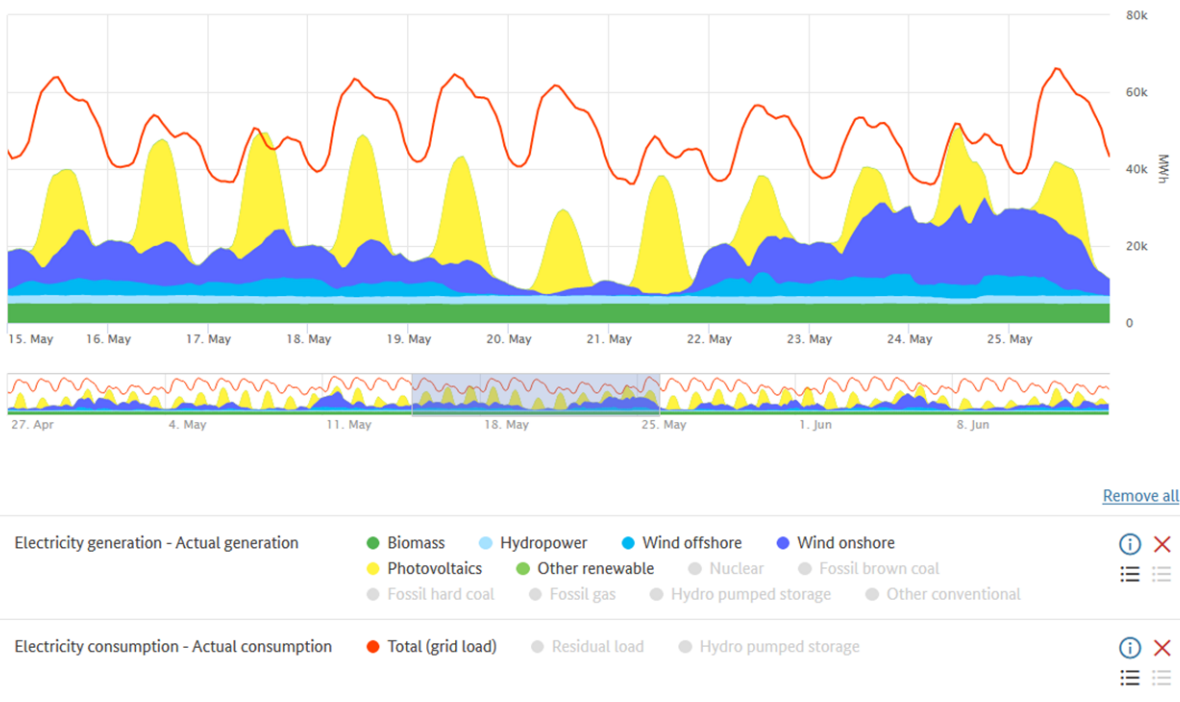



Figure 4: List with deselected components

Important:

You can select up to 30 different components for a chart. If you select more than 30 components, you will get the following message: "The modules could not be added because the maximum number of 30 modules was exceeded. Defaults have been restored."

You can also only select components with up to two different units (for example megawatt hours (MWh) and euros per megawatt hour (€/MWh)) for a chart. If you select a component

that is displayed in a third unit (for example megawatts (MW)), a red  will appear next to the component. If you still want to add this component to the chart, you need to deselect all the components displayed in another unit (for example €/MWh).

List symbols



more information about the data category selected (hover your mouse over the icon)



remove the whole category




select all the components in the category



deselect all the components in the category

Black-and-white mode

The default setting for all the charts on the SMARD website is colour. Each data category

has its own colours. You can view the charts in black and white by clicking [More](#)  then "Black and White Mode".

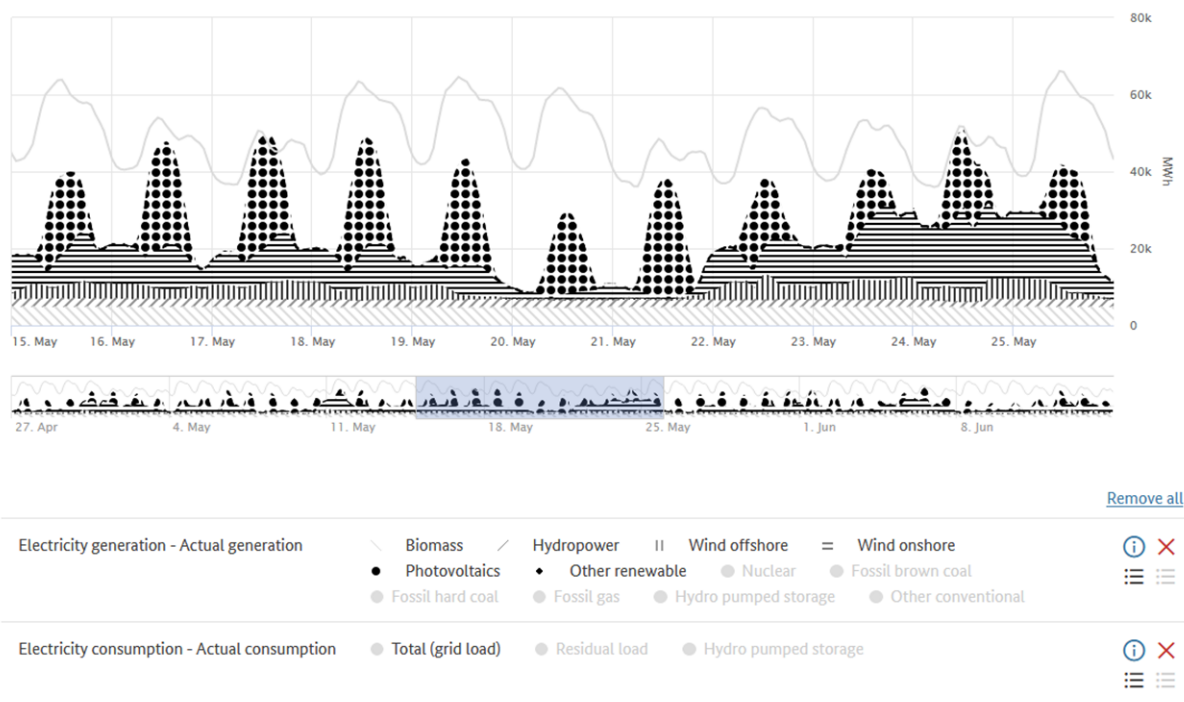


Figure 5: Example of a black-and-white chart

2.1.2 Selecting filters

You can select different regions and time periods for the data categories you select. You can also change the resolution, for example to view monthly data instead of quarter hourly data.

Selecting a region

You can select a region from the drop-down list. The default setting the first time you go to the [Market data visuals](#) section is Germany. You can choose from the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Country: Luxembourg
- Control area (DE): 50Hertz
- Control area (DE): Amprion
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG
- Control area (LU): Creos

Important:

Some data categories are only available for certain regions (for example "Country: Germany). If you select a region for which a data category is not available, you will get the following message: "No data is available for the selected region." More information about which data categories are available for which regions is in **D Description of the data categories**.

Selecting a time period

You can select your own start and end dates. Click the start date in the box, select the date you want and click "Accept" to confirm, then repeat for the end date. The default setting the first time you go to the [Market data visuals](#) section is the current date plus the previous 10 days.

Important:

The length of the period you can select for a chart depends on the resolution you select. The following minimum and maximum lengths apply for the different resolutions:

- quarter hour: 1 to 3 days
- hour: 1 to 14 days
- day: 2 to 92 days
- week: 14 to 366 days
- month: 59 to 1,095 days
- year: 730 to 3,653 days.

If you select a period shorter than the minimum or longer than the maximum number of days for the resolution selected, you will get a message to say that the resolution will be changed to the next higher resolution. If you want the resolution to be changed, click "Accept".

2.1.3 Selecting the resolution

A key feature of the SMARD website is that you can create charts displaying any of the data categories so you can directly compare different market data and explore any irregularities in or links between the data. The data are scaled if necessary to make all the data available in all the resolutions, regardless of their original resolution.

To display market data originally provided with different resolutions in the same chart, the data must be converted to the same resolution – quarter hour, hour, etc. The system does this automatically. For example, quarter hourly megawatt hour (MWh) output values from a certain hour, week, month or year are added up.

You can select a resolution from the drop-down list. The default setting the first time you go to the [Market data visuals](#) section is an hour. You can choose from the following resolutions:

- quarter hour
- hour
- day
- week

- month
- year.

Each data point in a chart relates to a period of time. For example, if you select "Resolution: Hour" and move your cursor to the data point at 12pm on 1 January 2021 on the x-axis, the data point relates to the time from 12pm to 1pm on 1 January 2021.

Important:

The resolution you can select for a chart depends on the period you select. The following minimum and maximum lengths apply for the different resolutions:

- quarter hour: 1 to 3 days
- hour: 1 to 14 days
- day: 2 to 92 days
- week: 14 to 366 days
- month: 59 to 1,095 days
- year: 730 to 3,653 days.

If you change the resolution and the period selected is shorter than the minimum or longer than the maximum number of days for the resolution, you will get a message to say that the start date will be changed. If you want the start date to be changed, click "Change resolution".

Automatic interpolation

In a very few cases the data transmitted to the SMARD website are incomplete. If you want to create a chart and select a resolution other than the original resolution of the data you want to view, the data are scaled; if the data you want to view are incomplete, the missing figures are interpolated when the data are scaled to create the chart. The following rules must be met to interpolate the figures.

The figures are interpolated when the data are scaled. Figures can be interpolated for within a time period and for the start and/or end of a period. If a figure within a period is missing, the average of the figures immediately before and after is taken. If the figure at the start of a period is missing, the figure immediately after is taken as the interpolated figure. If the figure at the end of a period is missing, the figure immediately before is taken as the interpolated figure.

The figures are interpolated in line with clear rules for each scaling. The rules state how many figures are allowed to be missing in total and how many consecutive figures within a period are allowed to be missing. If more figures are missing than allowed, the figures are not interpolated and the chart with the selected resolution will have gaps.

The following rules apply depending on the original resolution and the resolution you select (example for data with an original resolution of a quarter hour):


Table 1: Interpolation rules – number of missing quarter hours


Scaling	Total	Consecutive
Hour	3	4
Day	48	8
Week	336	56
Month	1,488	248
Year	17,520	2,976

For example, if you select a resolution of a day, figures can be interpolated when the data are scaled if data for no more than 48 quarter hours are missing and if data for no more than eight consecutive quarter hours are missing.

2.2 Viewing tables

You can view the data you select in a table as well as a chart. You can switch to a table by

clicking [Show table](#) ; the data are only displayed with the resolution with which they are transmitted to the system. The table has a separate column for each component of the data category you select and a separate line for each time period.

You can switch back to a chart by clicking [Show diagram](#) .

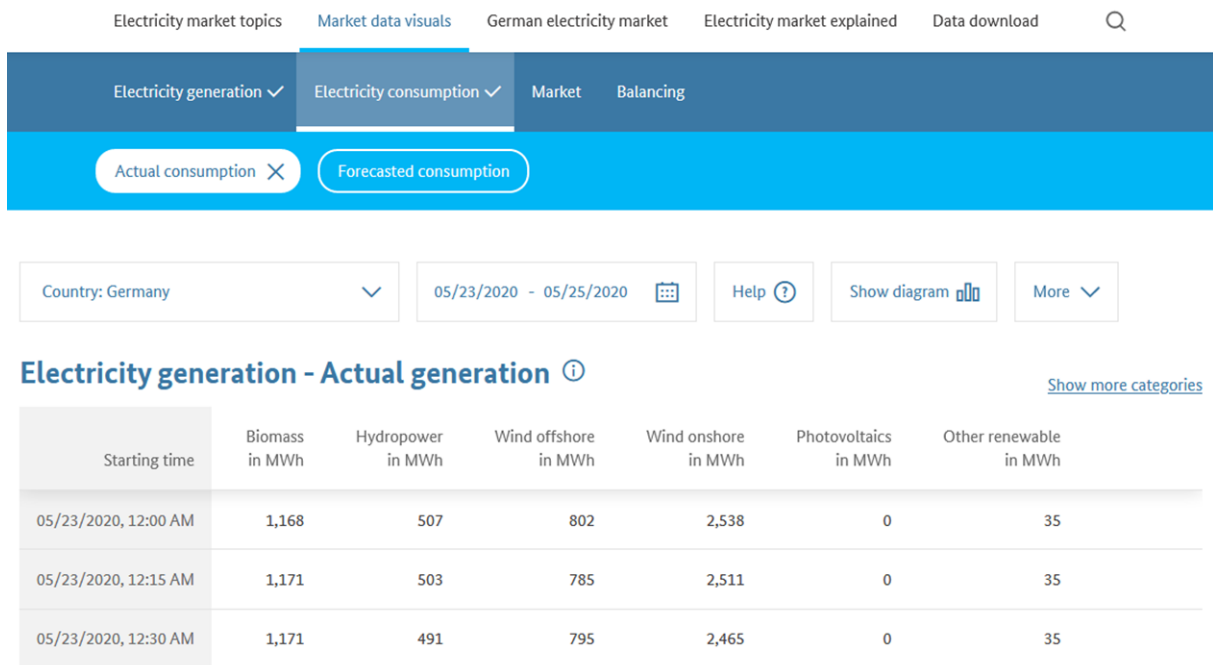



Figure 6: Example of a table

If you select more than one data category, each category will be shown with its original resolution in a separate sheet. To switch between the sheets, click  on the right for the data category you want to view.

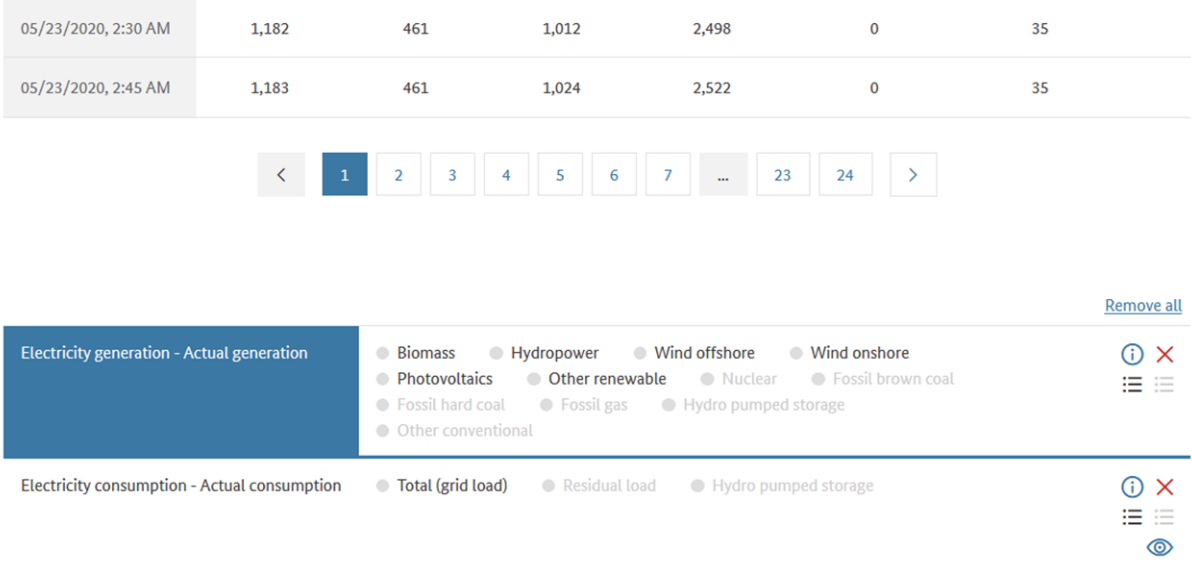




Figure 7: Switching between data categories in a table

2.3 Exporting charts and tables

You can export any of the charts you create to use later by clicking [More](#)  and selecting the file type you want.

You can choose from the following file types for charts:

- PDF
- SVG
- PNG
- JPEG.

You can also export any of the tables you create to use later by clicking [More](#)  and selecting the file type you want.

You can choose from the following file types for tables:

- PDF
- CSV
- XLS
- XML.

3 German electricity market

The [German electricity market](#) section is divided into two areas: "Power plants" and "Bidding zone".

You can use an interactive guide explaining these pages by clicking [Help](#) .

3.1 Power plants

The "Power plants" pages show data for generation units in Germany, Austria and Luxembourg and are divided into three categories: "Power plant map/list", "Power plant map" and "Power plant list". The data are based on the [Bundesnetzagentur's list of power plants](#), which in turn is based on the Bundesnetzagentur's annual [monitoring surveys](#).

Power plant blocks with an installed generation capacity of 100 MW or more are required by law to publish actual generation data. These data are then automatically retrieved from the ENTSO-E Transparency Platform and published on the SMARD website together with the core data from the power plant list. More information is in **3.1.3 Power plant details**.

3.1.1 Power plant map and list

a) Power plant map

The power plant map is a geographic map showing the locations of the generation units in Germany, Austria and Luxembourg. Each blue dot indicates the location of a power plant, wind farm or solar farm.

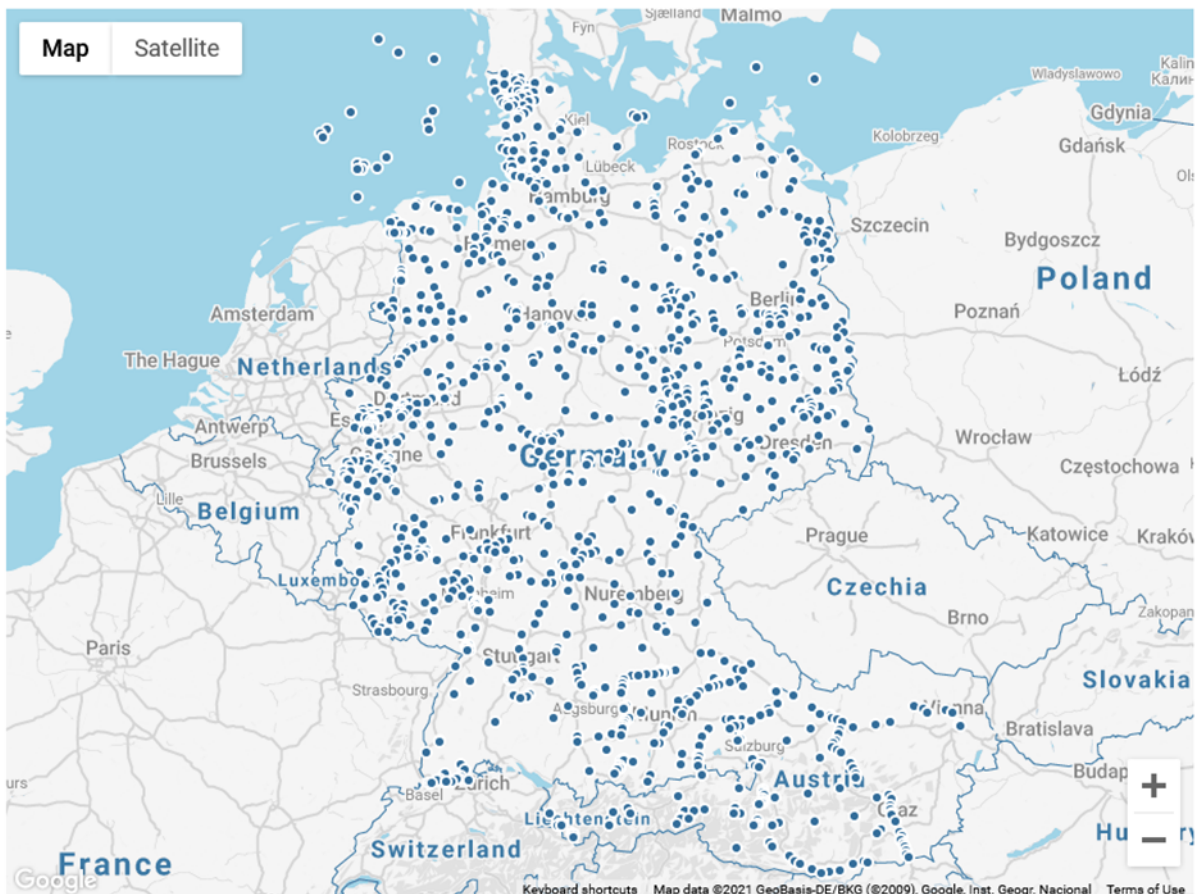


Figure 8: Power plant map

You can switch between a map view and a satellite view by clicking "Map" or "Satellite". You can zoom in and out by clicking $+$ and $-$. You can move the map by clicking and holding down the left mouse button (if using the desktop version) or with your fingers (if using the mobile version). You can view the details of a power plant by clicking one of the blue dots.

b) Power plant list

The power plant list is a table of power plants, wind farms and solar farms and gives a quick overview of the name, location, energy source and nominal capacity of each power plant or farm. The default setting is a list in alphabetical order by name. You can reverse the

alphabetical order by clicking Name ∇ . You can also list the power plants in alphabetical or reverse alphabetical order by location, energy source or capacity by clicking "City", "Energy resources" or "Nominal capacity".

You can view all the generation units belonging to a production unit by clicking $+$; the dot indicating the location of the production unit on the map turns light blue. You can view the details of the power plant or farm by clicking \triangleright .

Name	City	Energy resources	Nominal capacity	
+ Power plant Silz	Silz	Hydro water reservoir (excluding hydro pumped storage)	1,000 MW	>
+ Wehr	Wehr	Hydro pumped storage	910 MW	>
+ Schkopau	Schkopau	Fossil brown coal	900 MW	>
+ Heyden	Petershagen	Fossil hard coal	875 MW	>
+ Heating power plant Niehl	Cologne	Fossil gas	872.9 MW	>
— Trianel gas power plant	Hamm	Fossil gas	838 MW	>
Block 10		Fossil gas	417.1 MW	
Block 20		Fossil gas	420.9 MW	
+ Heating power plant Lausward	Düsseldorf	Fossil gas	826.4 MW	>

Figure 9: Power plant list

You can navigate through the pages of the table by clicking the numbers or arrows below the table.



Figure 10: Navigating through the power plant list

c) Power plant map/list

The "Power plant map/list" provides a side-by-side view of the map and the list, together with all the functions for each. The difference here is that the map and the list are linked to each other. If, for example, you zoom in on the map, the list changes and only includes the power plants or farms shown on the map.

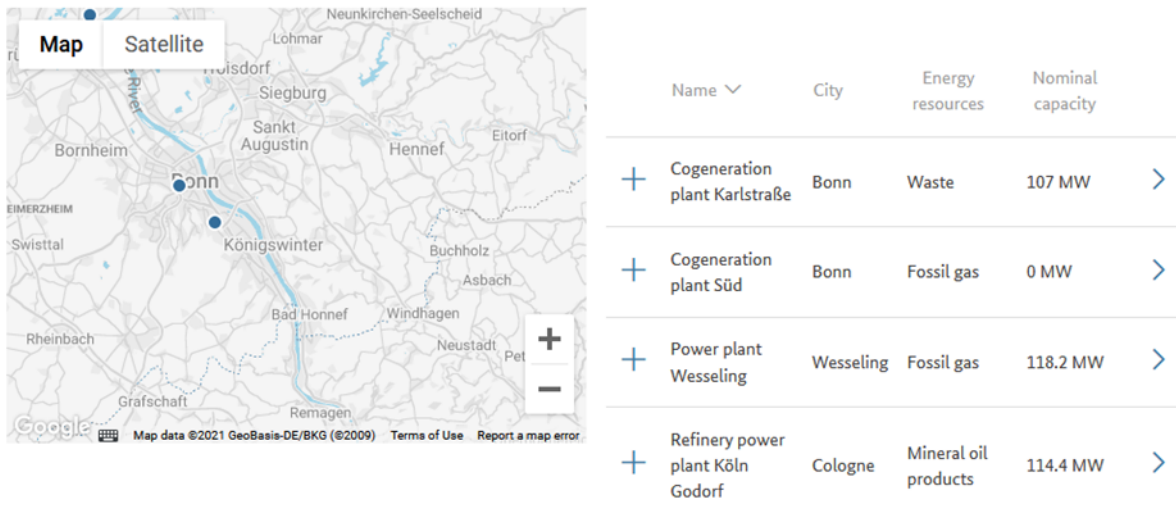


Figure 11: Power plant map and list

3.1.2 Selecting filters

You can use 10 different filters under "Power plant map", "Power plant list" and "Power plant map/list" to change which production units are displayed on the map and/or in the list.

Company

You can select a company name from the drop-down list. The default setting is all companies.

Search

You can use the free text search field to search for a term in the name, location or energy source of a production unit.

Control area

You can select a control area from the drop-down list to view the production units in a certain area. The default setting is all control areas.

Location

You can enter a location as free text and then select one of the locations suggested in the drop-down list.

Area

You can use the area filter together with the location filter to view more production units within a wider radius of the location selected. The default setting is 100 km; you can increase the radius up to 500 km by moving the circle along the line.

Federal state

You can select a federal state (or canton in Luxembourg) from the drop-down list to view the production units in a certain state or canton. You can select "At sea" to view the production units in the North Sea and Baltic Sea. The default setting is all federal states.

Commissioning

You can select the start and end of a period by moving the two circles along the line. The default setting is the year of commissioning of the oldest production unit as the start and the year of commissioning of the youngest production unit as the end of the period.

Energy resources

You can select an energy source from the drop-down list. The default setting is all energy sources.


Nominal capacity


You can select a range by moving the two circles along the line. The default setting is 0 MW to 5,000 MW.

Network operator

You can select a transmission system operator from the drop-down list to view the production units connected to a certain operator's network. The default setting is all operators.

3.1.3 Power plant details

You can view all the core data for a production unit in a pop-up window by clicking  in the list or the circle indicating a location on the map. If a production unit has one or more generation units with an installed generation capacity of 100 MW or more, the data for actual generation are displayed separately for each generation unit.

You can view the data for actual generation in a chart or a table. You can switch to a table by clicking [Show table](#) ; the data are displayed with the resolution with which they are transmitted to the system. The table has a separate column for each generation unit and a separate line for each time period.

You can download the generation data for each generation unit belonging to a production unit by clicking "Download power plant data" in the [Data download](#) section. A more detailed description is in **C 5 Data download**.

Example of a pop-up window with power plant details:



838 MW

Trianel gas power plant

Image source: foto@luftbild-blossey.de

Production unit	Nominal capacity	Energy resources	Commissioning	Status
Block 10	417.1 MW	Fossil gas	2008	Operating
Block 20	420.9 MW	Fossil gas	2008	Operating

Company	Trianel Gaskraftwerk Hamm GmbH & Co. KG
Zip code, city	59071 Hamm
Country	Germany
Main energy resources	Fossil gas
Control Area	Amprion

Figure 12: Core data in pop-up window

Show table 

More 

Actual generation

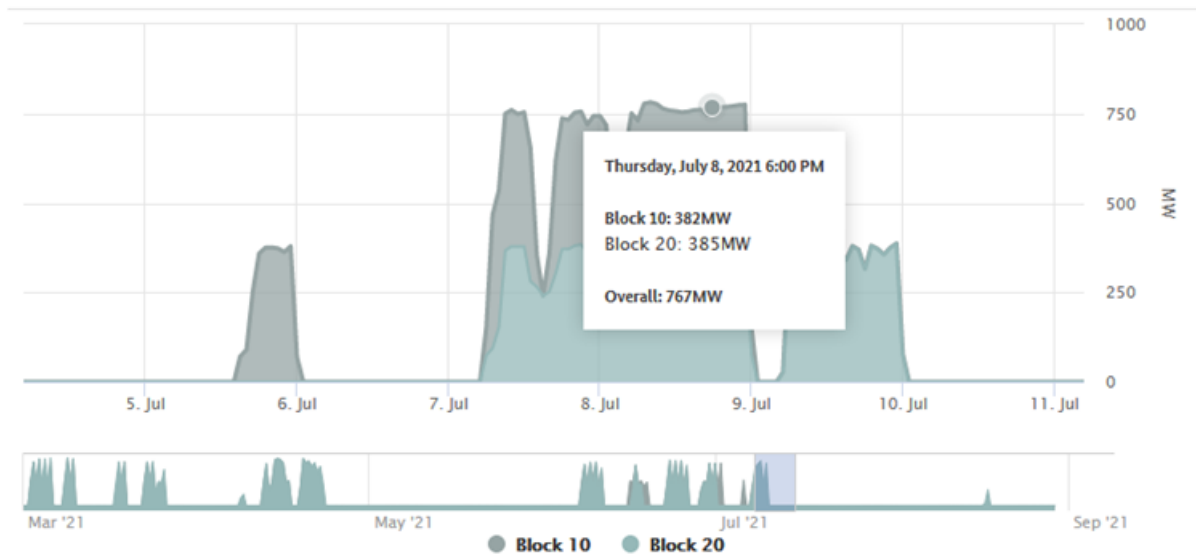


Figure 13: Actual generation data in pop-up window

Legal reporting obligations and data providers

The TSOs must calculate for their control areas the actual generation output (SMARD: "actual generation") per generation unit of 100 MW or more installed generation capacity in accordance with Article 16(1)(a) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform by the TSOs or third-party data providers five days after the operational period (see Article 16(2)(a) of Commission Regulation (EU) No 543/2013).¹

The owners of the generation units are the primary owners of the data.

Data definition and calculation

The actual generation corresponds to the net generation. The net generation is the electricity generated minus the electricity required by the generation units themselves.

The actual generation is published in megawatts [MW] per hour.

3.2 Bidding zone

The "Bidding zone" page shows a map of central Europe and up-to-date data for generation, consumption, day-ahead prices and imports/exports from/to Germany's neighbouring countries.

¹ Owners of generation units of 100 MW or more installed generation capacity can choose whether to transmit the data to the ENTSO-E Transparency Platform via their TSO or via a third-party data provider.


Selecting a region

You can select a region from the drop-down list. The default setting is Germany. You can choose from the following bidding zones/control areas/countries:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Country: Luxembourg
- Control area (DE): 50Hertz
- Control area (DE): Amprion
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG
- Control area (LU): Creos

Selecting a time period

You can also select a date and a time (full hour) and confirm by clicking "Accept". If, for example, you select a date and "12:00" as the time, the generation, consumption, day-ahead prices and net imports/exports data for the time from 12pm to 1pm will be displayed. You can

view the data in a certain category by clicking .

Map symbols

You can also view data for a certain category by clicking the symbols on the map.



Day-ahead prices

Each circle divided into three represents the day-ahead price in a country in relation to a certain price range. This range is a median range that is calculated using Germany's day-ahead prices in the preceding year and updated every year.

If only one third of a circle is thick, it means that the price in the country is below the lower edge of the range. If two thirds of a circle are thick, the price is within the range. If all three thirds of a circle are thick, the price is above the upper edge of the range.

The corresponding data are displayed in the table next to the map.



Exports ("EX") and imports ("IM")

Each circle divided into three represents the amount of electricity imported or exported in relation to Germany's commercial foreign trade. One median range each is calculated for imports and exports using Germany's net imports and exports in the preceding year and is updated every year. The arrow in the circle shows the direction of flow of the electricity.

If, for example, only one third of an imports circle is thick, it means that the amount of electricity imported by a country is below the range. If two thirds of the circle are thick, the amount is within the range. If all three thirds of the circle are thick, the amount is above the upper edge of the range. The same applies to exports.

The corresponding data are displayed in the table next to the map.


4 Electricity market explained

The [Electricity market explained](#) section has links to articles explaining the data categories on the SMARD website as well as certain aspects of the German electricity market such as balancing services and trading. The articles are divided similarly to the [Market data visuals](#) section into the categories "Market", "Generation", "Grid" and "Consumption".

All of the articles are available in English.

5 Data download

The data published on the SMARD website is freely available for public use in accordance with section 111d EnWG. In the [Data download](#) section you can download, save and use data relating to a period of up to two years with the original resolution.

You can use an interactive guide by clicking [Help](#) .

5.1 Market data visuals

You can download market data either in the [Market data visuals](#) section (see **C 2.3 Exporting charts and tables**) or in the [Data download](#) section as described below. You need to select one option from each of the following:

Main category:

- Electricity generation
- Electricity consumption
- Market
- Balancing

Data category:

- Main category: Electricity generation
 - Actual generation
 - Forecasted generation

- Installed generation capacity
- Main category: Electricity consumption
 - Forecasted consumption
 - Actual consumption
- Main category: Market
 - Day-ahead prices
 - Scheduled commercial exchanges
 - Cross-border physical flows
- Main category: Balancing
 - Manual Frequency Restoration Reserve
 - Exported balancing services
 - Frequency Containment Reserve
 - Automatic Frequency Restoration Reserve
 - Imported balancing services
 - Total costs
 - Balancing energy

Region:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Country: Luxembourg
- Control Area (DE): 50Hertz
- Control Area (DE): Amprion
- Control Area (DE): TenneT
- Control Area (DE): TransnetBW
- Control Area (AT): APG
- Control Area (LU): Creos

Time period:

You need to select the start and end dates separately and confirm by clicking "Accept". The default setting is the current date plus the previous 10 days. The maximum possible period is two years.

File type:

You can choose from the following file types to export the data:

- CSV
- XLS
- XML.

Click [Download file](#)  to export the data.

5.2 Power plant data

You need to select one option from each of the following to download generation data for one or all of the power plants:

Select power plant: All power plants or one power plant

Data category: Actual generation equal to or exceeding 100 MW capacity

Time period:

You need to select the start and end dates separately and confirm by clicking "Accept". The maximum possible period is two years.


File type:


You can choose from the following file types to export the data:

- CSV
- XLS
- XML.

Click [Download file](#)  to export the data.

6 Search

You can use the search function by clicking . The search function is a free text search. A drop-down list may appear, depending on the word or phrase you type in the search box.




Type the word or phrase and press the enter button or click  to start the search. The search results will be grouped according to the section they appear in.

7 User account

You can save any of the content – articles, charts and tables – from the SMARD website as a favourite in an account so you can access it again later. If you want to save market data charts and tables as favourites, you can choose between saving the versions from the date when you are saving them or accessing the most recent versions of them.

Registration

You need to register to have an account.

You can register by clicking the account icon  at the top right or by clicking [More](#)  and then the favourites icon  in the drop-down list.

You need to complete the following fields to register:

- "Email"
- "Confirm email"
- "Password"
- "Confirm password".

Your password must be at least eight characters long and it must include at least one special character, one number, one uppercase letter and one lowercase letter.

An automatically generated email will be sent to the address you have given after you have confirmed your password. The data you enter when you register will be passed on to the Bundesnetzagentur. When you register, you will be asked to accept the terms of use and the [privacy statement](#). The legal basis for us to use your data after you have accepted the terms of use and created an account is point (a) of Article 6(1) of the EU General Data Protection Regulation (GDPR). We use your email address to validate you as a user. We ask for other personal data when you register to make sure that services or the email address you give are not abused.


You need to click a link in the email sent to the address you have given to complete the registration process. By clicking the link you also accept the terms of the privacy statement.


Signing in

You can sign in to your account by entering your:

- email and
- password.

Saving favourites


You can save content – articles, charts, tables or news tickers – from the SMARD website as a favourite so you can access it again later by clicking [More](#)  and then the favourites

icon  in the drop-down list. If you want to save a chart or table, a pop-up window will appear for you to give whatever you are saving a name. You also need to choose between:

- "Default data" to save the version of the chart or table from the date when you are saving it; or
- "Live data" to access the most recent version of the chart or table you are saving.

You then need to click "Accept" to save the chart or table in your account.

User details

You can access your personal details by clicking  at the top right. You can see your personal details saved under "Your details":


- Title (optional)
- First name

- Last name
- Email address
- Last login date
- Date account was created
- Number of logins

You can change your personal details and/or your password by clicking "Edit profile". You then need to click "Save profile" to save your changes.

You can view and delete the content you have saved as a favourite under "Favourites".

Signing out

You can sign out of your account by clicking  at the top right.

Deleting your profile

You can delete your account at any time you want. If you want to delete your account, click "Edit profile" on the "Your details" page. You need to click "Delete profile" and then "OK" in the pop-up window to confirm that you want to delete your account. All the data saved will be deleted completely when you delete your profile.

8 RSS feed


The free SMARD RSS feed keeps you informed of new content on the SMARD website. You will receive automatic notification each time a news ticker or article is posted in the [Electricity market topics](#) or [Electricity market explained](#) section. The RSS feed has the advantage that you don't need to provide any contact details.

Subscribing

You can subscribe to the SMARD RSS feed by clicking the link


<https://www.smard.de/service/rss/en/feed.rss>

in your RSS reader, browser add-on or email programme.

You can also access the link by clicking the RSS feed icon  at the top right.

9 News archive

All the news tickers posted on the SMARD website are listed in a news archive. You can access the list by clicking "News archive" at the bottom of a page.

You can click the favourites icon  to save a news ticker so you can access it again later. You need an account to save favourites (see **7 User account**).

D Description of the data categories

1 Electricity generation

1.1 Actual generation

Legal reporting obligations and data providers

The TSOs must calculate for their control areas the actual generation output (SMARD: "actual generation") in accordance with Article 16(1)(b) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform no later than one hour after the operational period (see Article 16(2)(b) of Commission Regulation (EU) No 543/2013). The data published can be updated later.

The owners of the generation units or the TSOs are the primary owners of the data.

Data definition and calculation

The actual generation corresponds to the net generation. The net generation is the electricity fed in minus the electricity required by the generation units themselves. The actual generation only includes electricity fed into the general supply network. It does not include electricity generated in the Deutsche Bahn network or within industrial networks and closed distribution networks.

The actual generation is published on the ENTSO-E Transparency Platform in megawatts [MW] per quarter hour. It is converted into megawatts per hour [MWh] for the SMARD website by dividing the figures provided by ENTSO-E by four.

The actual generation can be displayed for the following energy sources:

Renewable energy sources:

- biomass
- hydropower, comprising:
 - run-of-river
 - hydro storage
- offshore wind
- onshore wind
- photovoltaics
- other renewable energy sources, comprising:
 - geothermal energy
 - landfill gas
 - sewage gas
 - pit gas.

Conventional energy sources:

- nuclear
- fossil brown coal (lignite)
- fossil hard coal
- fossil gas (natural gas)

- hydro pumped storage
- other conventional energy sources, comprising:
 - derived gas from coal
 - mineral oil
 - waste
 - oxygen steel furnace gas
 - blast furnace gas
 - refinery gas
 - gas with a high proportion of hydrogen
 - other byproducts of production (for example steel and coke production)
 - mixture of more than one fuel type.

Depending on the control area and the energy source, there are different levels of coverage of generation by real-time measured data and different methods of calculation in the event that no measured data are available. This means that, for a few energy sources, there is no full coverage of the total generation from measured data, scheduled data, forecasts and/or extrapolated data. The level of coverage of generation for each energy source is the ratio of the installed net rated capacity of those generation units for which generation data are available to the installed net rated capacity of the respective energy source. In these cases, the actual generation of the relevant energy source/control area is systematically underestimated.

A table providing an overview of the level of coverage for each energy source is in the **Annex** under **1 Coverage of actual generation**.

The table shows that the only energy sources with full coverage of the installed capacity from measured data across all the control areas are offshore wind and nuclear.

The generation data for biomass, hydropower, photovoltaics and hydro pumped storage comprise scheduled data, forecasts and/or extrapolated data, depending on the TSO and energy source, in addition to measured data. The actual generation in relation to the installed capacity in accordance with Article 14(1)(a) of Commission Regulation (EU) No 543/2013 is, however, fully covered across all the control areas (100% level of coverage).

The generation in relation to the total installed capacity in accordance with Article 14(1)(a) of Commission Regulation (EU) No 543/2013 for other renewable energy sources, fossil brown coal, fossil hard coal, fossil gas and other conventional energy sources is, by contrast, not fully covered in some control areas despite the availability of measured data and/or the use of scheduled data and/or extrapolated data. The Bundesnetzagentur is in regular dialogue with the TSOs with the aim of continuously improving data quality. The TSOs currently have no data in particular for smaller power plants connected to the high-voltage and/or medium-voltage level.

Regions

The actual generation can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)

- Country: Germany
- Country: Austria
- Control area (DE): 50Hertz
- Control area (DE): Amprion (includes data for the control area (LU): Creos)
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG

Visualisation

The actual generation is displayed in an area chart. The y-axis represents the volume of electricity fed in [MWh] and the x-axis the time, with each data point representing the volume of electricity (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

The order of the energy sources that can be selected is based firstly on the statutory priority dispatch for renewable energy sources and secondly on the volatility of each dispatch. If all energy sources are selected, the renewable energy sources are displayed as the basis at the bottom of the chart. The conventional energy sources and hydro pumped storage are displayed above the renewable energy sources. Both renewable and conventional energy sources are displayed in order of volatility within each group: the energy source with a nearly constant level of generation is displayed at the bottom of each group, and energy sources with fluctuating levels of generation are displayed above.

1.2 Forecasted generation

1.2.1 Total

Legal reporting obligations and data providers

The TSOs must calculate for their control areas an estimate of the total scheduled generation (SMARD: "forecasted generation") in accordance with Article 14(1)(c) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform no later than 6pm the day before. The data published are not updated later.

The owners of the generation units and/or the DSOs are the primary owners of the data.

Data definition and calculation

The total forecasted generation corresponds to a forecast of the total scheduled net electricity generation. The forecast of the net electricity generation does not include the electricity required by the generation units themselves and only includes electricity fed into the general supply network.

The total forecasted generation is published on the ENTSO-E Transparency Platform in megawatts [MW] per hour. The total forecasted generation is displayed on the SMARD website in megawatt hours [MWh].

Regions

The total forecasted generation can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Control area (DE): 50Hertz
- Control area (DE): Amprion (includes data for the control area (LU): Creos)
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG

Visualisation

The total forecasted generation is displayed as a dotted line in a line chart. The y-axis represents the total forecasted generation [MWh] and the x-axis the time, with each data point representing the volume of electricity (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

1.2.2 Wind and photovoltaic installations

Legal reporting obligations and data providers

The TSOs must calculate for their control areas a day-ahead forecast of wind and solar power generation in accordance with Article 14(1)(d) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform no later than 6pm the day before.

The TSOs are the primary owners of the data.

Data definition and calculation

The forecasted generation from wind and photovoltaic installations corresponds to a forecast of the net electricity generation based on measured, meteorological and spatial data. The forecast of the net electricity generation does not include the electricity required by the generation units themselves and only includes electricity fed into the general supply network. Wind power generation is divided into onshore wind and offshore wind.

The forecasted generation from wind and photovoltaic installations is published on the ENTSO-E Transparency Platform in megawatts [MW] per quarter hour. It is converted into megawatts per hour [MWh] for the SMARD website by dividing the figures provided by ENTSO-E by four.

Regions

The forecasted generation from onshore wind installations can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Control area (DE): 50Hertz
- Control area (DE): Amprion (includes data for the control area (LU): Creos)
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG

The forecasted generation from offshore wind installations can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Control area (DE): 50Hertz
- Control area (DE): TenneT

The forecasted generation from photovoltaic installations can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Control area (DE): 50Hertz
- Control area (DE): Amprion (includes data for the control area (LU): Creos)
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG

Visualisation

The forecasted generation from wind and photovoltaic installations is displayed as separate dotted lines in a line chart. The y-axis represents the forecasted generation [MWh] and the x-axis the time, with each data point representing the volume of electricity (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

1.2.3 Other

Data definition and calculation

The forecasted generation for "Other" is a data category calculated on the SMARD website. It corresponds to the difference between the total forecasted generation and the forecasted generation from wind and photovoltaic installations. It should be noted that the total

forecasted generation is published per hour and the forecasted generation from wind and photovoltaic installations is published per quarter hour.

The forecasted generation for "Other" is published in megawatt hours [MWh].

Important:

The forecasted generation for "Other" calculated automatically on the SMARD website may differ slightly from the forecasted generation for "Other" calculated separately using the data provided. This is because the data received by the system per quarter hour is first converted from megawatts [MW] to megawatts per hour [MWh] by dividing the figures by four. The resulting numbers with decimal places are then used to calculate the forecasted generation. This result is rounded to a whole number and published on the SMARD website.

Calculating the forecasted generation for "Other" using the individual figures for total forecasted generation and forecasted generation from wind and photovoltaic installations published on the SMARD website may result in slight differences because the figures have been rounded to whole numbers. The forecasted generation calculated automatically on the SMARD website is to be taken as slightly less accurate.

Regions

The forecasted generation for "Other" can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Control area (DE): 50Hertz
- Control area (DE): Amprion
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG

Visualisation

The forecasted generation for "Other" is displayed as a dotted line in a line chart. The y-axis represents the forecasted generation [MWh] and the x-axis the time, with each data point representing the volume of electricity (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

1.3 Installed generation capacity

Legal reporting obligations and data providers

The TSOs must calculate for their control areas the generation capacity installed (SMARD: "installed generation capacity") in accordance with Article 14(1)(a) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform no later than one week before the end of the year. The data published are not usually updated later; only the data for renewable energy sources are updated in the second half of the year.

The owners of the generation units and/or the DSOs are the primary owners of the data. The TSOs aggregate these data for publication.

Data definition and calculation

The installed generation capacity corresponds to the sum of the installed net rated capacity of all generation units for each energy source. The data include both conventional and renewable generation units with a maximum net capacity of less than 1 MW in order to provide a representative picture of the generation capacity. The data include both existing units and units that have been provisionally closed and are part of a reserve (for example security standby, grid reserve, capacity reserve). The data relate to 1 January of each year. The installed net rated capacity data for renewable energy sources are updated in August of each year.

The installed generation capacity is published in megawatts [MW] for one year.

Regions

The installed generation capacity can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Country: Luxembourg
- Control area (DE): 50Hertz
- Control area (DE): Amprion
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG
- Control area (LU): Creos

Visualisation

The installed generation capacity is displayed in a stacked bar chart. The y-axis represents the installed generation capacity [MW] and the x-axis the time, with each data point representing the installed generation capacity in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

2 Electricity consumption

2.1 Actual consumption

2.1.1 Total

Legal reporting obligations and data providers

The TSOs must calculate for their control areas the total load (SMARD: "actual consumption") in accordance with Article 6(1)(a) of Commission Regulation

(EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform no later than one hour after the operating period. The data published can be updated later.

The TSOs are the primary owners of the data.

Data definition and calculation

The actual consumption on the SMARD website corresponds to the total load (including network losses without stored energy). This is the net generation minus export transmission capacity, plus import transmission capacity and minus the feed-in capacity from hydro pumped storage power stations. The net generation does not include the electricity required by conventional power plants themselves, electricity fed in within industrial networks and closed distribution networks or electricity fed into the Deutsche Bahn network. The net generation may include a forecast component if no data on actual generation are available (see **Table 2**).

The actual consumption is published on the ENTSO-E Transparency Platform in megawatts [MW] per quarter hour. It is converted into megawatts per hour [MWh] for the SMARD website by dividing the figures provided by ENTSO-E by four.

Important:

The actual consumption is not calculated in the same way by all German TSOs for their respective control areas as they have different methods of depicting the load in the best way possible. There are differences in particular in the calculation of the net generation and the updating of the total load with [quality data from the imbalance settlement \(MaBiS – market rules for electricity imbalance settlement\)](#).

Table 2: Differences in actual consumption

Component	50Hertz	Amprion	TenneT	TransnetBW
Net electricity generation	Based on generation per energy source in accordance with Article 16(1)(b) of Commission Regulation (EU) No 543/2013	Based on measured values and feed-in schedules of the power to be fed into the balancing groups (not per energy source)	Based on generation per energy source in accordance with Article 16(1)(b) of Commission Regulation (EU) No 543/2013	Based on generation per energy source in accordance with Article 16(1)(b) of Commission Regulation (EU) No 543/2013
Total load updating	At the earliest from the 42 nd working day with MaBiS data		At the earliest from the 42 nd working day with MaBiS data	

It is planned in future to update the total load for all control areas with the available MaBiS data. This means that the actual consumption originally published will also be updated.

Regions

The actual consumption can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)

- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Country: Luxembourg
- Control area (DE): 50Hertz
- Control area (DE): Amprion
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG
- Control area (LU): Creos

Visualisation

The actual consumption is displayed in a line chart. The y-axis represents the consumption [MWh] and the x-axis the time, with each data point representing the consumption (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

2.1.2 Residual load

Data definition and calculation

The residual load is a subcategory of "Actual consumption" on the SMARD website and has to be clicked on separately. The residual load corresponds to the total actual consumption minus the feed-in from photovoltaic, onshore wind and offshore wind installations.

The residual load is published in megawatts per hour [MWh] per quarter hour.

Important:

The residual load calculated automatically on the SMARD website may differ slightly from the residual load calculated separately using the data provided. This is because the data received by the system per quarter hour is first converted from megawatts [MW] to megawatts per hour [MWh] by dividing the figures by four. The resulting numbers with decimal places are then used to calculate the residual load. This result is rounded to a whole number and published on the SMARD website.

Calculating the residual load using the individual figures for actual consumption and feed-in from wind and photovoltaic installations published on the SMARD website may result in slight differences because the figures have been rounded to whole numbers. The residual load calculated automatically on the SMARD website is to be taken as slightly less accurate.

Regions

The residual load can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Control area (DE): 50Hertz

- Control area (DE): Amprion
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG

Visualisation

The residual load is displayed in a line chart. The y-axis represents the residual load [MWh] and the x-axis the time, with each data point representing the residual load (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

2.1.3 Hydro pumped storage

Data providers

The data on hydro pumped storage consumption must be transmitted to the ENTSO-E Transparency Platform no later than one hour after the operating period. The data published can be updated later.

The TSOs are the primary owners of the data.

Data definition and calculation

Hydro pumped storage consumption is a subcategory of "Actual consumption" on the SMARD website and has to be clicked on separately.

Hydro pumped storage consumption is published in megawatt hours [MWh] per quarter hour.

Regions

Hydro pumped storage consumption can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Control area (DE): 50Hertz
- Control area (DE): Amprion
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG

Visualisation

Hydro pumped storage consumption is displayed in a line chart. The y-axis represents the consumption [MWh] and the x-axis the time, with each data point representing the consumption (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

2.2 Forecasted consumption

2.2.1 Total

Legal reporting obligations and data providers

The TSOs must calculate for their control areas a day-ahead forecast of the total load (SMARD: "forecasted consumption") in accordance with Article 6(1)(b) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform no later than two hours before close of trading of the day-ahead market. The data published must be updated if the figures change by 10% or more.

The TSOs and DSOs are the primary owners of the data.

Data definition and calculation

The forecasted consumption on the SMARD website corresponds to a day-ahead forecast of the total load and is calculated using empirical data (historic load profiles), taking account of meteorological data and socio-economic factors.

The forecasted consumption is published on the ENTSO-E Transparency Platform in megawatts [MW] per quarter hour. It is converted into megawatts per hour [MWh] for the SMARD website by dividing the figures provided by ENTSO-E by four.

Regions

The forecasted consumption can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Country: Luxembourg
- Control area (DE): 50Hertz
- Control area (DE): Amprion
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG
- Control area (LU): Creos

Visualisation

The forecasted consumption is displayed as a dotted line in a line chart. The y-axis represents the forecasted consumption [MWh] and the x-axis the time, with each data point representing the forecasted consumption (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

2.2.2 Forecasted residual load

Data definition and calculation

The forecasted residual load is a subcategory of "Forecasted consumption" on the SMARD website and has to be clicked on separately. The forecasted residual load corresponds to the total forecasted consumption minus the forecasted feed-in from photovoltaic, onshore wind and offshore wind installations.

The forecasted residual load is published in megawatts per hour [MWh] per quarter hour.

Important:

The forecasted residual load calculated automatically on the SMARD website may differ slightly from the forecasted residual load calculated separately using the data provided. This is because the data received by the system per quarter hour is first converted from megawatts [MW] to megawatts per hour [MWh] by dividing the figures by four. The resulting numbers with decimal places are then used to calculate the forecasted residual load. This result is rounded to a whole number and published on the SMARD website.

Calculating the forecasted residual load using the individual figures for forecasted consumption and forecasted generation from wind and photovoltaic installations published on the SMARD website may result in slight differences because the figures have been rounded to whole numbers. The forecasted residual load calculated automatically on the SMARD website is to be taken as slightly less accurate.

Regions

The forecasted residual load can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Control area (DE): 50Hertz
- Control area (DE): Amprion
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG

Visualisation

The forecasted residual load is displayed as a dotted line in a line chart. The y-axis represents the forecasted residual load [MWh] and the x-axis the time, with each data point representing the forecasted residual load (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

3 Market

3.1 Day-ahead prices

Legal reporting obligations and data providers

The TSOs must calculate for their control areas the day-ahead prices in accordance with Article 12(1)(d) of Commission Regulation (EU) No 543/2013 and provide the data to ENTSO-E. The data must be published no later than one hour after gate closure.² The data published can be updated later.

The power exchanges are the primary owners of the data.

Data definition and calculation

The day-ahead prices correspond to the hourly day-ahead prices. The prices are determined daily for the next day by means of auctions.

The prices are published in euros per megawatt hour [€/MWh].

Regions

The day-ahead prices can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Country: Luxembourg
- Control area (DE): 50Hertz
- Control area (DE): Amprion
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG
- Control area (LU): Creos

The day-ahead prices can be displayed for the following bidding zones, depending on which region is selected:

- Germany/Luxembourg (as from 1 October 2018)
- Germany/Austria/Luxembourg (up to 30 September 2018)
- Denmark 1
- Denmark 2
- Italy (North)
- Sweden 4
- France
- Netherlands

² The day-ahead prices for the Germany/Luxembourg bidding zone are transmitted to the ENTSO-E Transparency Platform by a third-party data provider on behalf of the German TSOs.

- Poland (no data between 2 March 2017 and 19 November 2019)³
- Switzerland
- Slovenia
- Czechia
- Hungary
- Austria (since 1 October 2018)
- Belgium
- Norway 2

Visualisation

The day-ahead prices are displayed in a step chart. The y-axis represents the price [€/MWh] and the x-axis the time, with each data point representing the day-ahead price (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

3.2 Scheduled commercial exchanges

Legal reporting obligations and data providers

The TSOs must calculate for their control areas scheduled day-ahead commercial exchanges (SMARD: "scheduled commercial exchanges") in accordance with Article 12(1)(f) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform every day no later than one hour after the last cut-off time and, if applicable, updated no later than two hours after each intra-day nomination process. The data published can be updated later.

The relevant TSOs are the primary owners of the data.

Data definition and calculation

Scheduled commercial exchanges correspond to the planned imports and exports resulting from the sum of all volumes of electricity used or nominated in electricity trading from/to adjacent countries in the interconnected system.

Scheduled commercial exchanges are published on the ENTSO-E Transparency Platform in megawatts [MW] per hour or per quarter hour. Scheduled commercial exchanges are displayed on the SMARD website in megawatt hours [MWh] per quarter hour.

In addition, the data are used on the SMARD website to calculate scheduled commercial net exports (import-export balance) by adding up all the exports to the neighbouring countries in the selected regions and subtracting all the imports from the neighbouring countries.

³ In the period between 2 March 2017 and 19 November 2019 the Polish day-ahead prices were published on the ENTSO-E Transparency Platform in zloty per MWh and therefore cannot be displayed on the SMARD website.

Regions

The imports and exports from scheduled commercial exchanges and the calculated scheduled commercial net exports can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Country: Luxembourg
- Control area (DE): 50Hertz
- Control area (DE): Amprion
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG
- Control area (LU): Creos

The imports and exports from/to the following countries can be displayed, depending on the region selected:

- Belgium
- Denmark (sum of the Denmark 1 and Denmark 2 bidding zones)
- France
- Italy
- Luxembourg
- Netherlands
- Norway (corresponds to the Norway 2 bidding zone)⁴
- Poland
- Sweden (corresponds to the Sweden 4 bidding zone)
- Switzerland
- Slovenia
- Czechia
- Austria
- Hungary

Visualisation

The scheduled commercial net exports calculated on the SMARD website are displayed in a line chart. The imports and exports from/to the neighbouring countries are displayed in a stacked bar chart. The y-axis represents the volumes [MWh] and the x-axis the time, with each data point representing the volume of electricity (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

⁴ The data for the period from 9 December 2020 to 11 April 2021 are from a trial operation period.

3.3 Cross-border physical flows

Legal reporting obligations and data providers

The TSOs must calculate for their control areas physical flows between bidding zones (SMARD: "cross-border physical flows") in accordance with Article 12(1)(g) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform every day no later than one hour after the operational period.

The relevant TSOs or groups of TSOs are the primary owners of the data.

Data definition and calculation

Cross-border physical flows correspond to the measured real flow of electricity between neighbouring bidding zones on the borders of the interconnected system.

The cross-border physical flows are published per market time unit (usually megawatts [MW] per hour or per quarter hour). Cross-border physical flows are displayed on the SMARD website in megawatt hours [MWh] per quarter hour.

In addition, the data are used on the SMARD website to calculate physical net exports (import-export balance) by adding up all the exports to the neighbouring countries in the selected regions and subtracting all the imports from the neighbouring countries.

Important:

The transmission system operators changed for individual borders the original resolution to "quarter hour". Data submissions have been gradually adjusted for the borders of Denmark, Luxembourg, the Netherlands, Austria and Switzerland.

Over the medium term the physical flows of electricity to and from the countries of France, Poland and the Czech Republic are also being adjusted to the original resolution of quarter hour. The physical imports and exports of electricity to and from Belgium and Norway remain unaffected by this change. This data has been available ongoing in quarter hour resolution since the trial format began on 25 September (Belgium) and on 2 September (Norway) of last year.

So that the cross-border physical flows of electricity are uniformly depicted on SMARD, all country borders will be published in the "quarter hour" resolution and data with the original "hour" resolution will be converted accordingly.

The cross-border physical flows of electricity are published unnetted on SMARD in the original "quarter hour" resolution. This means that for a quarter hour complete data for imports and for exports is available. By contrast, published data of all country borders with the original "hour" resolution are based on an average of netted quarter hour values. A comparison between scheduled commercial exchanges and cross-border physical flows is only possible using netted figures.

Table 3: Original resolutions of cross-border physical flows

Country border	Original resolution	Resolution on SMARD	Date of the change
Belgium	quarter hour	quarter hour (unnetted)	-
Denmark	quarter hour	quarter hour (unnetted)	2 August 2021
Netherland	quarter hour	quarter hour (unnetted)	29 July 2021
Norway	quarter hour	quarter hour (unnetted)	-
Austria	quarter hour	quarter hour (unnetted)	24 July 2021
Switzerland	quarter hour	quarter hour (unnetted)	2 August 2021
France	hour	quarter hour (netted)	2022
Luxembourg	hour	quarter hour (netted)	2 August 2021
Poland	hour	quarter hour (netted)	2023
Sweden	hour	quarter hour (netted)	-
Czech Republic	hour	quarter hour (netted)	2021

For calculating physical net exports in quarter hour terms on SMARD where country borders use the hour as the original resolution, the imports and exports are divided by four. Those quarter hour values are therefore only to be interpreted as an approximation.

Regions

The imports and exports from cross-border physical flows and the calculated physical net exports can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Bidding zone: Germany/Austria/Luxembourg (up to 30 September 2018)
- Country: Germany
- Country: Austria
- Country: Luxembourg
- Control area (DE): 50Hertz
- Control area (DE): Amprion
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG
- Control area (LU): Creos

The imports and exports from/to the following countries can be displayed, depending on the region selected:

- Belgium

- Denmark (sum of the Denmark 1 and Denmark 2 bidding zones)
- France
- Italy
- Luxembourg
- Netherlands
- Norway (corresponds to the Norway 2 bidding zone)
- Poland
- Sweden (corresponds to the Sweden 4 bidding zone)
- Switzerland
- Slovenia
- Czechia
- Austria
- Hungary

Visualisation

The physical net exports calculated on the SMARD website are displayed in a line chart. The imports and exports from/to the neighbouring countries are displayed in a stacked bar chart. The y-axis represents the volumes [MWh] and the x-axis the time, with each data point representing the volume of electricity (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4 Balancing

4.1 Balancing energy

4.1.1 Balancing energy volume (+)

Legal reporting obligations and data providers

The TSOs must provide data for their control areas on the total imbalance volume (SMARD: "balancing energy volume") in accordance with Article 17(1)(h) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform as soon as possible but no later than 30 minutes after the operating period. If the data transmitted and published are estimates, they must be updated later.

The TSOs are the primary owners of the data.

Data definition and calculation

The balancing energy volume is the total volume of energy used across all the control areas in each quarter hour to physically balance the imbalance in Germany. The balancing energy volume is published in megawatts hours [MWh] per quarter hour together with whether there was a deficit or a surplus in the system.

The balancing energy volume data published by ENTSO-E are displayed on the SMARD website as two separate volumes. The balancing energy volume in the case of a deficit in the transmission system is displayed as the "Balancing energy volume (+)".

Regions

The "Balancing energy volume (+)" can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Country: Germany
- Country: Austria
- Control area (AT): APG

Visualisation

The "Balancing energy volume (+)" is displayed in a step chart. The y-axis represents the volume [MWh] and the x-axis the time, with each data point representing the volume of electricity (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.1.2 Balancing energy volume (-)

Legal reporting obligations and data providers

The TSOs must provide data for their control areas on the total imbalance volume (SMARD: "balancing energy volume") in accordance with Article 17(1)(h) of Commission Regulation (EU) No 543/2013. The data must be transmitted to ENTSO-E as soon as possible but no later than 30 minutes after the operating period. If the data transmitted and published are estimates, they must be updated later.

The TSOs are the primary owners of the data.

Data definition and calculation

The balancing energy volume is the total volume of energy used across all the control areas in each quarter hour to physically balance the imbalance in Germany. The balancing energy volume is published in megawatts hours [MWh] per quarter hour together with whether there was a deficit or a surplus in the system.

The balancing energy volume data published by ENTSO-E are displayed on the SMARD website as two separate volumes. The balancing energy volume in the case of a surplus in the transmission system is displayed as the "Balancing energy volume (-)".

Regions

The "Balancing energy volume (-)" can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Country: Germany
- Country: Austria
- Control area (AT): APG

Visualisation

The "Balancing energy volume (-)" is displayed in a step chart. The y-axis represents the volume [MWh] and the x-axis the time, with each data point representing the volume of

electricity (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.1.3 Balancing energy price

Legal reporting obligations and data providers

The TSOs must provide data for their control areas on the imbalance prices (SMARD: "balancing energy price") in accordance with Article 17(1)(g) of Commission Regulation (EU) No 543/2013. The data must be transmitted to ENTSO-E as soon as possible. The data for the whole delivery month must be published no later than the 20th working day of the following month. If the data transmitted and published are estimates, they must be updated later.

The TSOs are the primary owners of the data.

Data definition and calculation

The balancing energy price is a charge payable by parties causing imbalances for costs/revenue arising from the use of balancing energy across all the control areas. The balancing energy price is published in euros per megawatt hour [€/MWh] per quarter hour.

Regions

The balancing energy price can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Country: Germany
- Country: Austria
- Control area (AT): APG

Visualisation

The balancing energy price is displayed in a step chart. The y-axis represents the price [€/MWh] and the x-axis the time, with each data point representing the price (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.2 Total costs

Legal reporting obligations and data providers

The total costs for maintaining system stability and security comprise balancing energy income and expenses, costs incurred for network security measures, and costs incurred for countertrading.

The TSOs must provide data on the expenses incurred by the TSOs for procuring reserves and activating balancing energy in accordance with Article 17(1)(i) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform no

later than three months after the operational month. If the data are preliminary, the figures must be updated after the final settlement.

The subcategory "Costs network security measures" on the SMARD website comprises costs incurred for redispatching, the grid reserve, feed-in management and interruptible loads. The TSOs must provide data for their control areas on the costs incurred in accordance with Article 13(1)(c) in conjunction with Article 13(1)(a) of Commission Regulation (EU) No 543/2013. The data referred to in Article 13(1)(a) must be transmitted to the ENTSO-E Transparency Platform as soon as possible but no later than one hour after the operating period. The data referred to in Article 13(1)(c) must be published before the last working day of the following month. The data published can be updated later.

The TSOs must provide data for their control areas on the costs incurred for countertrading in accordance with Article 13(1)(c) in conjunction with Article 13(1)(b) of Commission Regulation (EU) No 543/2013. The data referred to in Article 13(1)(b) must be transmitted to the ENTSO-E Transparency Platform as soon as possible but no later than one hour after the operating period. The data referred to in Article 13(1)(c) must be published before the last working day of the following month. The data published can be updated later.

The TSOs are the primary owners of the data.

Data definition and calculation

The total monthly costs for maintaining system stability and security are broken down on the SMARD website into the subcategories balancing energy, network security measures and countertrading and displayed as separate bars.

Financial income for balancing energy

The financial income for balancing energy is the net income to the TSOs after settling the imbalance accounts with balance responsible parties.

Financial expenses for balancing energy

The financial expenses for balancing energy are the net expenses incurred to the TSOs for procuring reserves and activating balancing energy.

The difference between the income and expenses for balancing energy is made up of the costs for reserving the balancing capacity as well as additional revenue and shortfalls resulting from the reBAP incentive components (balancing energy prices AEP2 to AEP4). This difference is passed on through the network charges.

The subcategory "Costs network security measures" comprises the aggregate costs for:

- redispatching
- activating (not procuring) the grid reserve
- feed-in management
- interruptible loads.

The costs for countertrading are a separate subcategory.

All the data are published in euros [€] per month.

Regions

The total costs can be displayed for the following regions:

- Country: Germany
- Country: Austria
- Control area (DE): 50Hertz
- Control area (DE): Amprion
- Control area (DE): TenneT
- Control area (DE): TransnetBW
- Control area (AT): APG

Visualisation

The total costs are displayed in a bar chart with a separate bar for each subcategory. The y-axis represents the currency [€] and the x-axis the time, with each data point representing the costs (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.3 Frequency containment reserve (FCR)

4.3.1 Volume of procured balancing services

Legal reporting obligations and data providers

The TSOs must provide data on the accepted aggregated offers (SMARD: "volume of procured balancing services") in accordance with Article 17(1)(d) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform as soon as possible but no later than one hour after the operating period.

The TSOs are the primary owners of the data.

Data definition and calculation

The volume of procured balancing services corresponds to the accepted aggregated offers per procurement period.

The volume is published in megawatts [MW] per quarter hour.

Regions

The volume of procured balancing services can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Country: Germany
- Country: Austria
- Control area (AT): APG

Visualisation

The volume of procured balancing services is displayed in a step chart. The y-axis represents the capacity [MW] and the x-axis the time, with each data point representing the volume procured (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.3.2 Price of procured balancing services

Legal reporting obligations and data providers

The TSOs must provide data for their control areas on the prices paid by the TSO per type of procured balancing reserve and per procurement period (SMARD: "price of procured balancing services") in accordance with Article 17(1)(c) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform as soon as possible but no later than one hour after the procurement process ends. If the data transmitted and published are estimates, they must be updated later.

The TSOs are the primary owners of the data.

Data definition and calculation

The price of procured balancing services corresponds on the ENTSO-E Transparency Platform to the price paid by the TSOs per balancing time unit (quarter hour). The price of procured balancing services is calculated by dividing the capacity prices per procurement period by the number of quarter hours in the relevant procurement period.

The price is published in euros per megawatt [€/MW] per quarter hour.

Important:

The reference period for a price differs depending on the region and period of time selected:

- For Germany, the prices paid by the TSOs in accordance with Article 17(1)(c) of Commission Regulation (EU) No 543/2013 and published up to 2 November 2020 are the prices per procurement period. The prices published as from 3 November 2020 are the prices per balancing time unit (quarter hour). The figures displayed in the charts under [Market data visuals](#) are therefore only comparable if a resolution of a quarter hour is selected. If a different resolution is selected (for example hour or day), the figures displayed for the period up to 2 November 2020 are averages and the figures displayed for the period from 3 November 2020 are sum totals. If a weekly, monthly or yearly resolution is selected that covers both of these dates (for example November 2020), the figures displayed are sum totals.
- For Austria/APG, all the published prices paid by the TSOs are the prices per balancing time unit.

Regions

The price of procured balancing services can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)

- Country: Germany (reference period up to 2 November 2020: procurement period; reference period from 3 November 2020: balancing time unit)
- Country: Austria (reference period: balancing time unit)
- Control area (AT): APG (reference period: balancing time unit)

Visualisation

The price of procured balancing services is displayed in a step chart. The y-axis represents the price [€/MW] and the x-axis the time, with each data point representing the price (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.4 Automatic frequency restoration reserve (aFRR)

4.4.1 Volume of activated balancing services

Legal reporting obligations and data providers

The TSOs must provide data on the amount of activated balancing energy (SMARD: "volume of activated balancing services") per balancing time unit in accordance with Article 17(1)(e) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform as soon as possible but no later than 30 minutes after the operating period. The data published can be updated later.

The TSOs are the primary owners of the data.

Data definition and calculation

The volume of activated balancing services (+/-) is published in megawatt hours [MWh] per quarter hour.

Regions

The volume of activated balancing services (+/-) can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Country: Germany
- Country: Austria
- Control area (AT): APG

Visualisation

The volume of activated balancing services (+/-) is displayed in a step chart. The y-axis represents the energy [MWh] and the x-axis the time, with each data point representing the volume of electricity (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.4.2 Price of activated balancing services

Legal reporting obligations and data providers

The TSOs must provide data for their control areas on the prices paid by the TSO for activated balancing energy (SMARD: "price of activated balancing services") per balancing time unit and per type of reserve in accordance with Article 17(1)(f) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform as soon as possible but no later than one hour after the operating period. The data published can be updated later.

The TSOs are the primary owners of the data.

Data definition and calculation

The price of activated balancing services (+/-) corresponds to the average price paid by the TSOs for the activated balancing energy.

The price is published in euros per megawatt hour [€/MWh] per quarter hour.

Important:

The following applies to the algebraic signs for the prices for negative balancing services: If the TSO pays the balancing service provider for the system service used, the price published on the ENTSO-E Transparency Platform is preceded by a minus sign, and vice versa.

Table 4: Algebraic signs for prices of activated balancing services published by ENTSO-E

	Positive price	Negative price
Positive balancing services	Payment by the TSO to the balancing service provider	Payment by the balancing service provider to the TSO
Negative balancing services	Payment by the balancing service provider to the TSO	Payment by the TSO to the balancing service provider

To make the payments displayed for positive and negative balancing services comparable, the prices for negative balancing services displayed on the SMARD website are the prices published on the ENTSO-E Transparency Platform multiplied by -1. This means that a minus sign in front of a price for positive or negative balancing services on the SMARD website indicates payment by the balancing service provider to the TSO.

Regions

The price of activated balancing services (+/-) can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Country: Germany
- Country: Austria
- Control area (AT): APG

Visualisation

The price of activated balancing services (+/-) is displayed in a step chart. The y-axis represents the price [€/MWh] and the x-axis the time, with each data point representing the price (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.4.3 Volume of procured balancing services

Legal reporting obligations and data providers

The TSOs must provide data on the accepted aggregated offers (SMARD: "volume of procured balancing services") in accordance with Article 17(1)(d) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform as soon as possible but no later than one hour after the operating period.

The TSOs are the primary owners of the data.

Data definition and calculation

The volume of procured balancing services (+/-) corresponds to the accepted aggregated offers per procurement period.

The volume is published in megawatts [MW] per quarter hour.

Regions

The volume of procured balancing services (+/-) can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Country: Germany
- Country: Austria
- Control area (AT): APG

Visualisation

The volume of procured balancing services (+/-) is displayed in a step chart. The y-axis represents the capacity [MW] and the x-axis the time, with each data point representing the volume procured (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.4.4 Price of procured balancing services

Legal reporting obligations and data providers

The TSOs must provide data for their control areas on the prices paid by the TSO per type of procured balancing reserve and per procurement period (SMARD: "price of procured balancing services") in accordance with Article 17(1)(c) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform as soon as possible but no later than one hour after the procurement process ends. If the data transmitted and published are estimates, they must be updated later.

The TSOs are the primary owners of the data.

Data definition and calculation

The price of procured balancing services (+/-) corresponds on the ENTSO-E Transparency Platform to the price paid by the TSOs per balancing time unit (quarter hour). The price of procured balancing services is calculated by dividing the capacity prices per procurement period by the number of quarter hours in the relevant procurement period.

The price is published in euros per megawatt [€/MW] per quarter hour.

Important:

The reference period for a price differs depending on the region and period of time selected:

- For Germany, the prices paid by the TSOs per type of balancing reserve in accordance with Article 17(1)(c) of Commission Regulation (EU) No 543/2013 and published up to 11 July 2018 are the prices per procurement period. The prices published as from 12 July 2018 are the prices per balancing time unit (quarter hour). The figures displayed in the charts under [Market data visuals](#) are therefore only comparable if a resolution of a quarter hour is selected. If a different resolution is selected (for example hour or day), the figures displayed for the period up to 11 July 2018 are averages and the figures displayed for the period from 12 July 2018 are sum totals. If a weekly, monthly or yearly resolution is selected that covers both of these dates (for example July 2018), the figures displayed are sum totals.
- For Austria/APG, all the published prices paid by the TSOs per type of balancing reserve are the prices per balancing time unit.

Regions

The price of procured balancing services (+/-) can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018) (reference period up to 11 July 2018: procurement period; reference period from 12 July 2018: balancing time unit)
- Country: Germany (reference period up to 11 July 2018: procurement period; reference period from 12 July 2018: balancing time unit)
- Country: Austria (reference period: balancing time unit)
- Control area (AT): APG (reference period: balancing time unit)

Visualisation

The price of procured balancing services (+/-) is displayed in a step chart. The y-axis represents the price [€/MW] and the x-axis the time, with each data point representing the price (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.5 Manual frequency restoration reserve (mFRR)

4.5.1 Volume of activated balancing services

Legal reporting obligations and data providers

The TSOs must provide data on the amount of activated balancing energy (SMARD: "volume of activated balancing services") per balancing time unit in accordance with Article 17(1)(e) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform as soon as possible but no later than 30 minutes after the operating period. The data published can be updated later.

The TSOs are the primary owners of the data.

Data definition and calculation

The volume of activated balancing services (+/-) is published in megawatt hours [MWh] per quarter hour.

Regions

The volume of activated balancing services (+/-) can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Country: Germany
- Country: Austria
- Control area (AT): APG

Visualisation

The volume of activated balancing services (+/-) is displayed in a step chart. The y-axis represents the energy [MWh] and the x-axis the time, with each data point representing the volume of electricity (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.5.2 Price of activated balancing services

Legal reporting obligations and data providers

The TSOs must provide data for their control areas on the prices paid by the TSO for activated balancing energy (SMARD: "price of activated balancing services") per balancing time unit and per type of reserve in accordance with Article 17(1)(f) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform as soon as possible but no later than one hour after the operating period. The data published can be updated later.

The TSOs are the primary owners of the data.

Data definition and calculation

The price of activated balancing services (+/-) corresponds to the price paid by the TSOs for the activated balancing energy.

The price is published in euros per megawatt hour [€/MWh] per quarter hour.

Important:

The following applies to the algebraic signs for the prices for negative balancing services: If the TSO pays the balancing service provider for the system service used, the price published on the ENTSO-E Transparency Platform is preceded by a minus sign, and vice versa.

Table 5: Algebraic signs for prices or activated balancing services published by ENTSO-E

	Positive price	Negative price
Positive balancing services	Payment by the TSO to the balancing service provider	Payment by the balancing service provider to the TSO
Negative balancing services	Payment by the balancing service provider to the TSO	Payment by the TSO to the balancing service provider

To make the payments displayed for positive and negative balancing services comparable, the energy prices for negative balancing services displayed on the SMARD website are the prices published on the ENTSO-E Transparency Platform multiplied by -1. This means that a minus sign in front of a price for positive or negative balancing services on the SMARD website indicates payment by the balancing service provider to the TSO.

Regions

The price of activated balancing services (+/-) can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Country: Germany
- Country: Austria
- Control area (AT): APG

Visualisation

The price of activated balancing services (+/-) is displayed in a step chart. The y-axis represents the price [€/MWh] and the x-axis the time, with each data point representing the price (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.5.3 Volume of procured balancing services

Legal reporting obligations and data providers

The TSOs must provide data on the accepted aggregated offers (SMARD: "volume of procured balancing services") in accordance with Article 17(1)(d) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform as soon as possible but no later than one hour after the operating period.

The TSOs are the primary owners of the data.

Data definition and calculation

The volume of procured balancing services (+/-) corresponds to the accepted aggregated offers per procurement period.

The volume is published in megawatts [MW] per quarter hour.

Regions

The volume of procured balancing services (+/-) can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018)
- Country: Germany
- Country: Austria
- Control area (AT): APG

Visualisation

The volume of procured balancing services (+/-) is displayed in a step chart. The y-axis represents the capacity [MW] and the x-axis the time, with each data point representing the volume procured (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.5.4 Price of procured balancing services

Legal reporting obligations and data providers

The TSOs must provide data for their control areas on the prices paid by the TSO per type of procured balancing reserve and per procurement period (SMARD: "price of procured balancing services") in accordance with Article 17(1)(c) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform as soon as possible but no later than one hour after the procurement process ends. If the data transmitted and published are estimates, they must be updated later.

The TSOs are the primary owners of the data.

Data definition and calculation

The price of procured balancing services (+/-) corresponds on the ENTSO-E Transparency Platform to the price paid by the TSOs per balancing time unit (quarter hour). The price of procured balancing services is calculated by dividing the capacity prices per procurement period by the number of quarter hours in the relevant procurement period.

The price is published in euros per megawatt [€/MW] per quarter hour.

Important:

The reference period for a price differs depending on the region and period of time selected:

- For Germany, the prices paid by the TSOs per type of balancing reserve in accordance with Article 17(1)(c) of Commission Regulation (EU) No 543/2013 and published up to 11 July 2018 are the prices per procurement period. The prices published as from 12 July 2018 are the prices per balancing time unit (quarter hour). The figures displayed in the charts under [Market data visuals](#) are therefore only comparable if a resolution of a quarter hour is selected. If a different resolution is selected (for example hour or day), the figures displayed for the period up to 11 July 2018 are averages and the figures displayed for the period from 12 July 2018 are sum totals. If a weekly, monthly or yearly resolution is selected that covers both of these dates (for example July 2018), the figures displayed are sum totals.
- For Austria/APG, all the published prices paid by the TSOs per type of balancing reserve are the prices per balancing time unit.

Regions

The price of procured balancing services (+/-) can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018) (reference period up to 11 July 2018: procurement period; reference period from 12 July 2018: balancing time unit)
- Country: Germany (reference period up to 11/07/2018: procurement period; reference period from 12/07/2018: balancing time unit)
- Country: Austria (reference period: balancing time unit)
- Control area (AT): APG (reference period: balancing time unit)

Visualisation

The volume of procured balancing services (+/-) is displayed in a step chart. The y-axis represents the price [€/MW] and the x-axis the time, with each data point representing the price (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.6 Exported balancing services

Legal reporting obligations and data providers

The TSOs must provide information for their control areas regarding cross-control area balancing per balancing time unit, specifying the volume of balancing energy activated in the control areas concerned, in accordance with Article 17(1)(j) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform no later than one hour after the operational period.

The TSOs are the primary owners of the data.

Data definition and calculation

The exported balancing services volume is published on the ENTSO-E Transparency Platform in megawatts [MW] per quarter hour. It corresponds to the volume of balancing energy activated in the control areas concerned.

The exported balancing services volume is converted into megawatts per hour [MWh] for the SMARD website by dividing the figures published on the ENTSO-E Transparency Platform by four.

Regions

The exported balancing services volume can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018) (exported balancing services to Austria)
- Country: Germany (exported balancing services to Austria)
- Country: Austria (exported balancing services to Germany)
- Control area (AT): APG (exported balancing services to Germany)

Visualisation

The exported balancing services volume is displayed in a step chart. The y-axis represents the energy [MWh] and the x-axis the time, with each data point representing the scaled volume of electricity in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

4.7 Imported balancing services

Legal reporting obligations and data providers

The TSOs must provide information for their control areas regarding cross-control area balancing per balancing time unit, specifying the volume of balancing energy activated in the control areas concerned, in accordance with Article 17(1)(j) of Commission Regulation (EU) No 543/2013. The data must be transmitted to the ENTSO-E Transparency Platform no later than one hour after the operational period.

The TSOs are the primary owners of the data.

Data definition and calculation

The imported balancing services volume is published on the ENTSO-E Transparency Platform in megawatts [MW] per quarter hour. It corresponds to the volume of balancing energy activated in the control areas concerned.

The imported balancing services volume is converted into megawatts per hour [MWh] for the SMARD website by dividing the figures published on the ENTSO-E Transparency Platform by four.

Regions

The imported balancing services volume can be displayed for the following regions:

- Bidding zone: Germany/Luxembourg (as from 1 October 2018) (imported balancing services from Austria)
- Country: Germany (imported balancing services from Austria)
- Country: Austria (imported balancing services from Germany)

- Control area (AT): APG (imported balancing services from Germany)

Visualisation

The imported balancing services volume is displayed in a step chart. The y-axis represents the energy [MWh] and the x-axis the time, with each data point representing the volume of electricity (scaled where necessary) in a period of time. More information on how to modify and interpret the charts is in **C 2.1 Viewing charts**.

References

- Commission Regulation (EU) No 543/2013 of 14 June 2013 on submission and publication of data in electricity markets; [link](#)
- ENTSO-E Manual of Procedures, Revision V3.2; [link](#)

Annex

1. Coverage of actual generation

Coverage of installed generation capacity per energy source by measured data, scheduled data, extrapolated data and forecasts within the data category "Actual generation" for each German control area (as at September 2020)

Table 6: Overview of the level of coverage for actual generation

Energy source	50Hertz	Amprion	TenneT	TransnetBW
Biomass	Measured data	Forecast	Forecast	Forecast
Coverage	Full	Full	Full	Full
Hydropower	Forecast	Forecast Scheduled data	Measured data Extrapolated data	Measured data Extrapolated data
Coverage	Full	Full	Full	Full
Offshore wind	Measured data	-	Measured data	-
Coverage	Full	-	Full	-
Onshore wind	Measured data	Measured data Extrapolated	Measured data Extrapolated data	Measured data Extrapolated
Coverage	Full	Full	Full	Full
Photovoltaics	Measured data	Measured data Extrapolated	Measured data Extrapolated data	Measured data Extrapolated data
Coverage	Full	Full	Full	Full
Other renewable energy sources	Measured data	Forecast	Forecast	Forecast
Coverage	Partial	Full	Full	Full
Nuclear	-	Measured data	Measured data	Measured data
Coverage	-	Full	Full	Full
Fossil brown coal	Measured data	Measured data	Measured data	-
Coverage	Partial	Full	Full	-
Fossil hard coal	Measured data	Measured data	Measured data	Measured data
Coverage	Partial	Full	Partial	Full
Fossil gas	Measured data	Measured data	Measured data	Measured data
Coverage	Partial	Full	Partial	Full
Hydro pumped storage	Measured data	Measured data	Measured data Extrapolated	Measured data
Coverage	Full	Full	Full	Full
Other conventional energy sources	Extrapolated data	Scheduled data	Scheduled data	Extrapolated data
Coverage	Full	Partial	Partial	Full

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