

2023

Telecoms Annual Report



Bundesnetzagentur



Foreword

Dear Reader,

In the foreword to last year's annual report I predicted that 2023 would be just as eventful as 2022. I admit it wasn't exactly a bold prediction. These are turbulent times. Conflicts and crises are becoming more frequent, not less frequent. There are a lot of people who are concerned about what the future might hold. It's no good being naively optimistic, but I'm convinced that good news can change people's view of the world. So let me start.

The EU has developed an instrument to tackle illegal content on the internet. Incitements to violence, disinformation, copyright infringements, dubious business practices – all this can now be detected and sanctioned thanks to the Digital Services Act, which came into force in November 2022. The Act creates the first harmonised, comprehensive framework of rules for almost all digital services. From now on if something is illegal offline, it is illegal online.

Germany's Bundestag has adopted the German Digital Services Act (DDG) transposing the EU Act and, among other things, designating the national competent authorities. The government's draft of 20 December 2023 gives the Bundesnetzagentur the role of Digital Services Coordinator (DSC). The DSC is responsible for coordinating national and cross-border cooperation with competent authorities and other DSCs and acts as Germany's point of contact for the European Commission.

We have already set up a task force at the Bundesnetzagentur to enable us to take on this new key task with our full expertise and drive.

And here's some more good news: fast internet for everyone is on its way. In 2023 the number of homes passed by fibre went up by as much as 37%. Today nearly 18 million people across the country have access to this state-of-the-art technology. Mobile data volumes are continuing to rise steeply. Last year's volume of more than nine million gigabytes was 36% higher than the year before. I know they always say that people don't like reading too many numbers – but in this case I'm more than happy to break the rule as the numbers reflect the progress we urgently need for our country's digital transformation.

So, if you're looking for good news, read our annual report.



Klaus Müller,
President of the Bundesnetzagentur



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Market trends



The number of homes passed by fibre increased in 2023 by 37% against the previous year to reach 17.9mn. The number of active fibre connections also increased to 4.3mn, well above the year before.

Mobile data volumes are continuing to increase steeply, reaching 9,118mn GB of data in 2023, up 36% against 2022.

Telecommunications markets as a whole

External revenue

According to the Bundesnetzagentur's preliminary calculations, external revenue in the German telecommunications market increased to €59.9bn in 2023, corresponding to a year-on-year increase of 1.2% (2022: €59.2bn). This continues the upward trend seen throughout the previous two years.

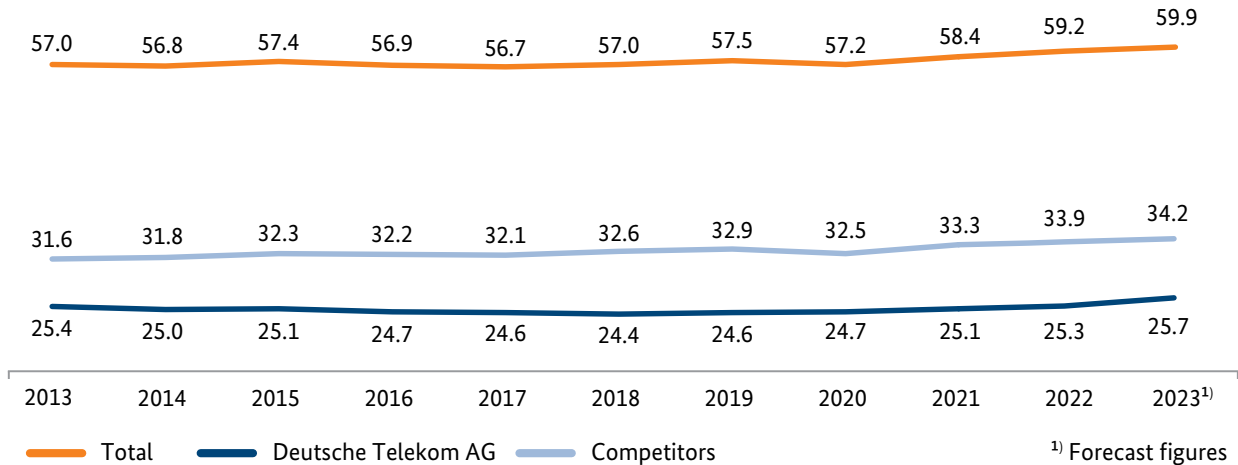
Both Deutsche Telekom AG and its competitors saw their external revenue rise in 2023, with a projected increase to €25.7bn (+1.6%) for Deutsche Telekom AG and an increase to €34.2bn (+0.9%) for competitors. On the basis of these

figures, the competitors' share of total external revenue in the telecommunications market was 57% in 2023 and Deutsche Telekom AG's was 43%, proportions that were the same as in the previous years.

A breakdown by market segment shows that the largest share is attributable to the fixed network. Accounting for a projected 53% (€31.70bn), the market share of this segment in 2023 was more than that of mobile services at 46% (€27.64bn).

There are two categories of fixed network: xDSL/FTTx networks and HFC networks. By far the largest proportion of external revenue from the fixed network, 81% (€25.71bn), was for xDSL/FTTx networks, whilst the share for HFC networks was 19% (€5.99bn).

External revenue in the telecommunications market (€bn)



External revenue by sector

	2021		2022		2023 ¹⁾	
	€bn	%	€bn	%	€bn	%
External revenue on the telecommunications market	58.4	100	59.2	100	59.9	100
External revenue in fixed networks	30.96	53	30.87	52	31.70	53
External revenue in mobile networks	26.50	45	27.53	47	27.64	46
Other external revenue	0.90	2	0.78	1	0.58	1

¹⁾ Forecast figures

xDSL/FTTx networks

In the xDSL/FTTx networks segment, external revenue amounted to €25.71bn in 2023, according to currently available data. This corresponds to a 3% increase against 2022 (€24.94bn).

There was little change in 2023 to the breakdown of external revenue into retail services, wholesale services and other external revenue. Revenue via retail is generated from services for private, commercial and public sector final consumers, and accounted for a projected share of 82%, same as in the previous year. Wholesale services for fixed

network and mobile operators and pure service providers outside of the Deutsche Telekom AG group took a share of 15% (2022: 16%). These services include wholesale products for voice traffic and telephony, broadband and internet, and infrastructure services. Other external revenue remained stable against the previous year at 2%.¹

HFC networks

HFC network operators registered a projected increase in revenue from €5.93bn in 2022 to €5.99bn in 2023. By far the largest proportion of this, 95%, was for revenue via retail, the same as in the previous year. The share of external revenue for wholesale gained one percentage point to reach 2%. The wholesale business is of little significance compared with the xDSL/FTTx segment. Other external revenue remained stable against 2022 at 4%.²

Mobile networks

External revenue from mobile networks reached a projected €27.64bn in 2023, a slight gain on the previous year (2022: €27.53bn). This can be broken down into 69% via retail (excluding terminal equipment), 8% via wholesale, 20% via terminal equipment and 3% via other. The shares in 2022 were 67%, 9%, 21% and 3% respectively.

The distribution of external revenue from mobile services varies considerably between network operators and service providers/mobile virtual network operators (MVNOs). As in the previous two years, the Bundesnetzagentur expects the lion's share of total revenue (82%) for mobile services in 2023 to be attributable to network operators. Service providers/MVNOs are projected to take a market share of 18%.³

External revenue from mobile services

	2021		2022		2023 ¹⁾	
	€bn	%	€bn	%	€bn	%
Total	26.50	100	27.53	100	27.64	100
Network operators	21.64	82	22.55	82	22.75	82
Service providers/MVNOs	4.86	18	4.98	18	4.89	18

1) Forecast figures

1 Deviation in the total amount is due to rounding.

2 Deviation in the total amount is due to rounding.

3 1&1 Mobilfunk GmbH has operated its own public mobile network since 8 December 2023 but also remains active as an MVNO. Its external revenue is still included in full under service providers/MVNOs for 2023.

Investments in fixed assets

Investments in fixed assets in the telecommunications market reached €13.2bn in 2023, according to currently available data, as companies continue driving the rollout of optical fibre and 5G networks.⁴

Competitors invested a projected €7.6bn in 2023 compared with €8.5bn in 2022. Deutsche Telekom AG's investments increased from €4.9bn in 2022 to around €5.6bn in 2023.⁵

The companies were mostly investing in new broadband network infrastructure. This includes investments to expand coverage and/or upgrade connection performance. These investments accounted for about 88% of total investments in 2023. Approximately 7% went towards the maintenance of existing broadband network infrastructure and around 5% was used for other purposes, such as investments in subscriber terminal equipment, the expansion of data centres and investments in customer support.⁶

From the time the market was opened up in 1998 through to the end of 2023, companies invested a total of almost €213bn in fixed assets in the telecommunications market. Of this amount, 54% (€114.9bn) is attributable to competitors and 46% (€97.9bn) to Deutsche Telekom AG.⁷

Employees

132,400 people were employed in Germany by companies in the telecommunications market at the end of 2023, which is 133,000 fewer (0.5%) than in 2022. Deutsche Telekom AG reduced its headcount by 2,900 to 78,600, whilst the number of people employed by competitors rose by 2,300 to 53,800 at the end of 2023.

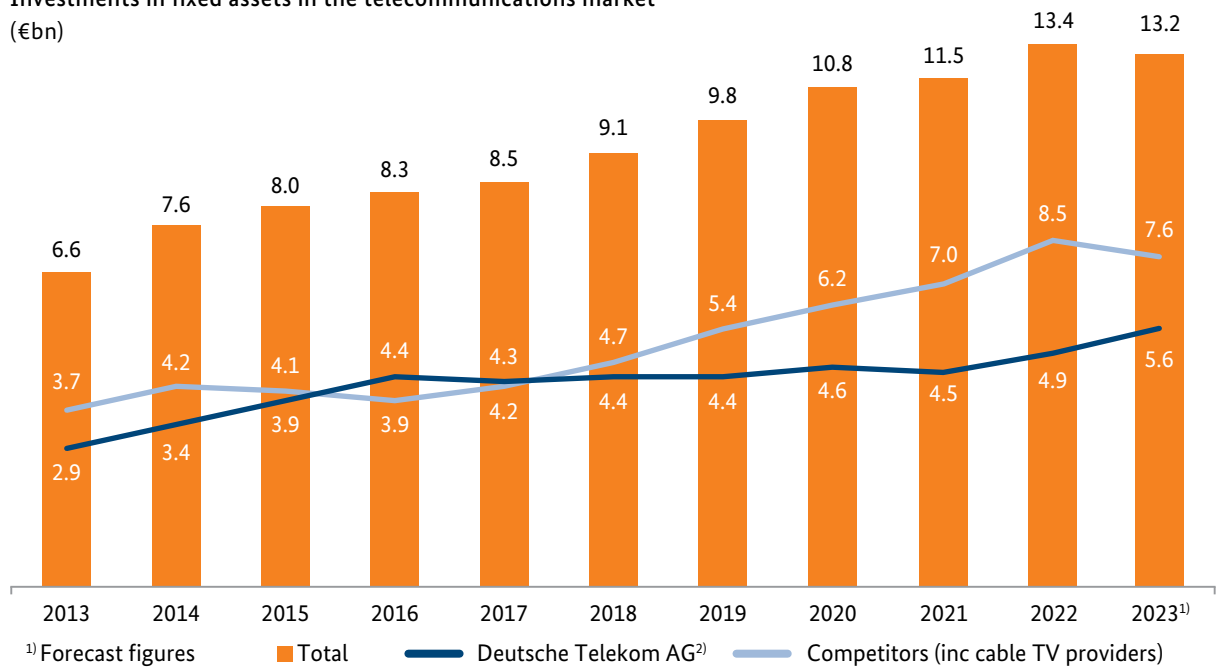
⁴ Investments include additions to fixed assets. Additions to usage rights recognised by lessees as part of sale and leaseback transactions under IFRS (International Financial Reporting Standard) 16 are not included.

⁵ Investments by the joint ventures Glasfaser NordWest GmbH & Co. KG and GlasfaserPlus GmbH were included under Deutsche Telekom AG at the rate of 50% and 100% respectively. Glasfaser NordWest GmbH & Co. KG is a 50:50 joint venture founded by Telekom Deutschland GmbH and EWE AG in 2020. GlasfaserPlus GmbH is a company founded by Telekom Deutschland GmbH in 2020. In 2021, Telekom Deutschland GmbH partnered up with the IFM Global Infrastructure Fund advised by Australian infrastructure investor, IFM Investors. Glasfaser NordWest GmbH & Co. KG and GlasfaserPlus GmbH operate as wholesale-only enterprises, meaning they are active exclusively in the wholesale market with no interaction with retail customers.

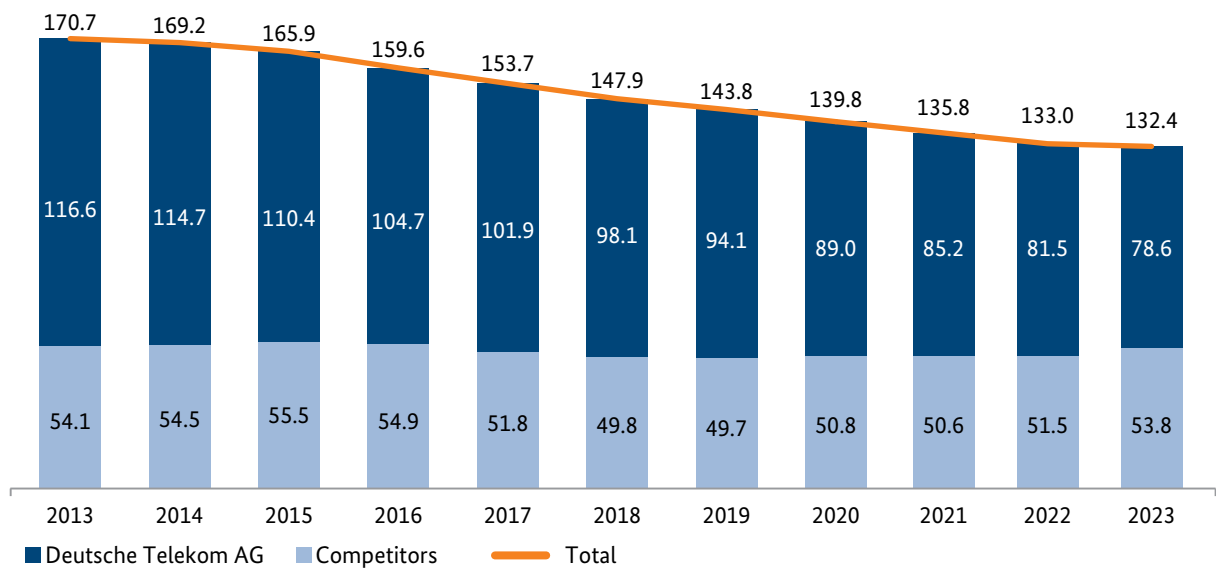
⁶ When interpreting the data, it should be noted that the assignment of investments to the categories "existing broadband network infrastructure", "new broadband network infrastructure" and "other" may have been subject to different interpretation by the companies surveyed in order to collect information for this report. In addition, not all companies were able to provide a breakdown of their data. These companies are not included in the calculation of shares.

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Investments in fixed assets in the telecommunications market (€bn)



Employees in the telecommunications market (thousands)



Fixed network

Broadband connections

The number of contract-based broadband connections increased to around 38.4mn by the end of 2023.⁸

The majority of broadband connections, about 64% or 24.5mn, continue to be based on various DSL technologies.⁹

Together, all other technologies accounted for approximately 13.9mn connections. Most of these were based on HFC networks (around 8.6mn). Approximately 4.3mn were based on fibre-to-the-home (FTTH) or fibre-to-the-building

(FTTB). Around 0.9mn connections were fixed wireless broadband comprising LTE/5G connections for fixed-location use.¹⁰ Roughly 0.1mn connections were broadband wireless access via fixed links, fixed connections or satellite connections.

As far as marketing to end-users was concerned, Deutsche Telekom AG's competitors maintained their market share of all retail broadband connections of around 61% at the end of 2023.

Transmission rates

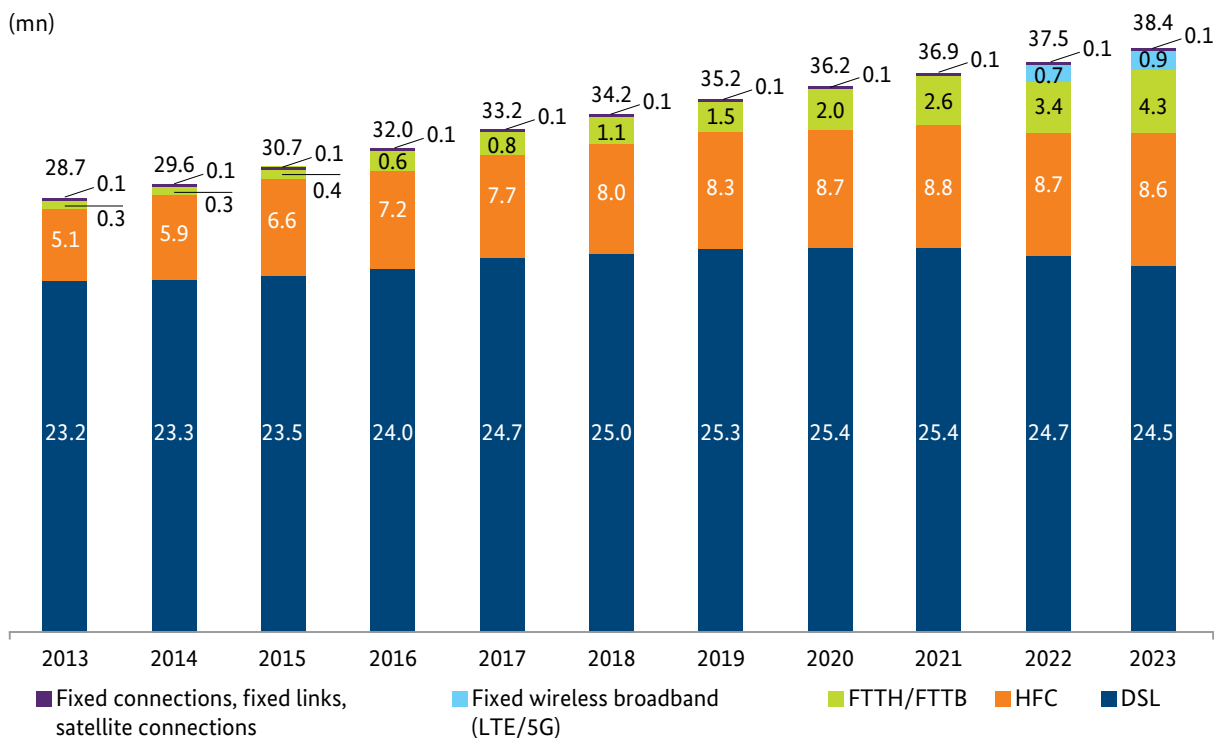
In the broadband market, demand remains strong for connections with fast nominal transmission speeds. Some 19.4mn broadband connections were available with an advertised top transmission rate of at least 100 megabits per

⁸ Broadband connections include all connections with a bandwidth of at least 144 kilobits per second (Kbps). The Bundesnetzagentur bases this threshold on the requirements defined by the European Commission in its latest broadband report (COCOM).

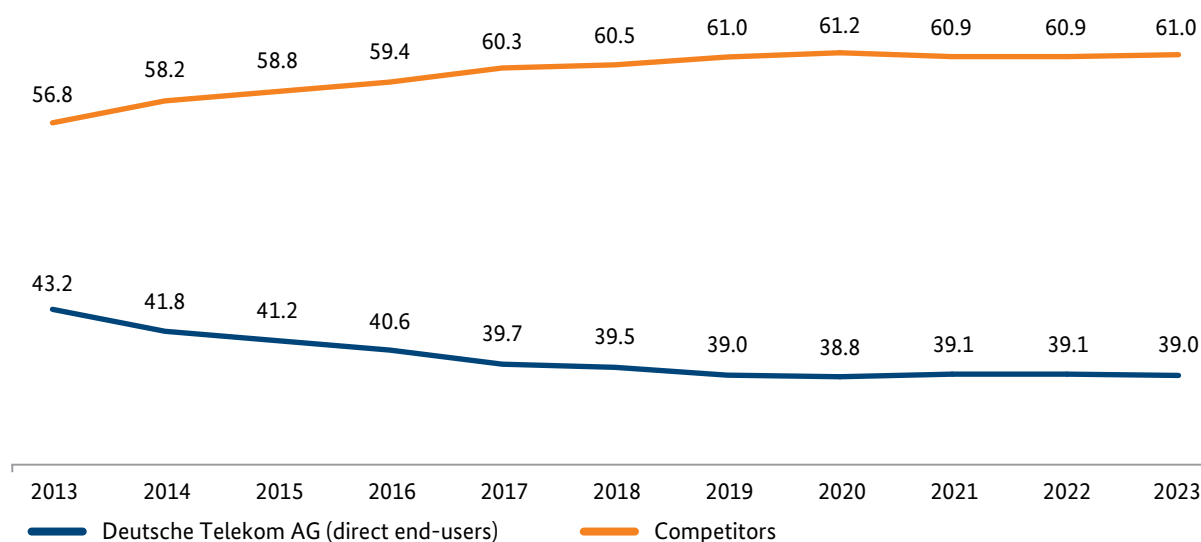
⁹ Including hybrid connections (combined use of DSL and LTE/5G).

¹⁰ Includes fixed wireless broadband since 2022. Prior to this, these connections were reported under mobile services.

Active fixed broadband connections (mn)



Share of fixed broadband
(%)



second (Mbps) at the end of 2023. This amounted to about 51%, or 38.4mn, of all broadband connections sold in fixed networks. Roughly 2.2mn connections had an advertised speed of at least 1 gigabit per second (Gbps).

Some 1.2mn connections still had a maximum nominal data rate of under 10 Mbps at the end of 2023.

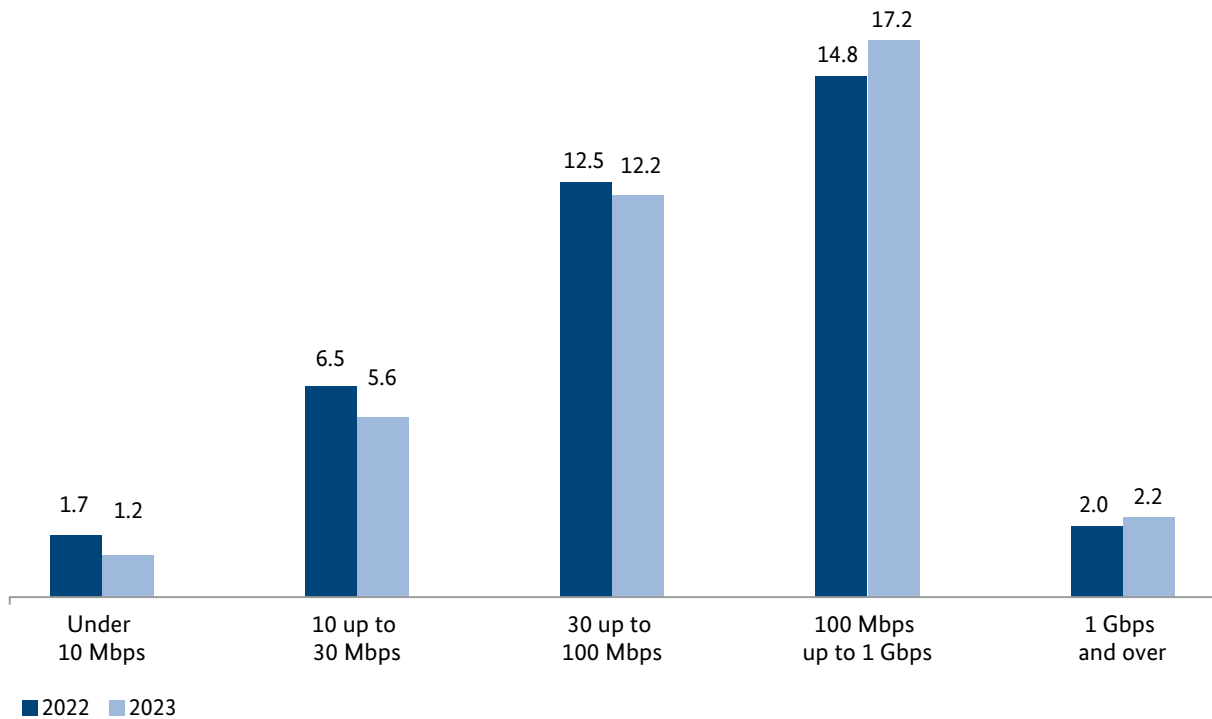
Digital subscriber line connections

At the end of 2023, some 24.5mn DSL connections were operational. Around 14.0mn of these were attributable to direct end-users of Deutsche Telekom AG and around 10.5mn to competitors, which primarily marketed DSL connections to end-users on the basis of the specific wholesale products of Deutsche Telekom AG or alternative carriers. Based on these figures, Deutsche Telekom AG's competitors had achieved a DSL market share of around 43% by the end of 2023.

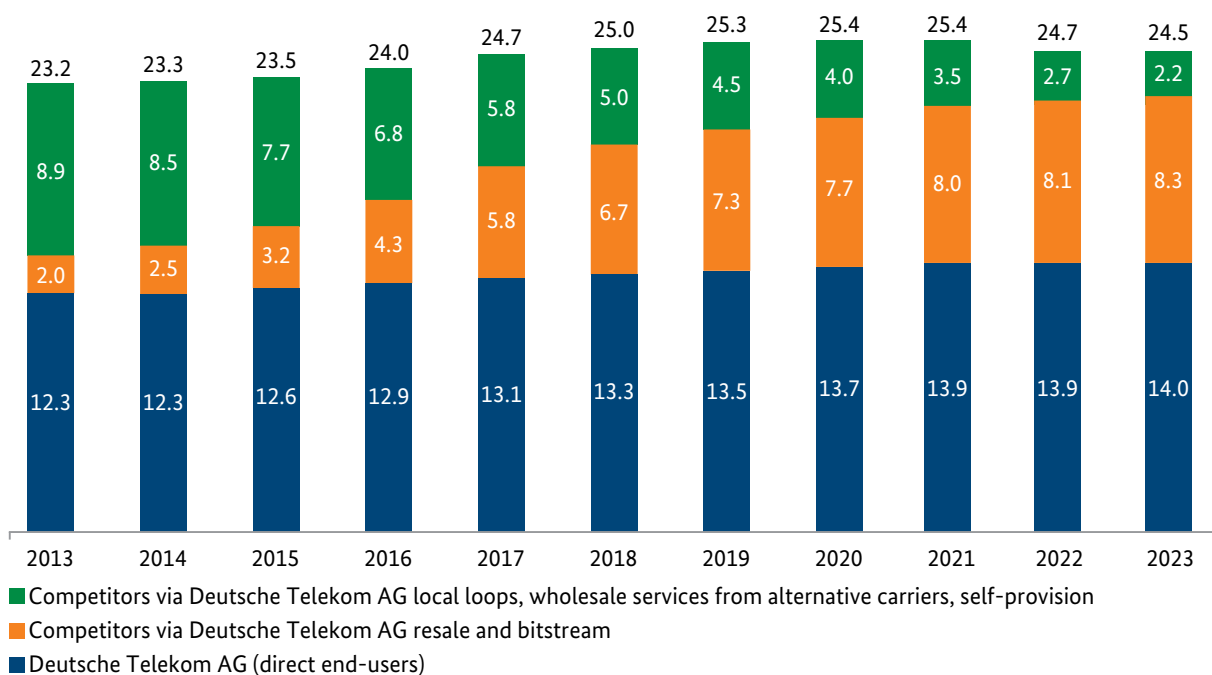
At around 20.4mn connections, very high data rate DSL (VDSL) technology accounted for approximately 83% of all DSL connections at the end of 2023. About 8.5mn VDSL connections were provided by the competitors compared to Deutsche Telekom AG's total of around 11.9mn direct VDSL customers.

Vectoring technology is the main reason for the wide spread of VDSL. It can be used to provide transmission rates of up to 250 Mbps.

Advertised maximum download speeds of active fixed broadband connections (mn)



Active DSL connections (mn)



VDSL is also of key importance at the wholesale level. Demand for specific VDSL wholesale products from Deutsche Telekom AG remains high, with bitstream wholesale products seeing particularly strong growth. Deutsche Telekom AG's layer 2 bitstream product was the main cause of this increase. It has been offered by Deutsche Telekom AG alongside its established layer 3 bitstream product since the end of 2016 and is another alternative for providing end-user access.

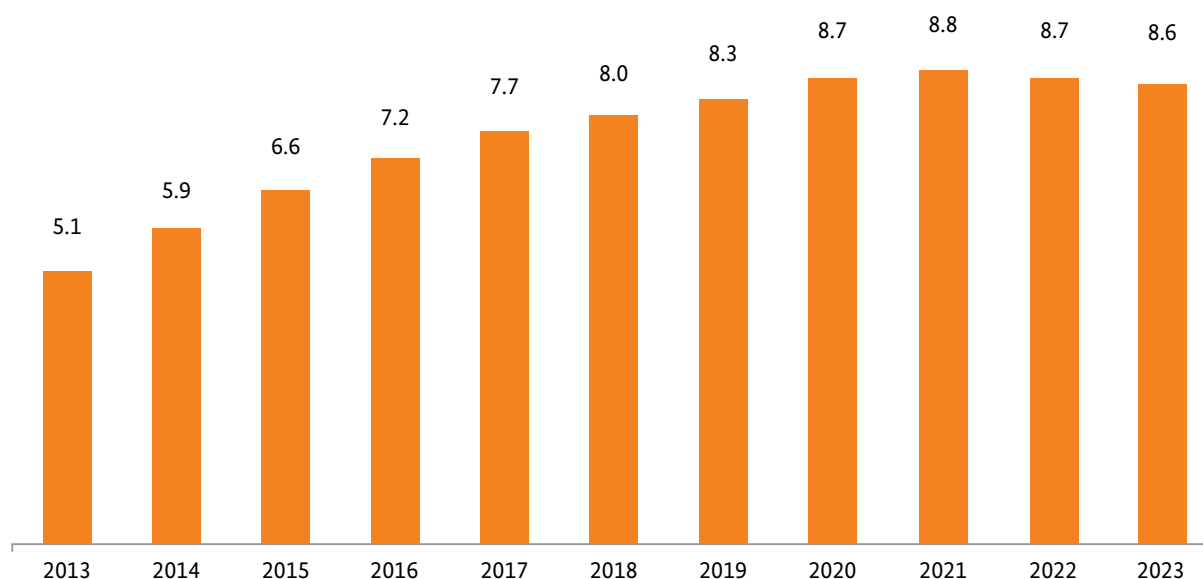
According to Deutsche Telekom AG, there were around 4.4mn connections based on layer 2 bitstream access at the end of 2023 (2022: approximately 4.0mn).

The number of competitor-operated connections based on Deutsche Telekom AG's high-bit-rate, unbundled local loops, wholesale services provided by other carriers and self-provision continued to fall due to their limited usage possibilities amidst the ongoing rollout of vectoring technology.

Broadband connections via HFC networks

These hybrid networks comprising fibre and coaxial cables now frequently offer download speeds of up to 1 Gbps. At the end of 2023, there were around 8.6mn connections via HFC infrastructure. This continues the gradual downward trend that began following a long period of steady growth up to 2021.

Active broadband connections via HFC
(mn)



Broadband connections via FTTH/FTTB

Thanks to their outstanding technical properties and almost unlimited transmission rates, optical fibres are considered to be the perfect medium for transporting data.

The number of homes passed by FTTH or FTTB for end-users grew to 17.9mn at the end of 2023, an increase of 4.8mn on the previous year. Homes passed refers to fibre infrastructure that already reaches end-users, ie an FTTH/FTTB dedicated optical fibre cable or bundle directly passes their property (at a maximum distance of 20 metres). As well as active connections, the figures for homes passed include inactive FTTH/FTTB end user connections that are available but are not yet operational under a corresponding contract, as well as end-users directly passed by FTTH/FTTB. Further investment is required to complete the connection to these end-users.

At the end of 2023, there were 7.3mn active and inactive FTTH and FTTB connections (homes connected). These connections are already complete and can be made operational at very short notice with no need for further investment in installation work.

The number of active fibre connections for private, commercial and public sector end-users increased to 4.3mn at the end of 2023, around 900,000 more than at the end of the previous year. These were split between about 3.2mn FTTH connections (74%) and about 1.1mn FTTB connections (26%). The share of FTTH connections has been greater than that of FTTB connections since 2019.

The growth in demand drove up the share of homes activated among total active broadband connections from 9.1% in 2022 to 11.2% by the end of 2023. However, the prevalence of these connections is still low, largely due to the high level of existing coverage with high speed infrastructure (VDSL vectoring and HFC networks). The FTTH/FTTB share of broadband connections is expected to grow sharply in the coming years to meet rising demand for higher speeds. The take-up rate, which is the share of homes passed with an active connection (homes activated), was about 24% at the end of 2023.

Number of end-users covered or passed by FTTH/FTTB

	2021	2022	2023
Number of end-users covered or passed by FTTH/FTTB (homes passed)	8.9mn	13.1mn	17.9mn
Active and inactive FTTH/FTTB end-user connections (homes connected)	5.5mn	6.4mn	7.3mn
Active FTTH/FTTB end-user connections (homes activated)	2.6mn	3.4mn	4.3mn
Take-up rate	29%	26%	24%

Satellite broadband connections

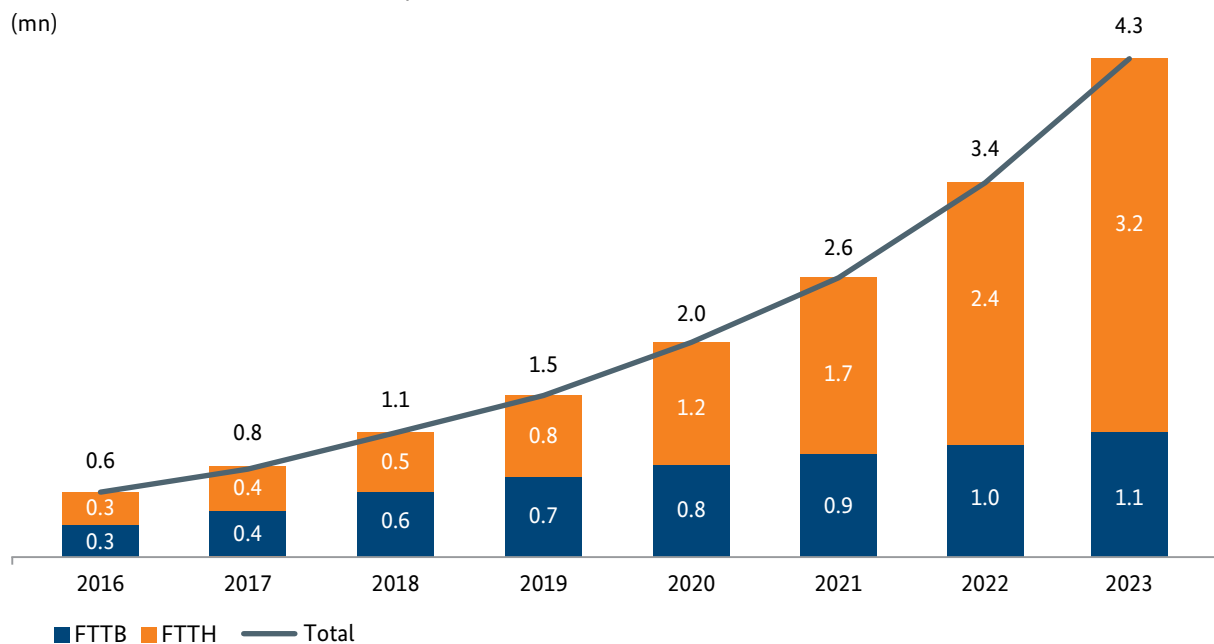
Around 30,000 customers were using satellite internet access from virtually any location at the end of 2023. Demand remained low due to the availability of more cost-effective alternative access options, often with higher maximum transmission speeds. However, satellite internet connections can help to provide full broadband coverage in regions where other technologies are not, or not sufficiently, available.

Data volume

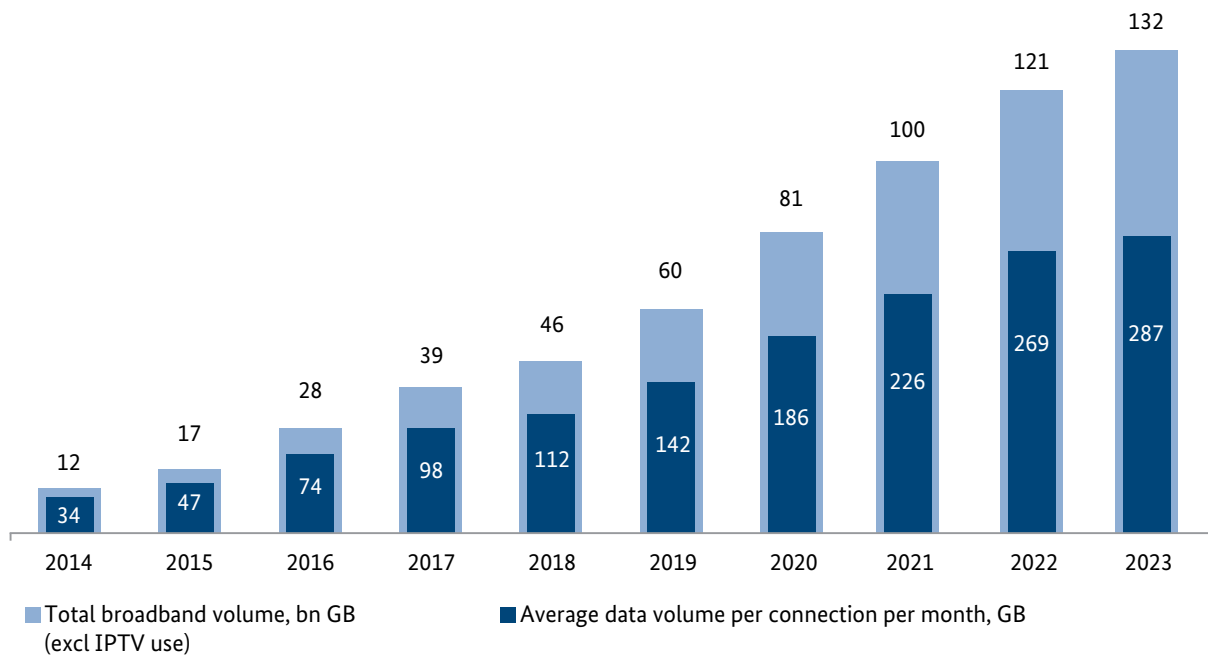
The volume of data transmitted on the basis of broadband connections in fixed networks continues to rise, with consumers using around 132bn GB in 2023.¹¹ This corresponds to an average of approximately 287 GB per connection per month.

¹¹ In contrast to streaming figures, the traffic volumes shown do not include data traffic from Deutsche Telekom AG's closed-network internet based TV (IPTV) service or data traffic via mobile networks with hybrid and fixed-location use.

Active broadband connections via FTTH/FTTB
(mn)



Data volume in fixed networks

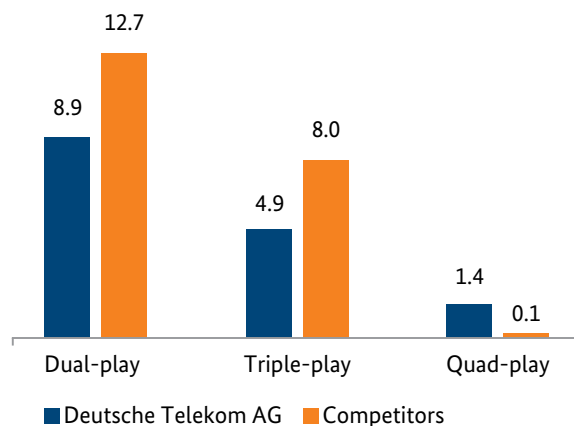


Bundled products

Bundled products that, in addition to a broadband connection, include at least one other telecommunications service (fixed-network telephony, TV or mobile services) in a single contract are offered as standard by companies in their marketing to end-users. Sometimes these services cannot be purchased separately or are more expensive individually. Bundled products without a broadband connection are less common.

Consumers who have already entered into a fixed-network and mobile contract with a provider can usually take advantage of discounts and exclusive offers by bundling the two contracts in special advantage programmes. By offering such measures, providers seek primarily to increase customer loyalty to their products.

Bundle tariffs in fixed networks in 2023 (mn)



At the end of 2023, Deutsche Telekom AG and its competitors had around 36mn contracts with bundle tariffs and advantage programmes. Bundled products with two services were still the most common of these, accounting for approximately 21.6mn customers. The majority of these dual-play bundles consist of an IP-based telephone service in addition to a broadband connection. A smaller share of customers had

triple-play bundles consisting of fixed network telephony, mobile or TV services.

Around 12.9mn customers had triple-play bundles at the end of 2023. Approximately 69% of these consisted of a broadband connection and telephone service and an additional TV service, whilst roughly 31% had a mobile component instead of the TV service.

At the same time, around 1.5mn customers were using quad-play bundles and advantage programmes consisting of four fixed-network and mobile services.

Voice communication connections

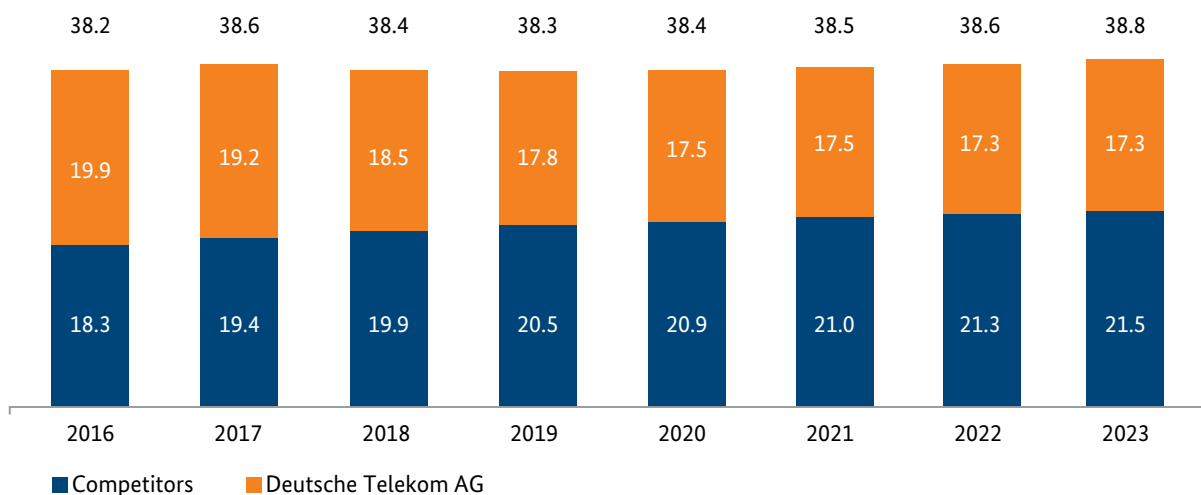
The number of voice communication connections in the fixed networks has been largely stable in recent years, rising from 38.6mn total connections in 2022 to 38.8mn (+0.5%) in 2023.

The competitors to Deutsche Telekom AG have increased their share every year. In 2023, they accounted for 21.5mn voice communication connections, compared with 21.3mn in the previous year. The number of Deutsche Telekom AG voice communication connections stayed stable against the previous year at 17.3mn in 2023. This corresponds to a share of 55% of all voice communication connections in 2023 for competitors and 45% for Deutsche Telekom AG, proportions that were the same as in the previous year.

Conventional fixed-network telephony using analogue and ISDN¹² connections has moved almost completely to Voice over Internet Protocol (VoIP). At the end of 2023, the majority of voice communication connections (38.7mn) were based on IP technology and the number of analogue/ISDN connections was below 0.1mn.

¹² Integrated Services Digital Network

Voice communication connections (mn)



Call minutes in fixed networks

The volume of call minutes from fixed networks to fixed networks within Germany, to German mobile networks and to international fixed and mobile networks declined in 2023, continuing the downward trend of the past two years.¹³ In 2020, the first year affected by the corona-virus pandemic, call minutes rose to about 104bn, and in the second year of the pandemic (2021) they fell by 11% to around 93bn. Call minutes fell again in 2022 by 14% to 80bn and by a further 20% in 2023 to 64bn, continuing the steady decline that was interrupted by the pandemic.

Approximately 33bn of the total call minutes in 2023 can be attributed to Deutsche Telekom AG, which is a drop of 15% from the 39bn minutes the year before. The call volume handled by com-

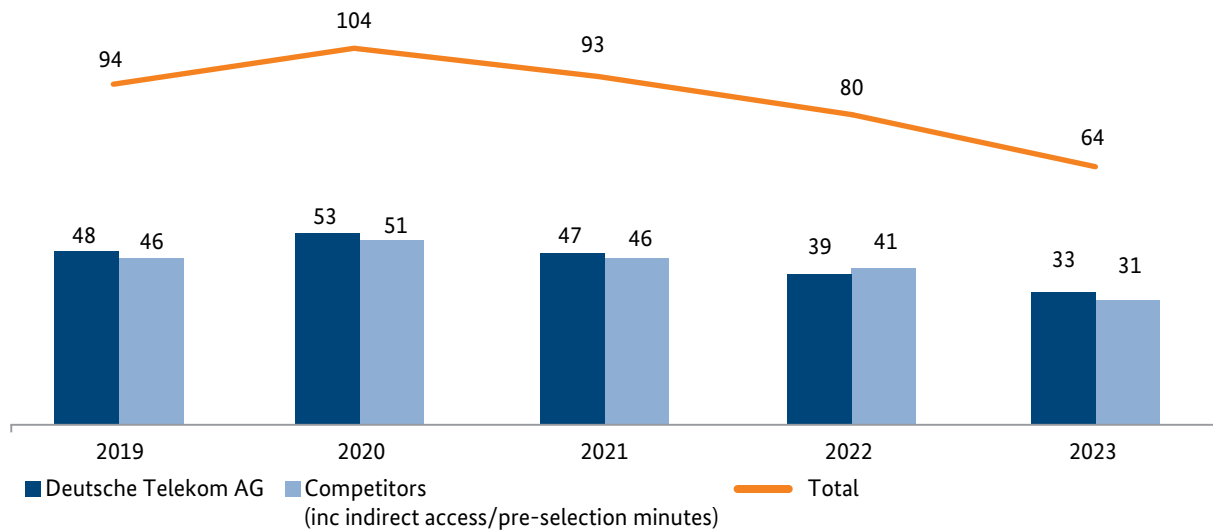
petitors decreased by 24%, from 41bn minutes in 2022 to 31bn minutes in 2023. At 48% (2022: 51%), the competitors' share was less than that of Deutsche Telekom AG at 52% (2022: 49%).

As in previous years, direct traffic accounted for the majority of competitors' call minutes, around 31bn (97%) in 2023. Indirect access and carrier pre-selection calls accounted for a total of under 1bn minutes, or almost 3%, of all calls handled by competitors in 2023 (more than 1% of total calls). A decrease in pre-selection in the Deutsche Telekom AG network means that indirect access again exceeded pre-selection call volumes in 2023.

Of the total 64bn minutes of calls made in 2023, around 54bn were within the national fixed networks. About 8bn minutes were made to the national mobile networks and around 2bn to foreign fixed and mobile networks. The competitors had a share of about 48% of these national

¹³ In general it should be noted when interpreting these call minutes that certain traffic volumes are not included in the database. These primarily include voice and video call minutes made using number-independent interpersonal communications services (NI-ICS), mainly messaging and video calling services.

Outgoing call minutes in fixed networks (bn)



fixed-network minutes, 48% in national mobile networks and 52% of the international minutes.

Mobile services

Actively used SIM profiles

Data collected by the Bundesnetzagentur suggests that there were 105.4mn active SIM profiles at the end of 2023.¹⁴ This does not include profiles for machine-to-machine (M2M) data communications. Statistically speaking, each resident has around 1.2 SIM profiles. SIM profiles are defined as active if they have been used for communication in the last three months or if an invoice has been generated for the SIM profile in this period.

¹⁴ The SIM profile is a set of parameters comprising an IMSI, an authentication key and other associated data that enables devices to authenticate against and gain access to a mobile network. Includes all profiles for all SIM technologies (e.g. physical SIM cards, eSIMs).

The shares of SIM profiles attributable to network operators and to service providers and MVNOs were the same in 2023 as in the previous year.¹⁵ The network operators, including their subsidiaries, internal service providers and sales partnerships, accounted for 77% (81.0mn) of the profiles and the service providers and MVNOs for 23% (24.5mn). With contracts, by contrast, there was once again a small change of two percentage points from prepaid to postpaid SIM profiles. At the end of 2023, 71% (75.0mn) of SIM profiles were on postpaid contracts and 29% (30.5mn) on prepaid contracts. Some 62.8mn SIM profiles were being used for M2M at the end of 2023, an increase of approximately 8% against 2022 (58.3mn).

The number of SIM profiles in active use in long term evolution (LTE) networks was 88.2mn at the end of 2023, up over 18% year-on-year. Some 19.7mn of these end-users use 5G non-standalone (5G NSA). This technology makes the connection

via a 4G/5G radio access network and transports the data over a 4G core network.

Voice communication is increasingly being made using the internet-based service Voice over LTE (VoLTE). This is IP-based and offers much better call quality, faster connections and more efficient use of bandwidth. The number of active users with a VoLTE-capable device in combination with a suitable mobile contract rose from 61.2mn at the end of 2022 to 68.8mn at the end of 2023.

¹⁵ Disclosures/data for 1&1 Mobilfunk GmbH were still included in full under service providers/MVNOs for 2023.

Use and distribution of active SIM profiles

	2021		2022		2023	
	mn	%	mn	%	mn	%
Total excluding M2M	106.4		104.4¹⁾		105.4	
Penetration (SIM profiles/inhabitant)	-	128	-	124	-	124
Business:						
Network operators (MNOs)	81.5	77	80.5	77	81.0	77
Service providers/MVNOs	24.9	23	23.9	23	24.5	23
Contract type:						
Postpaid	70.7	66	72.5	69	75.0	71
Prepaid	35.7	34	31.9	31	30.5	29
SIM profiles used for M2M	45.6	-	58.3	-	62.8	-
LTE subscribers (excluding M2M)	71.2	-	74.5	-	88.2	-
VoLTE users	56.4	-	61.2	-	68.8	-

¹⁾ The drop in active SIM profiles in 2022 is due to an adjustment to exclude inactive cards.

Actively used SIM profiles of MVNOs

The Bundesnetzagentur began assigning phone numbers for mobile services to mobile virtual network operators (MVNOs) in 2013. MVNOs do not operate their own radio network infrastructure on the basis of licensed spectrum. Eight companies on the German market use this business model.

At the end of 2023, about 530,000 end-users were using SIM profiles from number blocks originally assigned to the MVNOs. These are not included under “Use and distribution of active SIM profiles”.

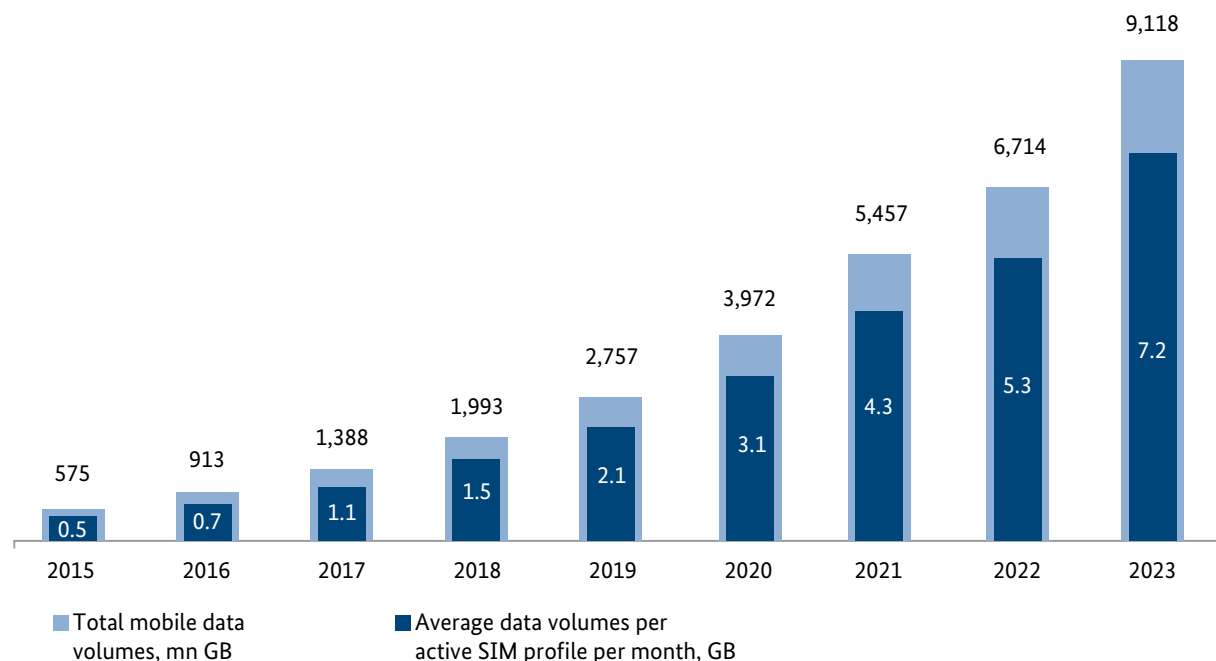
Registered SIM profiles

The total number of SIM profiles registered in Germany is significantly higher than the total number of SIM profiles in active use. One reason for this is that second and third devices or other spare SIM profiles are not in constant use.

At the end of 2023 the mobile network operators reported a total of 185.0mn registered SIM profiles.¹⁶ This is an increase of around 16mn profiles compared with 2022.

¹⁶ No standard definition applies to the total number of SIM profiles specified in the publications of network operators. Each company decides for itself how to count SIM profiles and when adjustments are required.

Mobile data volumes



Total volume and usage figures

Mobile broadband

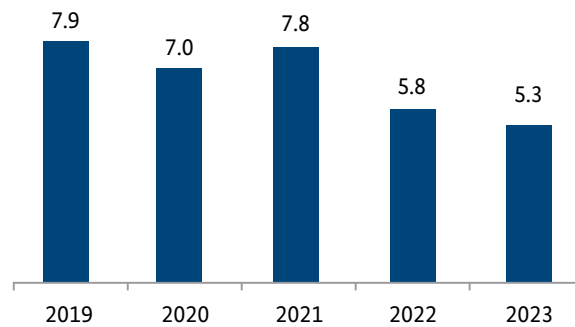
Mobile data volumes are continuing to increase steeply. Current data collected by the Bundesnetzagentur suggests that 9,118mn GB of data were transmitted in 2023, up from 6,714mn GB in 2022. This corresponds to an increase of around 36%. The vast majority (91%) of data traffic took place via LTE, whilst 6% was via 5G and 3% via GSM (2G).

The average data volume used per active SIM profile, per month, rose by about 36% year-on-year in 2023 to 7.2 GB.

SMS messages

Use of the short message service (SMS) had been in decline since it peaked in 2012 at 59.8bn, as more and more people acquired internet-capable smartphones and instant messaging services were introduced. Following a short-term rise in 2021 to 7.8bn messages, there was a further decrease in 2022, and again in 2023 to 5.3bn. Each active SIM profile sent an average of about four messages a month, down from around five the previous year.

SMS messages sent (bn)



Call minutes

153.5bn minutes of outgoing calls were made via mobile networks in Germany in 2023. In other words, about 122 minutes of calls a month were made with each active SIM profile.

Overall there was a slight year-on-year decline of almost 4% in mobile telephony in 2023. One explanation for this is the growing use of number-independent interpersonal communications services (NI-ICS), mainly messaging and video calls. A total of 351bn outgoing voice and video call minutes were made using NI-ICS in 2023 ([see NI-ICS market overview](#)).

The breakdown of mobile voice traffic has varied only slightly in recent years. Around 43% of call minutes in 2023 (2022: 42%) were within the same operator network (on-net), approximately 35% (2022: 34%) were calls to other national mobile networks (off-net) and around 20% were terminated in the national fixed network.

The number of inbound call minutes terminated within mobile networks in 2023 decreased by

Outbound and inbound mobile voice minutes

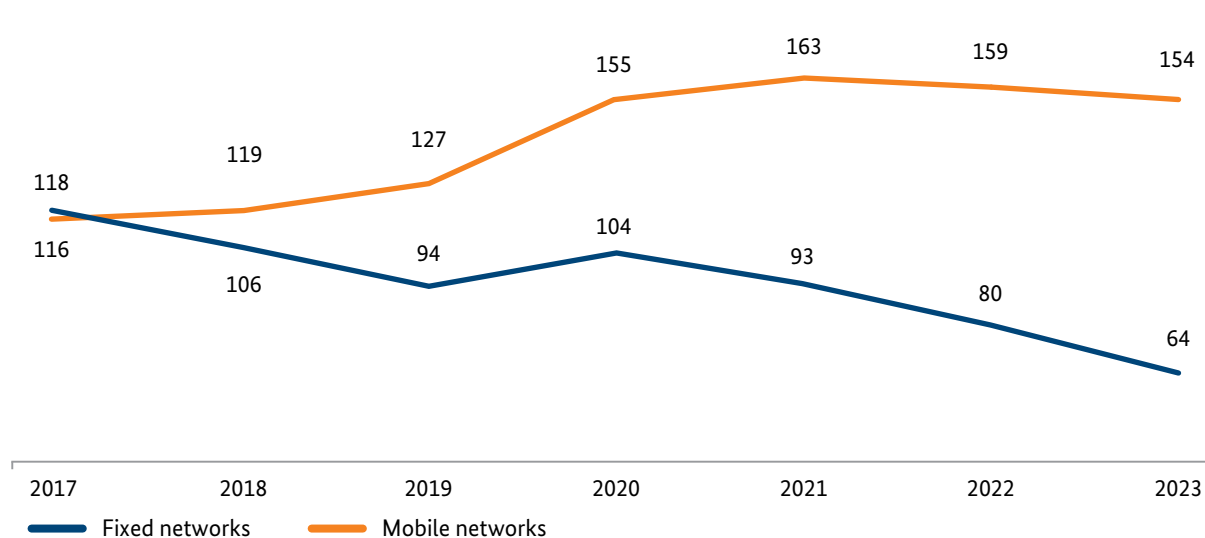
	2021	2022	2023
	Minutes (bn)	Minutes (bn)	Minutes (bn)
Outgoing traffic from mobile networks	162.59	159.28	153.49
To German fixed networks	36.90	33.51	30.70
To the same mobile operator network	66.53	66.78	65.37
To other mobile operator networks	54.75	54.88	53.73
To foreign networks (fixed/mobile)	2.39	2.60	1.74
Other traffic	2.02	1.51	1.95
Incoming traffic to mobile networks	139.80	138.49	133.68
From German fixed networks	14.31	12.95	11.23
From the same mobile operator network	66.27	65.37	63.52
From other mobile operator networks	56.30	57.45	56.08
From foreign networks (fixed/mobile)	2.49	2.32	2.14
Other traffic	0.43	0.40	0.71

almost 4% to around 134bn minutes. Roughly 48% of the call minutes were from the same operator network and 42% from other national mobile networks.

Mobile call volumes by far exceed the volume of calls in the fixed networks (around 64bn minutes). For the first time, more than twice as many

call minutes were generated through mobile terminal devices as were generated through landlines. This was mainly due to improved voice quality, continuous availability and the pricing of mobile services. Video and internet telephony (Voice over Internet Protocol) minutes were not included.

Outgoing call minutes in fixed and mobile networks (bn)



International roaming

The volume of data generated abroad was 347.4mn GB in 2023, a year-on-year increase of 261.7mn GB or around 33%. This increase is due to the spread of online communications services and the increased use of over-the-top (OTT) content services, such as streaming services. The number of outgoing call minutes abroad decreased by around 9% from 3,746mn in 2022 to 3,422mn in 2023. The number of SMS messages sent abroad was up 18% from 179mn in 2022 to 212mn at the end of 2023. This increase is due to the removal of all remaining pandemic travel restrictions during 2022, and in this context mainly the messages with information on international charges that are sent to end-users when travelling abroad.

Infrastructure

The expansion of the mobile communication networks relies heavily on the installation of additional radio base stations. According to data provided by the network operators, the number of these interfaces between the wireless and wire-based network rose by around 6% in 2023 to 214,677, mainly due to the expansion of the 5G networks. The number of LTE base stations in operation increased by 3% to 87,905. The number of 5G base stations grew by 18% from 41,945 at the end of 2022 to 49,571 at the end of 2023. In addition, the number of small cell sites increased to 5,290. These provide additional capacity at locations of high user concentration by densifying the network in city centres, affecting both the speed of data throughput and the data quality (such as high-resolution streaming).

Rollout of 5G networks continues to be partly based on the existing 4G infrastructure via a solution known as 5G non-standalone (5G NSA). Current 5G networks use a type of 5G NSA known

International roaming

	2021	2022	2023
Volume of data generated abroad (mn GB)	149.3	261.7	347.4
Outgoing call minutes abroad (mn)	3,183	3,746	3,422
SMS sent abroad (mn)	152	179	212

Radio base stations

	2021		2022		2023	
		%		%		%
Total	187,443	100	203,241	100	214,677	100
5G	29,959	16	41,945	21	49,571	23
LTE/4G	82,479	44	85,054	42	87,905	41
UMTS/3G	652	0	111	0	0	0
GSM/2G	74,353	40	76,131	37	77,201	36

as Dynamic Spectrum Sharing (DSS), allowing bands to be used for both 4G and 5G at the same time. Base stations with DSS were mostly counted as both 4G and 5G base stations. 95% of 5G-capable base stations use DSS technology.

Strong progress was made last year with the roll-out of 5G standalone (SA) through the connection of existing radio sites to 5G core networks. The network operators are simultaneously building end-to-end 5G network infrastructure with new antennas likewise connected to their 5G core networks. The use of the network infrastructure and spectrum exclusively for 5G will enable the technology to reach its full potential, not least the high speeds and low latency required for real-time applications.

In practice, a physical antenna site usually contains radio base stations of different mobile communication standards. The number of antenna sites (89,341 at the end of 2023) is therefore lower than the number of radio base stations (214,677 at the end of 2023). Infrastructure operated jointly by more than one network operator, a practice known as site sharing, is counted multiple times in the physical site data.

Most of the antenna sites are connected via fibre or fixed links. At the end of 2023, about 52% of the sites were connected via fibre and about 47% via fixed links. The number of fibre-connected sites was up 3% year-on-year. A small number of sites are still connected via copper-based transmission paths.

Key figures and competitors' shares

The following table summarises selected key figures and competitors' shares in the telecommunications market for the period from 2021 to 2023.

Gigabit Register

Concept

The German government's Gigabit Register, maintained by the Bundesnetzagentur, went online in December 2022 at www.gigabitgrundbuch.bund.de. The platform simplifies fixed-network and mobile rollout planning for companies and generally increases transparency on the availability of broadband networks.

It comprises six information services serving different target groups.

Services accessible to all users:

- Broadband Atlas: the central transparency and information tool for current fixed and mobile broadband coverage in Germany.
- Mobile communications monitoring: a map displaying transparent data about each provider's actual mobile coverage across the country.
- Broadband speed checker: map showing the results of end-users' fixed and mobile connection speed tests.
- Dead spot map: displays gaps in mobile coverage based on the results from users of the dead spot app.

Key figures and competitors' shares in the telecommunications market

Key figures	2021	2022	2023
External revenue (€bn)	58.4	59.2	59.9 ¹⁾
Investments (€bn)	11.5	13.4	13.2 ¹⁾
Employees	135,800	133,000	132,400 ¹⁾
Total active fixed broadband connections (mn)	36.9	37.5	38.4
- DSL	25.4	24.7	24.5
- HFC	8,8	8.7	8.6
- FTTH/FTTB	2.6	3.4	4.3
- Other	< 0.1	< 0.7	1.0
Total voice communication connections in fixed networks (mn)	38.5	38.6	38.8
Active SIM profiles (mn)	106.4	104.4	105.4
Mobile penetration rate (active SIM profiles/inhabitant) (%) ²⁾	127.9	123.9	124.4
Competitors' shares (%)	2021	2022	2023
External revenue	57	57	57 ¹⁾
Investments in fixed assets	61	63	62 ¹⁾
Fixed broadband connections	61	61	61
DSL connections	45	44	43
Voice communication connections in fixed networks	55	55	55

¹⁾ Forecast figures

²⁾ Number of inhabitants according to Federal Statistical Office

Services only accessible to those involved in broadband rollout:

- Infrastructure Atlas: the central information and planning tool for gigabit rollout projects.
- Analysis platform: an analysis tool for public administration with information on broadband coverage and infrastructure for decision makers from national and regional bodies.

The efficient rollout of digital infrastructure in Germany needs a sound and transparent basis of data, without which it is impossible to identify sharing potential, prepare investment decisions and plan effective national and regional support measures. To this end, the current geographic information systems have been consolidated in a central portal.

These components will be supplemented by a planning platform designed specifically for companies on the telecommunications market involved in rollout. The platform will hold information on existing and planned infrastructure and will enable companies to better explore potential for infrastructure sharing and co-deployment. The platform will be based on the Bundesnetzagentur's existing Infrastructure Atlas. It is planned to include information on publicly owned property suitable for mobile rollout.

Gigabit Register IT project

The Gigabit Register IT project was set up to handle the technical migration, operation and ongoing development of the complex Broadband Atlas and analysis platform services. Together with the Infrastructure Atlas, these are the Gigabit Register's largest IT platforms.

Previous operator Mobilfunkinfrastrukturgesellschaft (MIG) handed over the live project on 1 January 2023 after making the necessary technical and organisational preparations for transition. The process was jointly coordinated by the Bundesnetzagentur, MIG and the Federal Ministry for Digital and Transport (BMDV).

A consortium of MIG service providers was put in charge of operating the system in the AWS Cloud on an interim basis until 31 December 2023 to avoid interruptions in service and until a new operator could be found for 2024 onwards.

Preparations began in early 2023 for an EU-wide tender on the operation and development of the Gigabit Register for the period from November 2023 to December 2026. The contract notice was published on 22 June 2023 and following a negotiation phase the new operator was awarded the contract on 24 November 2023. Operational responsibility was assumed on 1 January 2024 after a handover period with the interim operator. Besides operating and developing the platforms, the new operator will migrate the systems from the AWS Cloud to a private open-source cloud.

Delegation of tasks

The single information point of the Federation (ZIS) is responsible for the Gigabit Register. The tasks were delegated to the Bundesnetzagentur in accordance with section 78(2) sentence 2 TKG on 1 January 2023. The Bundesnetzagentur already maintained the vast majority of applications before the platforms were consolidated under the Gigabit Register. It also took over operation of the entire Broadband Atlas, established 2005, on 1 January 2023.

Broadband Atlas

Concept

The Broadband Atlas is operated by the Bundesnetzagentur's single information point of the Federation (ZIS) and is Germany's main information tool for current fixed and mobile broadband coverage in Germany. The atlas is regularly updated and is available to all interested parties free of charge.

The interactive maps show which speeds and connection technologies are available for data transmission. The map can be navigated to display any location in Germany to the level of place name and address, with the most granular information displayed at the level of the individual raster cells. Broadband availability is shown as a percentage of the households to be supplied, aggregated in raster cells of 100x100 metres. Unpopulated areas without households are only shown in the mobile coverage view. As a supplement to the interactive map, the page displays the settings and filters along with a bar chart that shows the percentage of broadband availability. It is also possible to contrast current with historical data. The providers are listed by the technology reported for the location at the raster cell level.

History

The Broadband Atlas has been an established market tool since 2005. In 2022, for the first time, data on broadband rollout was collected on the legal basis created by the new TKG in 2021. The Broadband Atlas now receives data on fixed networks from over 360 telecommunications companies in addition to mobile coverage data collected by the mobile network operators. Information on the fixed network was gathered for the first time in 2022 by the Bundesnetzagentur at

the request of the Federal Ministry for Digital and Transport (BMDV). MIG validated, processed and made the information available.

Responsibility for collecting data and operating the Broadband Atlas has been entirely with the Bundesnetzagentur since 1 January 2023. Taking over the Broadband Atlas as a running IT project presented considerable challenges and still does today.

Data on the fixed network

According to the Broadband Atlas, by mid-2023 FTTH/FTTB infrastructure reached almost 30% of households. More than 73% of households across all technologies can access gigabit connections, most of which are based on upgraded HFC networks. Standard speeds, which are often the most popular choice even in the presence of faster connections, are available almost everywhere. For instance, connections with at least 50 megabits per second (Mbps) are available to roughly 96% of households and with at least 100 Mbps to almost 93% of households.

Data on the mobile network

The map of mobile coverage is based on data collected biannually by the Bundesnetzagentur from the mobile network operators, who deliver data for each raster cell (100x100 metres) on the different technologies (2G, 4G, 5G) available. The Bundesnetzagentur has set minimum thresholds on reception quality for each technology. Measurements must be taken from the end-user perspective, ie at 1.5 metres above ground level, and further technical parameters have been defined regarding signal quality, mainly for 4G and 5G. The values are predictions of outdoor reception provided by the network operators.

Infrastructure Atlas

Background

The Infrastructure Atlas is the central information and planning tool for gigabit rollout in Germany. It contains data on the location of network operators' infrastructure available for sharing, such as fibre cabling, ducts, carrier infrastructure and access points, as well as information about civil works, contact details for infrastructure owners, and information on availability and funding. This helps to speed up rollout planning and decision making in the pre-project phase, and save costs during rollout through the sharing of existing infrastructure. The Infrastructure Atlas is not public. The data is only accessible to authorised users for a limited time and for a limited area. Companies involved in the rollout, as well as regional administrative bodies, can apply for access.

The Infrastructure Atlas now comprises data from more than 4,000 owners of infrastructure and the information has been used in over 16,000 projects since 2009.

Obligations under the new TKG

The conditions for providing and accessing the data and the obligations for data providers were revised in 2022 following the entry into force of the new TKG on 1 December 2021. Almost all of the more than 4,000 data providers had adopted the changes in full by the end of 2023.

Over 75% have already delivered updated data, which is gradually being processed and imported into the Infrastructure Atlas. The full database update is expected to take until mid-2024.

Technical development of the Infrastructure Atlas

After it was introduced in 2022, work to expand the Infrastructure Atlas continued throughout 2023. Besides being able to register and request data access, the data providers can now also deliver infrastructure data and information about civil works via the portal and monitor the processing status of their data.

The Infrastructure Atlas complies in all key respects with the requirements of the German Online Access Act (OZG) and can additionally be accessed via the Federal Portal at <https://www.bund.de>.

The Infrastructure Atlas uses scalable technology that can integrate further functions and content as needed. Future requirements, mainly relating to the evolution of the portal into a planning platform, were taken into consideration during the development phase.

Use of the Infrastructure Atlas

The number of users grew steadily in 2023 by a further 1,900. Since its launch in spring 2022, around 3,500 people have registered at <https://isa.bundesnetzagentur.de> and use the platform's online offerings and services to access and deliver data.

Users filed 1,233 applications to access data in 2023, which was slightly fewer than in the previous year but still at a high level.

As a result of the popular new option introduced in spring 2023 to submit data via the portal, the Bundesnetzagentur received 1,250 deliveries of data for processing via this channel in 2023.

Analysis platform

Concept

The analysis platform is an information and analysis tool for public administration with restricted access. Decision-makers from national and regional bodies can access detailed information on fixed and mobile coverage, public funding and infrastructure. The platform increases transparency for public administration and contributes to efficient (public) rollout planning.

The analysis platform uses the same data as the Broadband Atlas, enhanced with statistical information from the Infrastructure Atlas and information on areas underserved by mobile services, known as white and grey spots. The platform allows users to analyse and compare broadband coverage for certain administrative regions and download the results. Representatives of the government can access a wider range of analysis tools at the level of individual addresses than are available in the public Broadband Atlas.

Use of the analysis platform is restricted to representatives of regional and national government. It was launched in April 2023 and is the most recent service to be added to the Gigabit Register.

Usage

There were 71 access profiles by the end of December. Of the profiles in active use, around 90% are used for state-level access and 10% by analysts at federal level. Each federal state has now been assigned to at least one profile. Users work for federal and state ministries, public sector digital agencies or dedicated broadband rollout offices, and publicly funded project organisations.

Around 16% of applications for access were rejected due to not meeting requirements. Access for registered users is password-protected with multi-factor authentication.

NI-ICS market overview

Legal classification

The revised Telecommunications Act (TKG), which entered into force in December 2021, transposes the provisions of the European Electronic Communications Code (EECC) into national law. There are two categories of interpersonal communications services: number-based interpersonal communication services (NB-ICS) and number-independent interpersonal communication services (NI-ICS). The main difference is whether or not the services use publicly assigned numbering resources. NI-ICS mainly comprise messaging services (including internet and video telephony), video calling services and email services, provided the criteria set out in the TKG are met.¹⁷ Under the new TKG, NI-ICS are covered by some of the sector-specific regulations. The regulatory requirements for NI-ICS relate above all to public safety, customer protection and market monitoring.

NI ICS market data survey 2023

The new TKG extended the Bundesnetzagentur's powers to obtain information to include providers of NI-ICS. The Bundesnetzagentur therefore carried out its first mandatory survey covering the providers with the greatest market relevance¹⁸ in Germany at the beginning of last year.¹⁹ The survey was repeated this year to collect market data for 2023.

A total of 47 relevant services were identified, delivered by 37 companies.

¹⁷ See section 3 paras 24, 40 and 61 TKG for the definition of (number-independent) interpersonal communications services.

¹⁸ Market data for the previous year is collected at the start of each new year.

¹⁹ The market relevance of the services was determined on the basis of user numbers available to the Bundesnetzagentur before the survey. The aim is to include the maximum number possible of all relevant NI-ICS service providers based on active users in Germany.

The vast majority of the NI-ICS providers contacted in 2024 responded to the market data survey and provided the information requested.²⁰ The response rate increased from 83% in the previous year to 85%.²¹ The Bundesnetzagentur continually strives to make sure that those companies that have not yet provided any information, for whatever reason, respond to future surveys.

The following figures are based on aggregate market data on the use of NI-ICS in Germany.²² The available data – in this case for 2022 and 2023 – is used to describe the situation and trends on the NI-ICS market and to draw comparisons with traditional telecommunications services.²³

User numbers and multi-homing

In 2023, the messaging and video calling service providers surveyed had an average of 196.01mn monthly active users (2022: 186.07mn), whilst the email service providers surveyed had an average of 171.91mn monthly active users (2022: 148.91mn). The idea behind “monthly active user” (MAN) is to only cover users who have used an NI-ICS at least once in a month to make calls or send text messages, images or videos.²⁴

The numbers for messaging and video calling services do not include the figures for five, presumably medium-sized, services. The user numbers given above are therefore to be seen as minimum figures. Based on an estimate of the missing figures, the Bundesnetzagentur assumes that the whole messaging and video calling services market comprises an additional approximately 40.03mn users.²⁵ The total number of users in 2023 is therefore estimated to be 236.04mn in Germany.

For various reasons users of messaging and video calling services, unlike NB ICS users, typically use multiple services simultaneously (known as multi-homing).²⁶

²⁰ It should be noted that the majority of services, mainly messaging and video calling services, are provided by companies based outside of Germany, both in Europe and further afield. This presents particular challenges in respect of the availability of these companies and the enforcement of existing obligations.

²¹ Based on the number of services covered.

²² Some of the figures included in the aggregate market data are estimates.

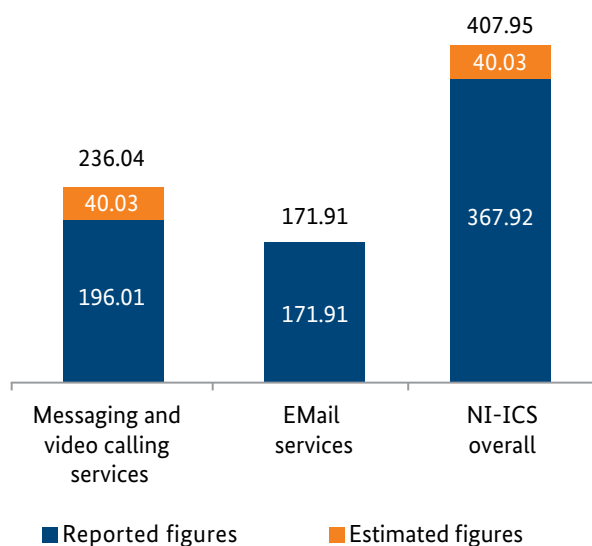
²³ Due to the novelty of the survey, it is possible that data will fluctuate in initial years (eg as a result of changes concerning participating companies, subsequent corrections or estimated figures), which may affect the comparability of the values across multiple years.

²⁴ See BEREC (2021): Report on harmonised definitions for indicators regarding over the top services, relevant to electronic communications markets, BoR (21) 127.

²⁵ The missing figures for the services were estimated using the user shares for each service based on a representative consumer survey made by the Bundesnetzagentur. See Bundesnetzagentur (2023): Use of online communications services in Germany.

²⁶ See, for example, Bundesnetzagentur (2023): Use of online communications services in Germany; RTR (2020): Monitoring Interpersonelle Kommunikationsdienste mit Fokus auf Instant Messaging, RTR Fachbereich Telekommunikation und Post (RTR FB TKP); WIK (2019): The Impact of OTT 1 Services on Communication Behaviour – a consumer perspective, WIK Discussion Paper No. 440.

Monthly active users of NI-ICS in Germany in 2023 (mn)



28% of providers charge for some add-ons and other extra services. Over half of all providers (56%) also utilise indirect forms of funding, such as revenue from advertising/data use, donations or cross-subsidisation in the company group (eg within digital ecosystems).

The market data from the survey indicates a multi-homing rate of 3.11 messaging and video calling services per user (or 3.66 services per user with the estimated figures).²⁷ Email users, too, often use multiple services at the same time, with a multi-homing rate for email of 2.73 services per user.²⁸

Different NI-ICS can generally be used simultaneously without a great deal of effort due to the comparatively low barriers to use, helped partly by the availability of some services free of charge. NI-ICS providers report a variety of different approaches to funding. Many use multiple sources simultaneously, whilst 44% say they make money through direct one-off or recurring payments (eg monthly charges).²⁹

²⁷ Assuming a user share of around 90% of the total population in Germany (16 years and above), ie a total of approximately 64.5mn users.

²⁸ Assuming a user share of around 88% of the total population in Germany (16 years and above), ie a total of approximately 63.1mn users.

²⁹ This mainly applies to email services and video calling services. It is rarely used by messaging service providers.

Usage figures

The majority of NI-ICS providers offer a bundle of different communication options, mainly including text and voice messaging and voice and video telephony, though not all providers necessarily offer all of these core functions in full. Often many other options are also available, such as delivery and read receipts or status and story messages. The actual scope of each function depends on the provider's business model.

Instant messaging is the most frequently used NI-ICS service and has become part of everyday life for most users. Instant messaging enables users to send images, videos, documents, voice messages and emojis as well as text messages. In 2023, users in Germany sent a total of 891.35bn instant messages (2022: 805.39bn).³⁰ This corresponds to an average of around 379 instant messages per month per monthly active user or about 12 instant messages per day. An individual user can represent multiple monthly active users (known as multi-homers).

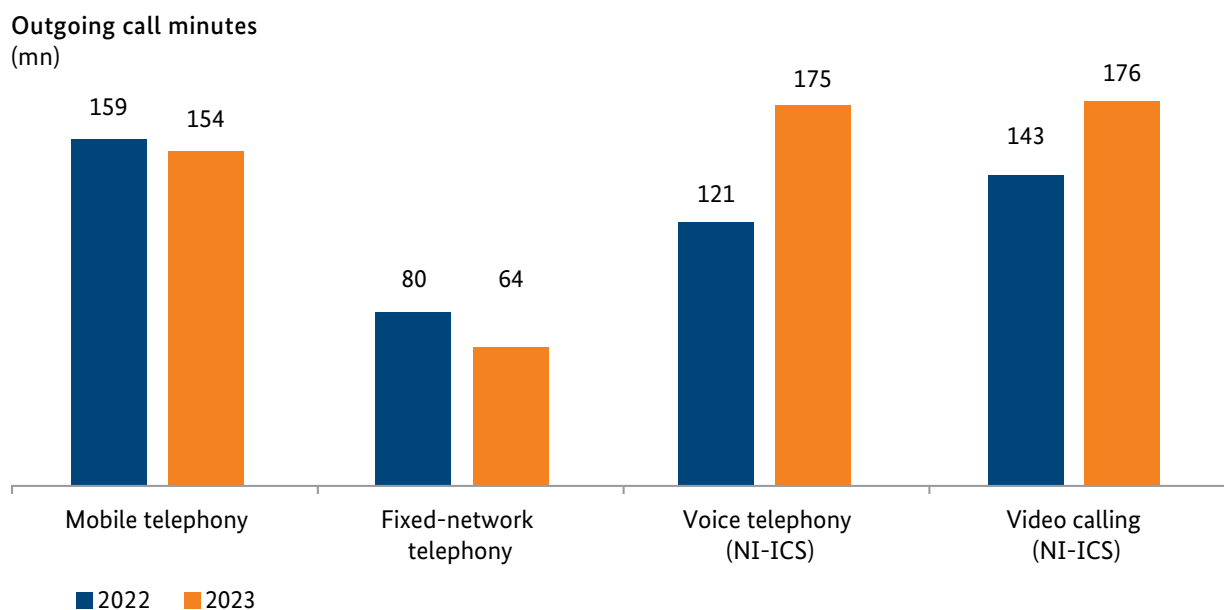
The figures below relate to the volume of voice calls made via messaging and video calling services. In 2023, 15.79bn (2022: 13.28bn) outgoing voice calls were made via messaging and video calling services in Germany, up 19% on the previous year. NI-ICS accounted for 175.05bn minutes, up from 120.97bn in 2022. This corresponds to about 81 voice calls per monthly active user per year and an average duration of 11 minutes per call.

By contrast, 8.22bn (2022: 7.65bn) outgoing video calls were made in 2023, a year on year increase of 7%, totalling 176.36bn (2022: 143.24bn) call minutes. This corresponds to about 42 video calls per monthly active user per year and an average duration of 21 minutes per call.

According to the email service providers, the monthly active users in Germany sent a total of 53.43bn emails in 2023 (2022: 47.05bn³¹), a year-on-year increase of 14%, averaging around 311 emails per monthly active user per year.

³⁰ The providers were asked to provide figures based on the point of origin of the communication. This also applies to the other usage indicators in this section.

³¹ The value for 2022 was adjusted due to subsequent corrections by providers.



Comparison with traditional telecommunications service

Since 2022, it has been possible to compare the volumes of calls made via messaging and video calling services and via traditional fixed and mobile telephony services using the market data provided. In 2023, 154bn outgoing call minutes were generated in the mobile networks and 64bn minutes in the fixed networks. By contrast, users in Germany generated at least 175bn voice telephony minutes and 176bn video telephony minutes via NI-ICS. This means that the volume of both voice and video calls via NI-ICS in 2023 was larger than the call volume in both the fixed and mobile networks. By volume, traditional number based mobile telephony is now no longer the most popular form of communication with users in Germany.

NI-ICS telephony has grown in popularity over the past few years, driven even more by advancements in the digital transformation and the associated changes in communication behaviour (mainly the increasing relevance of smartphones, mobile internet and solutions for home working).

Internet and digitalisation



The Bundesnetzagentur performs a number of tasks in the field of internet and digital transformation. It oversees the safeguarding of net neutrality in Germany and is also heavily involved in issues concerning the interoperability of digital services. The Bundesnetzagentur has taken on the new role of Digital Services Coordinator created by the Digital Services Act.

Net neutrality

Zero-rating options discontinued in Germany

The Bundesnetzagentur decided in the last reporting period to prohibit the marketing of certain zero-rating options in Germany on the basis of a European Court of Justice ruling. Providers of internet access services were required to terminate existing customer contracts for the affected products by the end of March 2023. The aim with this deadline was to ensure a consumer friendly transition to other tariffs for the large number of customers using the services. New marketing of these options had already been ordered to cease by 1 July 2022. The providers converted the existing contracts by the 2023 deadline.

Mobile flat rates

In civil law proceedings brought by the Federation of German Consumer Organisations (Verbraucherzentrale Bundesverband e. V./vzbv) against an internet access provider, the Federal Court of Justice on 4 May 2023 ruled on the end-users' right to use terminal equipment of their choice in conjunction with mobile flat rates under the principle of net neutrality. The Bundesnetzagentur took part in the proceedings in line with section 220 TKG, supporting the legal opinion of vzbv, and pursued parallel administrative proceedings against several providers. Both the vzbv and the Bundesnetzagentur found that providers of mobile flat rates prohibiting the use of fixed LTE routers for their services were in breach of net neutrality. The Federal Court of Justice confirmed this opinion and the tariff was subsequently adjusted. Pending parallel administrative proceedings opened by the Bundesnetzagentur were closed as a result. The clauses concerned were removed from mobile flat rate contracts.

DNS blocking

The Bundesnetzagentur does not itself order blocking but rather examines whether blocking is in breach of net neutrality provisions. Blocking imposed through statutory, regulatory or court order is compliant with net neutrality. Three extensions to Council Regulation (EU) 833/2014 took effect in the reporting period, requiring internet access providers to implement DNS blocking to curb the dissemination of content from certain Russian stations. Finally, the Bundesnetzagentur found three recommendations on DNS blocking made by the Online Copyright Clearance System during the reporting period to conform to net neutrality; supporting documents were requested in two further cases.

Financial contribution of major content providers to network rollout costs

In 2023, the intense debate continued about content providers making a financial contribution to network rollout costs, which telecommunications network operators have been demanding for some time. The Bundesnetzagentur dismisses these proposals, adopting the same position as the German government and the EU's Body of European Regulators for Electronic Communications (BEREC) (see [International cooperation](#)).

The Bundesnetzagentur has identified no market failure requiring regulatory intervention and believes this would adversely affect competition, end-users, innovation and the open internet. Data traffic is generated not by the content providers but by the customers who use services and content and pay to access the internet, in turn paying for the costs of the access networks. A financial contribution would be detrimental to all market participants, including small and medium-sized companies, for instance if providers

of cloud and content delivery networks were to pass on increased costs to their (business) customers or if services were withdrawn from the market entirely (eg Twitch in South Korea). Under European net neutrality rules, all data traffic must be treated equally. Requiring only large content providers to contribute financially would be incompatible with this principle.

Annual report on net neutrality

As in previous years the Bundesnetzagentur published an annual report on net neutrality in Germany for the period from May 2022 to April 2023.

Digitalisation at small and medium-sized enterprises (SMEs)

Empirical monitoring

The status of digitalisation in Germany's industry is a regular focus of studies and surveys, which frequently find that SMEs do not realise the potential associated with using digital technologies to the same extent as large companies.¹ In August 2023, the Bundesnetzagentur published a report on selected aspects of the digital and environmentally sustainable transformation in business based on the findings of a representative survey conducted with over 1,000 companies. Data was collected by Bonn Survey Centre (uz-bonn GmbH) between October 2022 and February 2023. The study found similar qualitative differences between SMEs and large organizations as those mentioned above, albeit minor in scale and with little quantitative significance. The full report is available at: https://data.bundesnetzagentur.de/Bundesnetzagentur/DE/Fachthemen/Digitalisierung/Mittelstand/Downloads/studie_langfassung.pdf

Networking

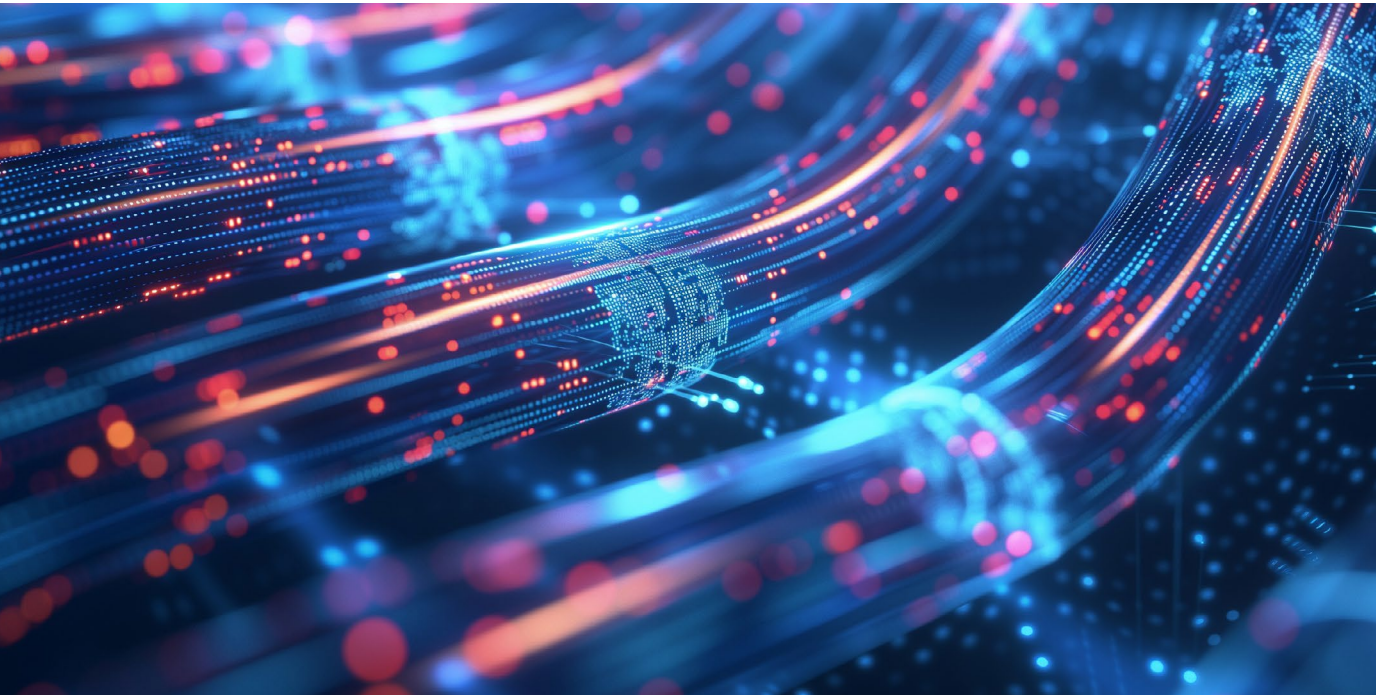
Another important measure alongside empirical monitoring is to network with the large number of players supporting the digital transformation process among SMEs. Such players include:

- the digital agencies of the federal states,
- Mittelstand-Digital Innovation Hubs,
- digital hubs,
- SME and trade associations
- and higher education institutions.

In addition to opportunities for discussion about the challenges SMEs face, the networking also encourages dialogue on services and initiatives offering SMEs support with digitalisation. The Bundesnetzagentur and the German Institute for Standardization (DIN) jointly organised the second network day in November 2023 themed around data literacy and its importance for SMEs.

More information is available at <https://www.bundesnetzagentur.de/994734>.

¹ Micro, small and medium-sized enterprises are defined in Commission Recommendation (EU) 2003/361. According to this definition, the category of SMEs is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding €50mn, and/or an annual balance sheet total not exceeding €43mn.



The Bundesnetzagentur and the German Chamber of Industry and Commerce (DIHK) jointly offered virtual networking meetings in 2023. All four 90 minute online meetings were devoted to the “twin transition”, ie whether a digital transformation can also be a green transformation. Both formats offered platforms for open exchanges on complex subjects and for making new contacts.

Information for SMEs

Companies that are interested in digitalisation will find an extensive database with points of contact on the Bundesnetzagentur’s website (www.bundesnetzagentur.de/Anlaufstellen-Datenbank). It provides over 250 regional and national contacts, most of which are publicly funded and which support SMEs with digitalisation. They offer advisory services, training, demonstrators, project support and financing

opportunities. SMEs can access an overview of best practice examples as further motivation for their digital transformation (www.bundesnetzagentur.de/best-practice).

Gaia-X

Gaia-X is an international initiative aiming to create interoperable, open and sovereign European data spaces. Since the end of 2021, the Gaia-X funding competition has been backing 11 projects in the education, healthcare, AI, aerospace, construction and finance sectors, which are working to develop intelligent, innovative services and realise data spaces. These serve as hands on examples and best practices for future projects in the Gaia X ecosystem. The Federal Ministry for Economic Affairs and Energy has earmarked some €117mn in funding for these projects over around three years.

The project is now at the halfway point and initial findings will be incorporated into future use cases. Rapid progress is being made with developing the necessary technology components and ensuring their conformity with Gaia-X, with the first demonstrators already showcased at various expos. The next step is to develop prototypes of Gaia-X-compliant data spaces and smart services. Integration into the Gaia-X ecosystem is expected to take place at the end of the project.

Artificial intelligence

The Bundesnetzagentur remains in constant dialogue about artificial intelligence (AI) with the market participants in Germany from the network sectors and other areas relevant to the Bundesnetzagentur.

AI cafés

The AI café event series continued in spring 2023 with two further events on AI standardisation in telecommunications and sustainability in AI. Another event in September 2023 looked at generative AI and social media. The use of AI in social media has implications for the application of the European Digital Services Act. For instance, users of social media are using generative AI to spread deepfakes and disinformation with the potential to harm the rights of individuals. AI is also used by online platforms to moderate content in marketplaces and other forums.

The AI cafés are recorded and made available on the Bundesnetzagentur's website at www.bundesnetzagentur.de/KI.

AI conference 2023

The digital conference DigiKon took place on 14 November 2023 with an afternoon session devoted to the topic of AI as the key to a sustainable future. AI and sustainability are two interconnected fields: AI can unlock opportunities for green innovation, reducing carbon emissions and managing resources, but equally so it is associated with social challenges and energy waste through the use of supercomputers. A balanced approach is essential for maximising AI's potential to improve sustainability whilst minimising the possibility of negative outcomes. The conference offered experts from politics, business,

science and civil society a platform for a constructive – and critical – exchange of views. The Federal Institute for Occupational Safety and Health, the German Environment Agency and a number of start-ups attended the conference to discuss sustainability based on actual AI applications.

Consumer survey on the use of online communications services

The Bundesnetzagentur published the findings from the third consumer survey on the use of online communication services within Germany at the end of 2023. Data was collected in partnership with the Berlin-based company INFO GmbH Markt- und Meinungsforschung using a mixed-mode survey combining telephone-based and online responses. People aged 16 and over living in Germany were surveyed and a total of 2,200 people throughout Germany took part.

Online communication services in the telecommunications sector have changed significantly in the last few years. With messaging, internet and video calling services now part of everyday life for users, it is very important to collect data on how online communications services are used so that trends and changes in all telecommunications markets can be tracked and analysed. The survey gathered insights into the spread and use of services within Germany, mainly frequency of use, functions and terminal equipment used, and the reasons for using the services.

The results of the most recent consumer survey carried out in 2023 show that roughly 90% of the population in Germany use online communications services at least once a month. This means that the level of use of these services is now similar to that of traditional telecommunications and email services. The percentages of people who report using the five most popular online communications services in Germany are: WhatsApp 92%, Facebook Messenger 36%, Instagram's direct messaging 27%, Microsoft Teams 20% and Zoom 19%. Over three quarters (77%) of users of online communications services use at least two different services simultaneously, known as multi-homing, averaging 3.2 online communications services per user. The full findings were published in November 2023 and are available at www.bundesnetzagentur.de/online-kommunikation.

Interoperability

Digital markets are showing strong trends toward concentration and a development toward increasingly interlocked, closing ecosystems. For this reason, discussions are taking place about interoperability obligations that aim to break the market power of dominant providers and to reduce dependencies. Regulations in the area of number-independent interpersonal communications services (eg messaging services) are to stimulate competition by enabling users of different services to communicate across providers.

Under the Digital Markets Act (DMA), which was adopted at European level and entered into force on 1 November 2022, messaging service providers that are classified as gatekeepers must meet interoperability obligations. In September 2023, the European Commission identified a list of gatekeepers for the first time (https://ec.europa.eu/commission/presscorner/detail/de/ip_23_4328). Meta, as a designated gatekeeper, is required to open its messaging services WhatsApp and Messenger to competitors to enable communication across different providers. Under the DMA, Meta must publish a reference offer containing the exact technical interoperability conditions for the services and make the offer available to competitors.

The European Commission evaluates the reference offers in consultation with the Body of European Regulators for Electronic Communications (BEREC). In this context the Bundesnetzagentur plays a part in BEREC's work, particularly with regard to the technical approaches and requirements for ensuring interoperability.

Digital Services Act

The Digital Services Act (DSA) sets rules for digital services and platforms, and entered into force on 16 November 2022. The DSA lays out EU-wide requirements for things such as ways to report illegal content, algorithm transparency and researchers' access to platform data. Its objective is the creation of a transparent and safe online environment. It applies to a wide array of online intermediaries, from cloud providers to marketplaces, social networks and video sharing services to search engines. The European Commission has already designated several very large online platforms (eg Meta, TikTok, Twitter/X, Amazon, Alibaba, Zalando) and very large search engines (eg Google) which have had to comply with the DSA since 25 August 2023. The DSA has applied to national online intermediaries, such as hosting services and online platforms, since 17 February 2024.

The legislative processes in Germany for adopting the DSA and designating the competent authorities are ongoing. In the government draft published on 20 December 2023, the Bundesnetzagentur is required to appoint a Digital Services Coordinator (DSC). The DSC coordinates national and cross border cooperation with competent authorities and other DSCs whilst also functioning as a point of contact for the European Commission. The DSC is specifically assigned special tasks, acts as a grievance board for citizens, and certifies and monitors out-of-court dispute resolution bodies and "trusted flaggers". The Bundesnetzagentur has set up a task force to make the necessary content and organisational preparations for taking on the new role.

Terrorist Content Online Regulation

Terrorist Content Online Regulation (EU) 2021/784 on addressing the dissemination of terrorist content online (TCO) has applied since 7 June 2021, aiming to tackle the misuse of hosting services to spread terrorist content. The regulation requires hosting service providers to remove terrorist content within one hour of receiving a removal order and if their web space has been used repeatedly to distribute terrorist content they must take specific measures to prevent it in the future. Hosting service providers not based within the European Union but who offer services here must designate a legal representative within the EU. The Act addressing terrorist content online (TerrOIBG) assigns regulatory tasks to the Bundesnetzagentur and the Bundeskriminalamt. Under the TerrOIBG the Bundeskriminalamt issues orders to hosting service providers requiring them to remove terrorist content. The Bundesnetzagentur monitors implementation of specific measures by the providers in line with section 5 TCO and imposes sanctions under section 18 TCO and section 6 TerrOIBG.

The Bundesnetzagentur and Bundeskriminalamt organised an information event in November 2023 to educate hosting services providers on their obligations and the relevant proceedings under the TCO.

The Bundeskriminalamt issued several hundred orders in 2023 for the removal of terrorist content to hosting service providers based in Europe outside of Germany. Two removal orders were issued by a competent authority from within Europe to a hosting service provider based in Germany. The Bundesnetzagentur consequently opened initial proceedings against a hosting service provider in late summer 2023, determining that the provider's platform is exposed to terrorist online content.

The Bundesnetzagentur coordinates its activities closely with the Bundeskriminalamt.

Data Act

The Data Act entered into force on 11 January 2024 and will become applicable on 12 September 2025. Together with the Data Governance Act, it forms a key pillar of the European data strategy. The Data Act aims to improve the cross-sectoral exchange and use of data between businesses, between businesses and consumers and between businesses and government. It contains rights and obligations regarding reasonable and non-discriminatory conditions on data access as well as comprehensive rules on the conditions under which this data may be processed and made available. The Data Act also contains provisions that make it easier to switch between providers of data processing services (eg cloud services), reduce the costs of switching and establish interoperability between these services.

The draft legislation implementing the Data Act in Germany will focus primarily on designating the government authorities and determining sanctions. Legislators can delegate tasks from the Act to one or more authorities. Some rules require the competent authority to have experience in the field of data and electronic communications services. The Bundesnetzagentur has been closely monitoring the legislative processes from the start and is ready to assume new tasks to enforce the Data Act in Germany.

Data Governance Act

The Data Governance Act (DGA) is a key pillar of the European data strategy. It entered into force on 23 June 2022 as a European Regulation and went into effect for all Member States on 24 September 2023.

The DGA is a cross-sectoral regulatory tool with the aim that more data overall can be made available, shared with confidence and re-used without it being technically complex. The newly created provisions should reduce obstacles to data exchange so that the untapped potential of the data economy can be unleashed.

With this in mind, the DGA essentially regulates four areas:

- rules for the re-use of protected data that is owned by public sector bodies;
- establishment of a notification and supervisory procedure for the provision of services by data intermediaries;
- framework for the voluntary registration of entities that collect and process data made available for altruistic purposes;
- creation of a European Data Innovation Board.

The DGA sets out that one or multiple competent authorities assume the tasks of monitoring and enforcing the DGA. Legislators will allocate the specific responsibilities as part of the national implementation. The Bundesnetzagentur has been focused on various issues associated with data regulation for several years and has been performing supervisory tasks from the Data Usage Act (DNG) since 2022.

A project group is now dealing with issues relating to DGA implementation and preparing to assume further tasks if required.

Data Usage Act

The German Data Usage Act (DNG) broadens the availability of the federal administration's open administrative data whilst simplifying and improving the options for the use of available publicly financed data. In accordance with section 10 DNG, the usage is normally free of charge.

Public sector bodies that have to earn sufficient revenue to cover a significant portion of the costs associated with fulfilling their public tasks can notify the Bundesnetzagentur that section 10(4) DNG allows them to charge for data usage. In 2023, independent federal appraisal committees filed corresponding requests for determinations of standard land values. A list of the public sector bodies that have notified the Bundesnetzagentur of their exemption from free-of-charge data usage is available on the Bundesnetzagentur website at <https://www.bundesnetzagentur.de/datennutzungs-gesetz>.

On 20 January 2023, the European Commission published a list of high-value datasets that public sector bodies must make available for re-use, free of charge, within 16 months. This data will have important benefits for society, the environment and the economy. The Commission defined the following categories of high-value datasets: geo-spatial, earth observation and environment, meteorological, statistics, companies and mobility. More information is available at <https://digital-strategy.ec.europa.eu/de/news/commission-defines-high-value-datasets-be-made-available-re-use>.

Sustainability and digitalisation

Digitalisation unlocks opportunities for innovation and competition. It is a driver of a climate-neutral economy. At the same time, progress means devices and networks that consume resources and energy, which can be harmful to the environment. Although several publications examine the environmental footprint of the information and communications technology (ICT) sector, data, especially on network infrastructure, is scarce.

A study commissioned by the Bundesnetzagentur in 2022 identified a series of indicators based on the EU taxonomy's six climate and environmental objectives. These indicators were used as a benchmark for evaluating the environmental sustainability of the networks. The study is available on the Bundesnetzagentur's website at <https://www.bundesnetzagentur.de/869210>.

At the end of 2023, the Bundesnetzagentur began preparations for a survey of the network operators on the environmental footprint of their network infrastructure. The aim is to further improve the quality and availability of environmental data on the ICT sector. Clear, solid information is useful

not only for decision-makers from politics, public administration and business, but also for consumers, making it easier to make more informed choices and opt for greener products. This can galvanise companies to become more environmentally conscious and gain a competitive edge through repositioning in the market.

eIDAS 2.0: the future of digital identity

A successful transition to a digitally sovereign society can only be achieved by building trust in the online environment, enabling people and companies to navigate digital transactions with confidence.

The new eIDAS Regulation in 2024 paves the way for a new level of digital sovereignty for EU citizens using electronic identities and trust services. eIDAS 2.0 requires the European Digital Identity Wallet (EUDI) to be introduced in all Member States and become mandatory within the next few years, enabling EU citizens to authenticate their identity digitally using a smartphone, securely store electronic attributes in the digital wallet and transmit selected information. Attributes can range from academic credentials to a driving licence or gym memberships. All transactions will be as transparent as possible and permanently available to view on a digital dashboard. New electronic trust services such as digital archives or distributed ledgers (blockchain) will also be possible.

Users of the digital wallet will be able to seamlessly integrate qualified electronic signatures at no cost as an alternative to written signatures. This step continues the transition towards an easy to use, legally secure electronic signature accepted in all EU Member States.

The Bundesnetzagentur remained actively committed to creating secure, trustworthy digital consumer networks in 2023 through its work on specialist bodies and close cooperation with industry, and was heavily involved in the development of eIDAS 2.0 and infrastructure planning under the new Regulation.

To meet the growing need for secure identification methods in the provision of qualified trust services, the Bundesnetzagentur has extended the trial phase for video identification with automated procedures and for two further methods of remote verification. This step gives providers and consumers an array of convenient and secure identity verification options to choose from to suit their audience and application.

Consumer protection and service



The Bundesnetzagentur can provide consumers with practical assistance in many cases. In 2023, the Bundesnetzagentur was again resolutely focused on tracking cold calling and combating number misuse. The Bundesnetzagentur's broadband speed checker helps consumers to prove reduced performance in their fixed network.

Customer protection

Customers of telecommunications service providers tend to approach the Bundesnetzagentur for help when they have not managed to resolve their issue with their provider directly. Their requests are handled as enquiries or complaints. Dispute resolution requests are treated differently; they are received by a special dispute resolution body of the Bundesnetzagentur.

The Bundesnetzagentur breaks down the enquiries and complaints into different categories. A total of about 18,700 concerns were raised in 2023, almost two-thirds thereof in connection with service disruptions. Specifically, these issues involved fault repair and internet speed, provider

switching, number porting and relocation. Other requests dealt with a wide range of contract-related issues such as contract duration, transparency and billing.

The Bundesnetzagentur can use the specific messages received to consider whether providers might be in breach of their obligations under telecommunications legislation, in particular of customer protection provisions in the Telecommunications Act (TKG). If the concerns raised are well-founded, the Bundesnetzagentur asks the providers concerned to re-examine the individual cases in question. Legal advice is not provided. The Bundesnetzagentur does not enforce any individual's special contract termination rights, rights to a fee reduction or monetary claims. It

is possible to apply for dispute resolution at the Bundesnetzagentur with the aim of reaching an amicable agreement with the provider.

In 2023, requests for remedy were necessary in a few cases, particularly in connection with the reversal of provider switches. Barring one instance, the Bundesnetzagentur did not have to issue any orders or impose any penalties or fines in this regard in the reporting period.

Text and video relay service for people who are deaf or hard of hearing

The service provides an accessible way for people who are deaf or hard of hearing to make telephone calls with hearing persons. To do so, they set up a video or data link via a PC, tablet or smartphone to a sign language interpreter or speech-to-text reporter provided by the service. The interpreters then call the desired person and translate the message received into spoken language. Conversely, the recipient's message is translated into sign language or written language. The text and video relay service thus enables people who are deaf or hard of hearing to make phone calls.

In 2023, the Bundesnetzagentur examined the need for the text and video relay service for 2024 and defined the need in an administrative order. This year too, the Bundesnetzagentur awarded the relay service to Tess – Sign & Script – Relay Dienste für hörgeschädigte Menschen GmbH for the period from 1 January to 31 December 2024.

The Bundesnetzagentur also took appropriate measures to ensure that the text and video relay service would be financed in 2024. In particular, it determined the proportionate costs to be borne by the relevant providers.

Combating number misuse

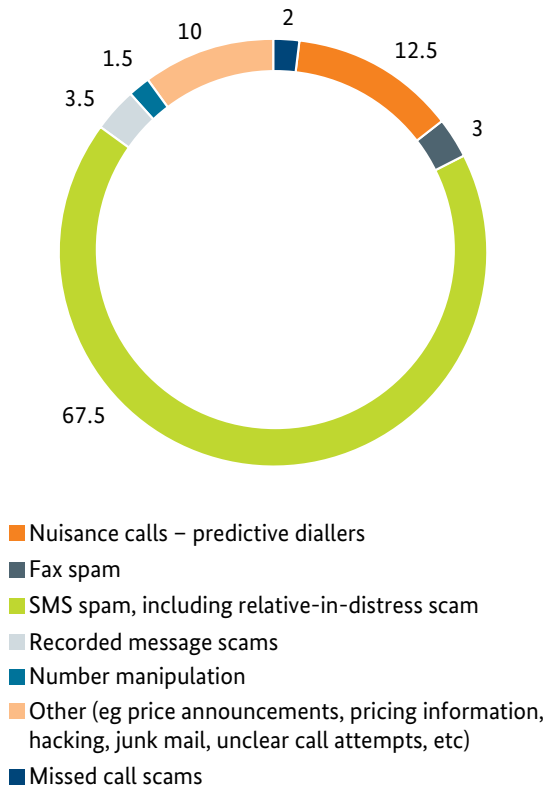
The Bundesnetzagentur is the supervisory authority responsible for combating number misuse. It follows up on any breach of number use. Cases pursued in this context frequently concern breaches of the consumer protection provisions of the Telecommunications Act (TKG) and the Act against Unfair Competition (UWG). A variety of measures can be taken to protect affected parties from disturbances and financial losses.

In total, the Bundesnetzagentur received 143,061 written complaints and enquiries about number misuse during 2023. An unusually large number of these complaints involved harassment via text messages, in particular in connection with the so-called “grandparent” or “relative in distress” scam (see below). The number of complaints received thus continues to remain at a very high level during the current reporting period. In addition to the written complaints, the Bundesnetzagentur received 11,435 telephone enquiries and complaints about number misuse and unsolicited marketing calls.

The Bundesnetzagentur works to protect consumers from unsolicited advertising and nuisance calls, charges for call queuing and the unauthorised billing of third-party services and subscriptions. It opened administrative proceedings to investigate the breaches in 1,850 cases, resulting in orders to disconnect 9,789 phone numbers. Bans on billing and collection were issued with regard to 1,298 numbers. All actions are published (in German) online in a continually updated list at

www.bundesnetzagentur.de/Massnahmenliste

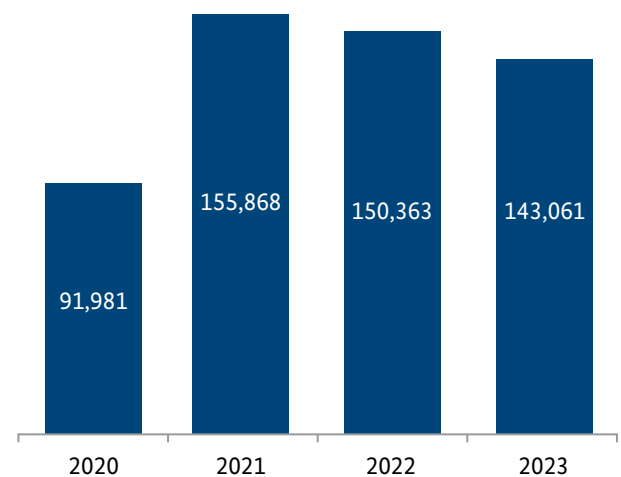
Written complaints about unsolicited marketing calls (%)



Nuisance calls

During the reporting period the Bundesnetzagentur received a total of 17,987 complaints concerning nuisance calls. Often the complaints are for call attempts where there is a connection but no one speaks on the other end or calls are attempted multiple times a day without leading to an actual telephone conversation. Such calls are usually generated by the software used in call centres to manage telemarketing calls (predictive diallers).

Written complaints and enquiries 2023



Depending on the calling practice of call centres, call recipients can be subjected to considerable harassment in violation of section 7(1) UWG. In such cases, the Bundesnetzagentur can take measures pursuant to section 123(1) and (4) TKG, including reprimands, warnings and orders to disconnect the call centre telephone numbers. Before it can do so, it is reliant on complaints containing descriptions of the nuisance call attempts that are as detailed as possible.

This type of calling behaviour is telemarketing that is subject to an administrative fine and as such cannot be prosecuted by the

Bundesnetzagentur for being attempted. Therefore complaints concerning unreasonable calling behaviour are recorded separately from complaints about telemarketing and statistics on such complaints are reported separately.

In 2023, 34 reprimands were made. In the course of the reprimand process, companies are informed about complaints about their calling behaviour at an early stage, thus giving them the opportunity to make changes.

Router and telephone system hacking/malware

During the reporting period, the Bundesnetzagentur continued to take strong action against cases of hacking in which third parties unlawfully generate calls that incur charges via routers or telephone systems of consumers or other end-users. When such cases occur, bans on billing and collection are often issued to protect the end-users affected. The Bundesnetzagentur's consistent intervention has led to a situation in which the majority of measures against such cases of abuse are taken in response to requests. Most cases continue to be reported to the Bundesnetzagentur by telecommunication service providers, while some are reported by the end-users affected. The orders issued by the Bundesnetzagentur provide protection to end-users against financial damages. The ordering of payment bans is another tool that can be used to enable the domestic telecommunication service providers involved to avoid payments of unlawfully generated charges on a lasting basis. The sector's work on halting payment flows and on improving early detection of such cases is ongoing. Vis-à-vis 2022, a positive trend can be noted whereby the number of reported incidents has continued to drop and is currently at a low level.

Again in 2023, the Bundesnetzagentur received complaints about international calls on mobile

phone bills. In addition, the agency also received complaints pertaining to the billing of short messages and multimedia messaging services (MMS) to international numbers. The Bundesnetzagentur's findings suggest that, in most cases, these connections were likewise made with the help of malware and without the knowledge of the parties affected. In the meantime, however, the agency has also become aware of individual cases in which the billing of international messages was the result of a SIM swap or what is also known as SIMjacking. In these cases, unidentified fraudsters were able (often by tapping/phishing data) to activate an eSIM card (embedded subscriber identity module) and subsequently generate messages at the expense of third parties. Often, the telecommunications service providers had already indemnified the end-users affected.

Third-party providers

As a result of procedures set out in 2019 by the Bundesnetzagentur to protect consumers, third-party services may only be billed via mobile phone bills under certain conditions. Either the customer has to be redirected during the process of paying for a third-party service from the third-party provider's website to a website of a mobile provider (redirect), or the mobile communications company has to implement various defined consumer protection measures (combination model). At 235 complaints on this issue during the reporting period, the total number of complaints received was again comparatively low. The Bundesnetzagentur examines such complaints and contacts the respective mobile providers on these issues. No measures had to be taken in 2023 against a breach of these regulations.

Number manipulation

During the reporting period, the Bundesnetzagentur continued its task of prosecuting cases of number manipulation, whereby it once again implemented its newly granted authority to investigate cases that displayed any evidence of manipulation. Within the applicable period for storing call data, the Bundesnetzagentur is authorised to request information from providers of a connection about the telephone number from which a call originated and the personal data necessary for prosecution of the number holder.

The number of complaints regarding suspected violations of the regulations on call number transmission was significantly lower than in 2022, thanks to a new provision taking effect as from 1 December 2022 that requires the Bundesnetzagentur to investigate number manipulation cases. According to this provision, the Bundesnetzagentur must ensure that no German telephone numbers are displayed as the caller's telephone number for calls that are transferred from foreign networks to the German public telecommunications network. In the event of non-compliance with this provision, the caller's number must be hidden. The adoption of this provision was based on the finding that a large number of calls with manipulated caller numbers displayed are routed through foreign networks to the German public telecommunications network. A person receiving a call from a German number should be able to feel confident that the call is from the authorised number holder.

In cases where it was possible to prove a violation of the provisions for number transmission in Germany, the Bundesnetzagentur exercised its authority to disconnect the telephone numbers used to set up the calls. In addition, relevant bans and prohibition orders were also imposed.

SMS and messaging spam, including relative-in-distress scam

In 2023, the Bundesnetzagentur received an unusually high number of complaints involving SMS and messaging spam. During the reporting period, a total of 96,655 complaints about unlawful messages sent via SMS or messaging services were recorded. This accounts for more than two thirds of the total number of complaints received in 2023.

The majority of consumers reported receiving messages that can be categorised as a family impersonation or relative-in-distress scam (around 60,000 complaints in total). This kind of scam involves situations where recipients receive unsolicited text messages that appear to have been sent by a relative of the recipient – usually their children or grandchildren – who has recently started using a new mobile phone number. The text messages urge the recipients to transfer money to help the sender posing as a family member out of a dire emergency. The recipients of the text messages are usually given a time limit of only a few hours to send the money and prevent an unfavourable situation for their alleged family member. The violations of criminal legislation in such cases allow the Bundesnetzagentur to exercise its authority and, pursuant to section 123 TKG, order numbers to be disconnected. During the reporting period, the Bundesnetzagentur exercised its authority and ordered the disconnection of several thousand mobile phone numbers used for messaging or advertised for purposes of returning calls.

The number of complaints involving consumers receiving messages in which, under one pretext or another, they are asked to “click” an internet link continued to be high in 2023. Such messages often contained information about alleged security issues with bank access data or the

imminent delivery of a parcel. Upon “clicking” the link, the recipients are redirected to a website where they are asked to enter their personal data, in particular their credit card details. To gain the confidence of unsuspecting users, these websites often had logos of reputed organisations such as credit institutes, savings banks or parcel delivery services. The data obtained would allegedly be collected for abusive purposes. The sending of these types of text messages often exposes the recipients to unreasonable harassment and consequently constitutes a violation of the provisions of the UWG. In such cases the Bundesnetzagentur regularly orders the sending numbers to be disconnected.

In addition to relative-in-distress and phishing scams, 2023 also witnessed several instances involving the unauthorised sending of purely promotional text messages, including for example unsolicited advertising for travel services.

By ordering the disconnection of sender numbers, the Bundesnetzagentur ensures that the disconnected numbers can no longer be used to send fraudulent text messages. Likewise, this measure also ensures that unlawfully advertised services can no longer be accessed

In addition to disconnecting numerous mobile numbers in 2023, the Bundesnetzagentur also disconnected a large number of geographic numbers as well as freephone numbers.

Fax spam

Unsolicited advertisements sent via fax transmission (junk faxes or fax spam) continued in 2023. Fax advertising and promotional campaigns are only permissible with the prior express consent of the recipient. The Bundesnetzagentur received 4,416 complaints related to fax spam in 2023 (as against 9,161 in 2022). The significant decline in the number of complaints – a downward trend that began in 2022 – thus continued. With numerous number disconnections, the Bundesnetzagentur’s consistent intervention also played an important role in combating fax spam.

Pop-ups (with error messages)

The Bundesnetzagentur has consistently disconnected a large number of phone numbers displayed on the computer in fake warnings and error messages called pop-ups. This scam warns of viruses and software problems that do not actually exist. The pop-ups display a telephone number that can be contacted for free help. The aim of the scam is to use remote diagnostics to pressure users into expensive, unnecessary or long-term maintenance and repair contracts. The payment methods specified often involve vouchers such as Google Play gift cards. Once the payment is made, the victim of the scam generally has no means of recovering the amount. Individual cases of financial losses in the upper four-figure range have been reported to the Bundesnetzagentur. This scam is also used for phishing personal data. The numbers shown on the PC are often registered using fake details. On a regular basis, the data of consumers that previously had contact with the supposed support staff are misused for this purpose. The Bundesnetzagentur regularly issues warnings to people not to call numbers displayed on pop-ups. According to the information provided on their websites, official error messages from Microsoft Corporation and Apple Corporation never contain telephone numbers.

Airline hotlines

In 2023, the Bundesnetzagentur disconnected various geographic numbers under which fake airline hotlines were operated. Some of the numbers were advertised on deceptively genuine-looking websites and could be found via internet search engines. The scammers posing as airline employees used the fake hotlines to try to obtain identification data, bank account information and credit card data. The unsuspecting victims were often asked to download software that enabled remote access. The numbers were generally registered to victims who had previously been in contact with a person posing as an employee of the airline. Recently, this type of abuse has, in a few cases, also spread to booking portals.

Other issues

As in previous years the Bundesnetzagentur received a large number of complaints in this reporting period that do not fall under any of the above categories.

To the maximum extent possible the Bundesnetzagentur also imposes the consumer protection measures at its disposal such as disconnecting telephone numbers. As part of its public relations, the authority provides information as early as possible about fraudulent groups of cases and, where possible, advises consumers on what action they can take.

Tracking unsolicited marketing calls

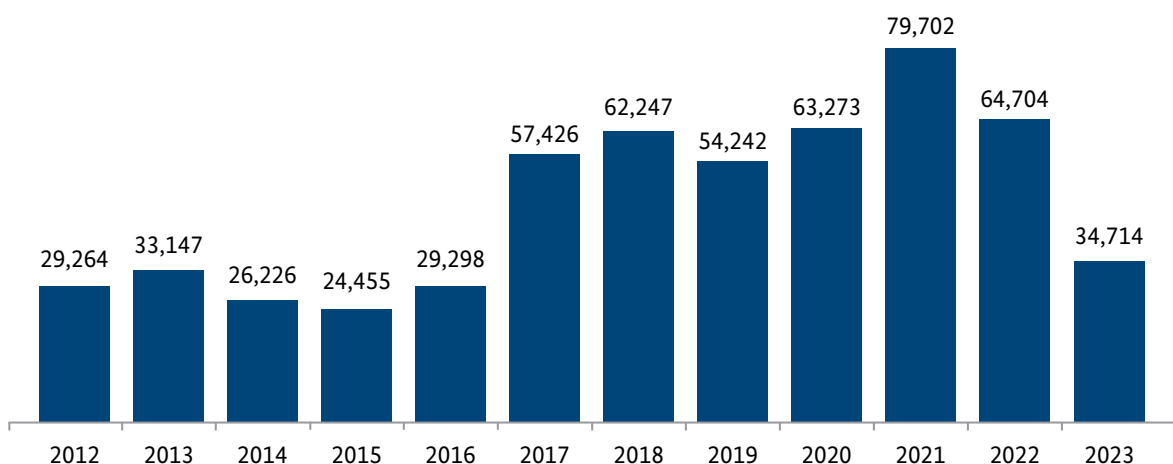
Each year, thousands of consumers continue to involuntarily fall prey to unsolicited telemarketing. Cold calls made without the prior express consent of consumers are prohibited by law. Cold calling is also prohibited if a recipient, before receiving a call, revokes their permission which they had granted earlier.

The Bundesnetzagentur has initiated proceedings against numerous companies and subsequently issued a total of eight fines amounting collectively to €1,435,500. Each of these proceedings was initiated in response to a large number of consumer complaints. The sum of all fines during the reporting period represents the highest amount that the Bundesnetzagentur has ever imposed in a single year for unauthorised telemarketing and the suppression of phone numbers. However, a ruling has not yet been passed for those cases in which the relevant companies have filed an appeal against the fines imposed.

A large number of extremely serious cases, involving not only gross negligence but also wilful intent on the part of companies and their executives in violating statutory regulations on unsolicited telemarketing, led to the Bundesnetzagentur's decision on imposing heavy fines. In four cases the Bundesnetzagentur had to almost exhaust the maximum statutory fine limit of €300,000 in response to the gravity and seriousness of the infringement caused by the unsolicited calls.

The four cases in question, all involving telemarketing campaigns by power supply and utilities companies, sparked off several hundred if not thousands of complaints, which the Bundesnetzagentur received within a very short space of time. In particular, consumers felt severely harassed by incessant telemarketing calls, one after the other in close succession, in which they were pressured by pushy salespersons or misled and manipulated into entering into contracts. In the reporting period the Bundesnetzagentur was able to identify a trend towards particularly severe harassment during cold calls.

Written complaints about unsolicited marketing calls



When it comes to the total number of complaints, however, we observe a different development: in 2023, the Bundesnetzagentur received 34,714 written complaints pertaining to unlawful telemarketing, considerably fewer than in 2022 when a total of 64,704 written complaints reporting unlawful cold calling were submitted by consumers. Following a significant increase in the number of complaints received – particularly during the pandemic years – the decline in the number of complaints in 2023 implied that the long-term average had once again been attained. The overall figure is nevertheless still extremely high.

From past experience we are aware that statistics pertaining to the number of complaints are subject to periodic fluctuations. According to the Bundesnetzagentur, a variety of mutually interacting factors is also responsible for the current trend. In addition to the consistent action taken by the Bundesnetzagentur against unauthorised telemarketing, it is likely that changes in people's lifestyle in the aftermath of the pandemic have also contributed to the decline in the number of complaints. As people are once again spending more time outdoors, they are less likely to be harassed by unwelcome calls at home. It is also likely that the recently introduced statutory transparency obligations for obtaining consumer consent for telemarketing have also resulted in a decline in the number of complaints.

In terms of the subject matter and categories of complaints, the highest number of complaints received by the Bundesnetzagentur in the reporting period dealt with unsolicited marketing calls for energy supply contracts and sweepstakes. Yet another frequently occurring topic of consumer complaints involved home improvement products.

In 2022, in addition to the prosecution of unsolicited telemarketing and imposition of administrative fines, the Bundesnetzagentur also continued its efforts in implementing the new transparency regulations on telemarketing consent that came into effect on 1 October 2021. Pursuant to these regulations, telemarketing companies are required to fully document and store consumers' express consent to marketing. In the administrative fines proceedings initiated in 2023 for unsolicited telemarketing, the Bundesnetzagentur has taken the opportunity to investigate any suspected violation of the obligations companies must fulfil with regard to the documentation and storage of consumer consent. In the context of these proceedings, and to ascertain compliance with the documentation requirements, the Bundesnetzagentur has asked the companies in question to produce documentary evidence of consumer consent. Breaches of the documentation and storage requirements may incur fines of up to €50,000.

Dispute resolution

Over the past 25 years, the Bundesnetzagentur's telecommunications consumer dispute resolution panel has been offering customers of telecommunications companies an alternative for settling disputes out of court. The dispute resolution procedure is free of charge for both telecommunications companies and customers. The aim is to reach a speedy and amicable resolution for both parties.

The telecommunications consumer dispute resolution panel is an official consumer conciliation body under the Act on Alternative Dispute Resolution in Consumer Matters (VSBG). In general, dispute resolution is available to all end-users. In this context, end-user refers to a user who neither operates public telecommunications networks nor provides publicly available telecommunications services. The provisions for a dispute resolution procedure are set out in a specific ordinance of the telecommunications consumer dispute resolution panel. These state for instance that end-users must take the initial step and attempt to settle the issue with the telecommunications company before submitting a request for dispute resolution.

In 2023 the telecommunications dispute resolution panel received over 3,000 requests for dispute resolution from customers of telecommunications companies. In 2,310 cases customers submitted a request to initiate a dispute resolution procedure. The number of requests in favour of an out-of-court settlement is thus almost as high as in 2022, when 2,389 requests were

received. In 2023 the panel also received 762 enquiries and requests for assistance, mostly relating to whether the facts presented in particular cases could be resolved through dispute resolution.

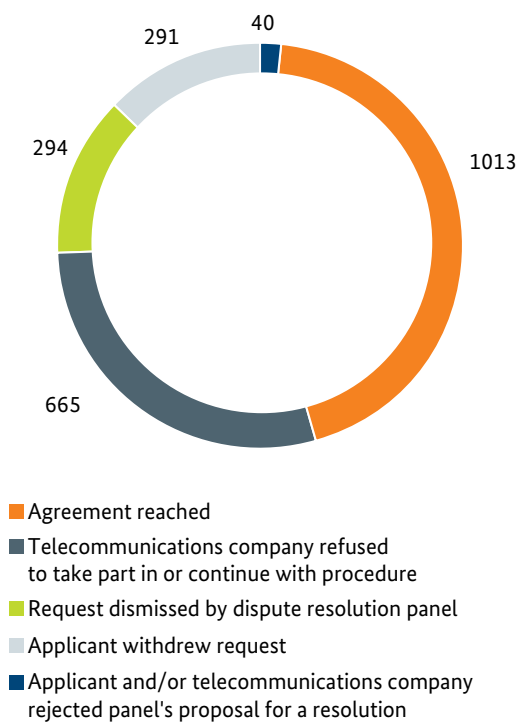
The majority of the dispute resolution requests involved disputes relating to the content and implementation of contracts, for example in connection with entering into and terminating contracts or unilateral modifications introduced by providers to existing contracts. Other examples included disagreements on the duration of a contract and the option for customers to terminate automatically renewed contracts at any time upon expiry of the minimum term with one month's notice. A number of cases related to faults and disruptions, billing complaints and reduced data transmission speeds. Dispute resolution requests also addressed issues such as relocation, provider switching or disconnection. Several dispute resolution requests involved contract disputes that were not related to the Telecommunications Act.

The dispute resolution panel handled and closed 2,303 cases in 2023. The parties reached an agreement in 1,013 cases, which corresponds to 44% of the dispute resolution cases that were concluded. In terms of the admissible requests that initiated a dispute resolution procedure, a success rate of 50% was achieved. Frequently, companies offer their customers a resolution once the procedure is underway. The dispute resolution panel provided a resolution proposal in 86 cases. In 46 cases, the disputing parties accepted the panel's proposal. In 665 cases the telecommunications companies implicated in the dispute resolution

procedure refused to take part in or to continue the procedure and offered no solution to the issue in hand.

In 291 cases, the applicants withdrew their requests, for example because the matter had been resolved swiftly.

Outcomes of dispute resolution procedures 2023



During the reporting period the dispute resolution panel rejected 294 inadmissible resolution requests. In relation to the number of cases that were admitted to initiate the resolution procedure, the rejection rate was 13% (as against 16% in 2022). Compared with 27% in 2021, the rejection rate thus dropped further in 2023. One of the reasons for this trend continuing in 2023 could be an amendment of the Telecommunications Act and the resulting expansion of the dispute resolution panel's area of responsibility as from 1 December 2021 to include new areas. Moreover, it is now possible to initiate a dispute resolution procedure over a dispute relating to the provisions set out in section 68 TKG. To initiate a procedure, the complainant is no longer required to prove that the telecommunications company has breached any specific customer protection rights set out in the TKG.

In accordance with the VSBG, additional information is published in the dispute resolution panel's annual activity report, which is available on the Bundesnetzagentur's website.

Broadband speed checker

For the eighth year in a row, the Bundesnetzagentur has published detailed findings from its broadband speed checker (<https://breitbandmessung.de/ergebnisse>). The relevant tests were carried out in the period from 1 October 2022 to 30 September 2023 (the eighth year the broadband speed checker has been in operation). The report covers a total of 305,035 valid tests on fixed broadband connections and 563,363 valid tests on mobile broadband connections.

As against 84.4% in 2021/2022, 85.5% of fixed broadband connection users across all bandwidth categories and providers enjoyed a speed that was at least half their contractually agreed maximum data transmission speed. Some 43.5% of users (as against 42.3% in 2021/2022) enjoyed a connection speed equivalent to or higher than their contractually agreed maximum speed. Slight improvements on the previous year were thus evident. As observed in previous years, more than half of all valid measurements revealed that end-users did not receive the contractually agreed maximum data transmission speed.

The ratio of actual to agreed estimated maximum data speed for mobile broadband connections was once again well below that for fixed broadband connections. Across all bandwidth categories and providers, 25.5% of users (2021/2022: 23.2%) enjoyed a speed that was at least half their contractually agreed estimated maximum speed. A further 4.0% of users (2021/2022: 3.0%) enjoyed a connection speed equivalent to or higher than their contractually agreed estimated maximum speed. Once again, the results have improved on the previous year.

The test results depend on the price plans agreed between the users and their providers. It is therefore not possible to draw conclusions from the results about broadband coverage or the availability of broadband internet access services.

The first Mobilfunkmesswoche NRW (mobile network measurement week calling upon citizens to record the network availability of their mobile network providers with the aim of identifying gaps in mobile network coverage) was held in North Rhine-Westphalia from 27 May to 3 June 2023. As part of the initiative, users were able to record the network availability of their mobile providers and report dead spots with the help of the Bundesnetzagentur's broadband speed/dead spot checker app. The mobile network measurement week is an initiative of mobile communications coordinators in the districts and municipalities of the state of North Rhine-Westphalia with the aim of providing a more accurate map of mobile network coverage at a local and state-wide level. The Bundesnetzagentur supported the mobile communications coordinators in evaluating the data.

Basic set of telecommunications services

The new TKG, which took effect on 1 December 2021, gives everyone in Germany the right to be supplied with telecommunications services, comprising voice communications services, internet access services and the necessary connection, thereby also ensuring adequate social and economic participation for every citizen. The minimum requirements for internet access service are laid down in the Telecommunications Minimum Supply Ordinance (Telekommunikationsmindestversorgungsverordnung, TKMV) which entered into force in June 2022, whereby a minimum download speed of 10 Mbps, a minimum upload speed of 1.7 Mbps and a maximum latency of 150 ms were defined as the minimum requirements. These specifications were based on expert reports and involvement of the general public. In particular, the Bundesnetzagentur took into account the minimum bandwidth, upload rate and latency used by at least 80% of consumers in Germany as well as other national circumstances, such as the impact of the specified quality on incentives for private-sector broadband expansion and broadband promotion measures.

The Bundesnetzagentur reviews these minimum requirements on a yearly basis. To this effect, the Bundesnetzagentur prepares a review report, which requires the consensus of the Federal Ministry for Digital and Transport (BMDV) and the Committee on Digital Affairs of the German Bundestag. This report should outline modifications or upgrades, if necessary, to the minimum requirements of the TKMV and the extent thereof. In order to reach a consensus on the first version of the TKMV in 2022, the Committee on Digital Affairs of the Bundestag also asked for clarification on several issues regarding potential future upgrading. In view of the potential

rise in demands placed on the provision of telecommunications services, empirical studies should address the following aspects:

- Analysis of parallel usage scenarios for multi-person households and their impact on the minimum requirements of the TKMV.
- Identification of further quality parameters, in addition to download and upload bandwidths and latency, which could be crucial for the stable usage of the services covered by the universal service.
- Analysis of transmission technologies that could be suitable for meeting the minimum requirements.
- Developing a valid database on the minimum bandwidths actually available in Germany in relation to individual households.

The relevant experts were commissioned by the Bundesnetzagentur between February and August 2023. The findings in the expert reports serve as the basis for reviewing the minimum requirements of the TKMV. Nearly all expert assessments were completed by the end of the year. The completed expert reports are available on the Bundesnetzagentur's website.

<https://www.bundesnetzagentur.de/694094>

The right to be supplied with telecommunications services also stipulates that a basic set of services must be affordable for all consumers. The Bundesnetzagentur published its principles for calculating affordable prices on 16 August 2022. A distinction is made between one-time connection fees and monthly rates. The federal average of prices for products and connections that are comparable to a basic set of services is taken as a reference for determining affordable prices. The average price does not take into

consideration any specific technology. On 21 November 2022, the Bundesnetzagentur began surveying data across all districts in Germany in order to determine the average prices for monthly services and connection prices. An amount of €30 including VAT was deemed an affordable price for monthly services. When surveying data to determine the average price for connections, including the connection set-up fees, additional data is collected in order to ensure accuracy. The Bundesnetzagentur considers several additional criteria for purposes of finalising the affordable price for connections, including the connection fees.

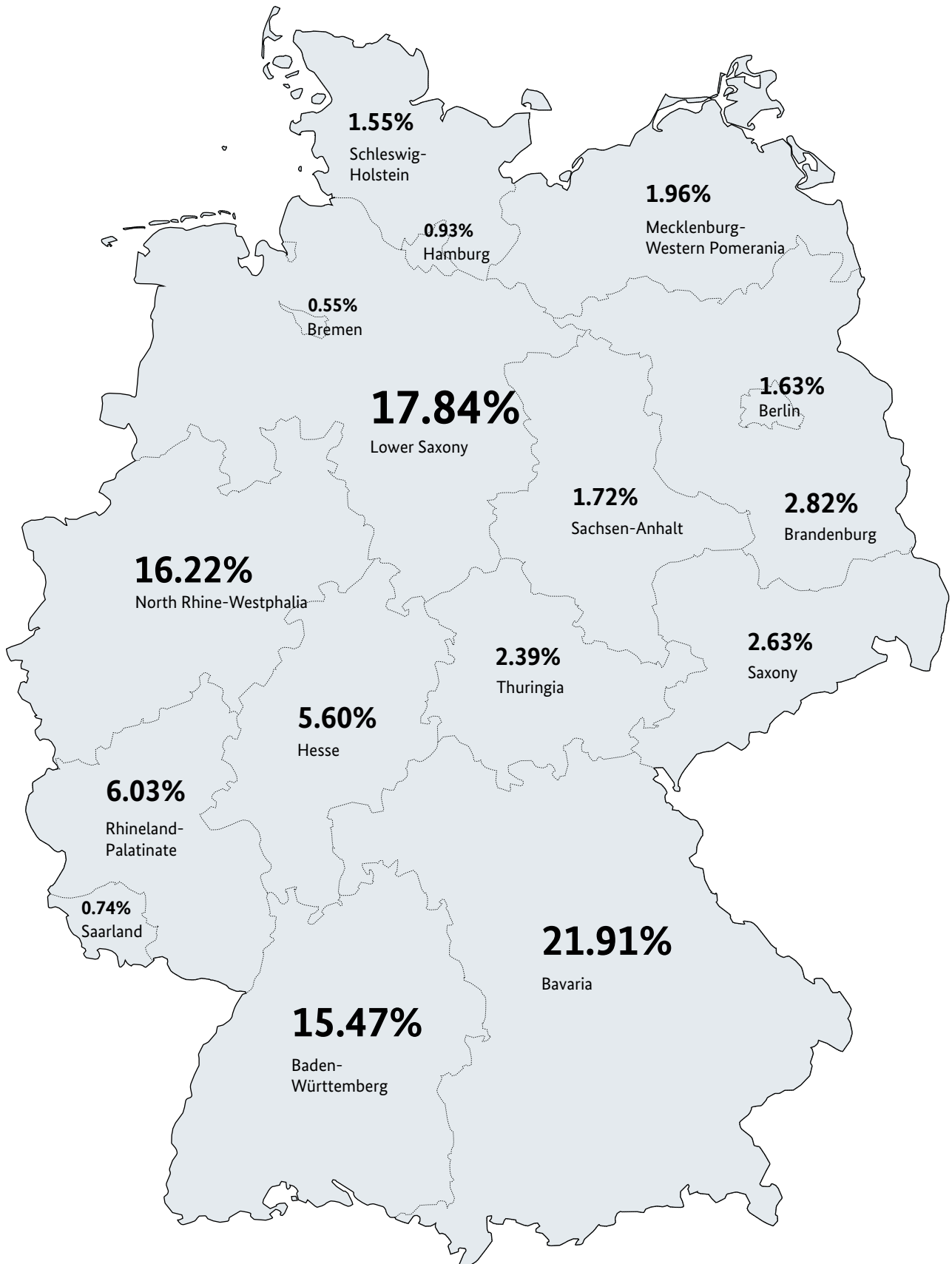
Citizens are entitled to the basic set of services in areas where the Bundesnetzagentur has identified both an undersupply of and a need for providing services. Areas with an undersupply are mainly areas without access in the objectively foreseeable future to affordable telecommunications services that meet the minimum requirements set forth in the TKMV. If the Bundesnetzagentur identifies an undersupply in a particular area, companies have one month to volunteer to provide the set of basic services. If no company volunteers, the Bundesnetzagentur will usually oblige one or more companies within three months to provide the services. These companies must then begin work on providing access to the services within three months and the services must generally be available within another three months.

Obligations under the right to be supplied with telecommunications services can place individual companies under undue pressure. In such cases, companies may be granted financial com-

pensation under certain conditions. The Bundesnetzagentur is currently working on the principles for calculating net costs and intends to publish them in the first half of 2024 following consultation with the undersupplied districts. The Bundesnetzagentur is also responsible for planning and operating a financing mechanism or levy procedure, whereby telecommunications companies contribute to a universal fund that is used to compensate obligated companies for incurring unreasonable financial burdens.

The Bundesnetzagentur has received around 5,869 enquiries about the provision of basic services since the new TKG came into force in December 2021. Following the adoption of the TKMV on 1 June 2022, the Bundesnetzagentur received on average 44% more enquiries per month than in the period from 1 December 2021 to 31 May 2022. The following map shows the percentage of enquiries from each state:

Queries about basic telecommunications services by state since 1 December 2021



Between 1 December 2021 and 18 December 2023, the Bundesnetzagentur – also with the involvement of telecommunications companies – was able to process and close around 5,066 of the approximately 5,869 enquiries that were submitted.

Of these enquiries, 87% involved consumers who reported an undersupply of services. A further 10% of the enquiries were submitted by companies and the remaining 3% by associations and other institutions that were neither consumers nor companies.

Thanks to its latest empirical study, the Bundesnetzagentur now has at its disposal additional data for processing the submitted enquiries and for extending its scope on monitoring the market. The results and the data from this empirical study are included in assessing the undersupply of services in accordance with section 160(1) TKG. Moreover, this data can also be used to better identify and monitor undersupplied regions.

To date, 13 cases of undersupply with an actual need to supply basic services to around 30 areas (consisting of one or more sites) in the states of Lower Saxony, North Rhine-Westphalia and Hamburg have been determined and published. With the exception of one instance, all other undersupply cases were either settled and/or revoked. The procedures are published regularly and are available on the Bundesnetzagentur's website.¹ In the event that an undersupply continues in identified areas as no operator volunteers to provide the basic set of services, a decision must be issued in accordance with the provisions of section 160 et seq TKG to oblige a telecommunications company and commit them to the task of providing the minimum services. Barring those cases that have been settled and/or revoked, all undersupply cases to date have been contested by telecommunications companies and are being disputed.

¹ <https://www.bundesnetzagentur.de/DE/Fachthemen/Telekommunikation/Grundversorgung/Unterversorgungsfeststellungen/start.html>

Roaming

The 2022 revised version of the European Union's Roaming Regulation was extended to ensure that consumers can continue to enjoy mobile services at domestic prices without compromising on quality when travelling within the European Union (roam-like-at-home/RLAH principle). In addition, the revised version contains several new provisions to ensure greater transparency for consumers, for example with regard to (alternative) emergency call services available in the European Union and charges for calling special numbers and value-added services in Member States.

The Bundesnetzagentur is available for consultation to providers of roaming services so as to ensure that any new price plans, prior to their introduction, are in compliance with the Roaming Regulation. Providers of roaming services are also obliged to notify the Bundesnetzagentur of the introduction of any fair use policies. Upon receiving notification, the Bundesnetzagentur is required to examine the fair use policy in order to ensure compliance with the provisions of the Roaming Regulation and the relevant Commission Implementing Regulation (EU) 2016/2286.

The Bundesnetzagentur investigated cases of fair use policies that did not comply with the Roaming Regulation (ie the limit was too low), in particular for a price plan that was advertised as a flat rate with an unlimited data volume in the domestic network. The price plan advertised as a domestic flat rate also included a specific data roaming volume for other European countries. In the course of the investigations, the company in question amended its disputed terms to ensure its price plans complied with the Roaming Regulation. As a result, customers of this company now enjoy a larger data volume while roaming.

Intra-EU communications

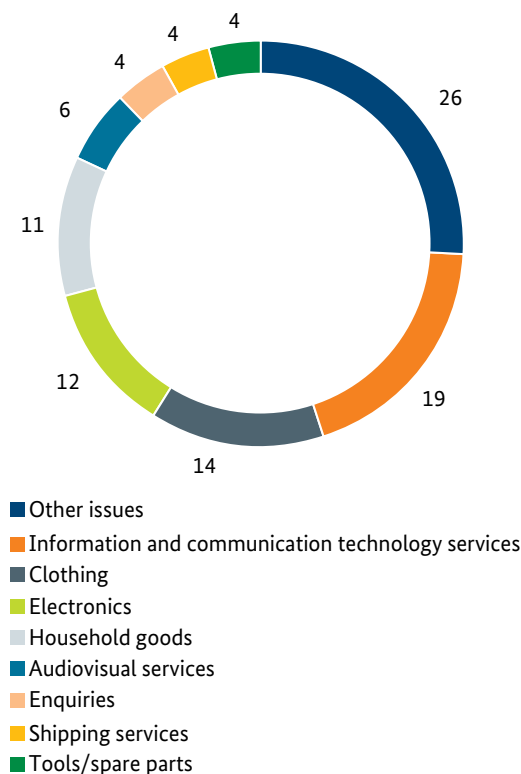
Price caps for voice calls (€0.19/minute net) and SMS messages (€0.06/SMS net) from the country of origin (Germany) to another Member State and associated rules for regulated intra-EU communications were introduced by EU Regulation on 15 May 2019. Ever since, the Bundesnetzagentur has continually monitored the products offered on the market by mobile and fixed network providers of intra-EU communications and taken action when it has encountered infringements.

Regular monitoring found various providers to be in breach of the applicable price caps for specific call destinations, especially in the outermost regions of the European Union. Upon initiating proceedings, the companies in question were urged to remedy the infringements. The providers concerned complied with the Bundesnetzagentur's request in good time and adjusted their price plans in accordance with the price caps stipulated in the EU Regulation.

Geo-blocking

The Geo-blocking Regulation (EU 2018/302) is part of the European Union's strategy to create a digital single market. The Regulation addresses unjustified discrimination against customers in the European Union based on their nationality, residence or place of establishment. It aims to remove barriers to cross-border business between providers and customers for the sale of goods and provision of services. The Geo-blocking Regulation applies to both online and bricks-and-mortar retailers. Its key provisions cover access to online interfaces, non-discriminatory treatment when purchasing or accessing goods and services, and non-discriminatory treatment in connection with payments. Some sectors are not covered by the scope of the Geo-blocking Regulation, including audiovisual, healthcare, financial, telecommunications and transport services. Likewise, the Regulation does not cover access to electronically supplied services, the main feature of which is the provision of access to or use of copyright-protected works or other protected subject matter. The Regulation also specifies that a customer buying goods is not entitled to delivery to a location outside the provider's field of activity. Consumers can submit their complaints to the Bundesnetzagentur online using the Bundesnetzagentur consumer portal and the Federal Portal. In 2023, 140 cases were reported, chiefly in connection with orders for media content, clothing, electronic equipment and home appliances. An increasing number of complaints have been received regarding the provider's refusal to permit the use of certain parcel forwarding services.

Enquiries and complaints related to geo-blocking (%)



Once again in 2023, the Bundesnetzagentur worked closely with the European Commission, other EU countries' national authorities responsible for the enforcement of the Geo-blocking Regulation as part of the consumer protection co-operation procedure, and with the European Consumer Centre Germany (ECC).

Introduction of the 116 016 “Violence against women” support hotline

In June 2023, the “Violence against women” hotline 116 016, available free of charge and without interruption from all public networks, started operation throughout Germany.

The EU Commission has reserved numbers beginning with 116 xxx for harmonised services of social value. The initiative to introduce a uniform Europe-wide telephone number for national support hotlines for violence against women began during Germany’s presidency of the EU and was diligently supported by the Bundesnetzagentur in the relevant bodies.

Following its reservation by the EU Commission, the Bundesnetzagentur assigned the telephone number 116 016 to the Federal Office of Family Affairs and Civil Society Functions (BAFzA) as a “Violence against women” support hotline. Public tendering normally conducted for the award of a harmonised service of social value was waived in the case of 116 016 because the BAFzA is legally required to deliver this service.

Market surveillance

The Bundesnetzagentur’s market surveillance activities are based on the EU Regulation on market surveillance and compliance of products and the German Market Surveillance Act (MüG), Electromagnetic Compatibility of Equipment Act (EMVG) and Radio Equipment Act (FuAG).

Again in 2023, the Bundesnetzagentur screened electrical and radio equipment from both online and brick-and-mortar retailers.

In the scope of the online market surveillance in 2023, more than 2,400 offerings involving over 64 million devices were identified as non-compliant and taken off the relevant e-commerce platforms.

In 2023, the Bundesnetzagentur examined around 3,000 device and equipment categories on offer in bricks-and-mortar retail. The Bundesnetzagentur was required to take action in over 1,000 cases involving more than 8 million devices.

Furthermore, the Bundesnetzagentur also intensified its cooperation with the competent regional authorities, in particular in the field of product safety, and with the market surveillance authorities in Germany’s neighbouring countries with the aim of removing non-compliant products from the EU single market. For example, a project to rate “wallboxes” was launched in November in cooperation with representatives from North Rhine-Westphalia.

In 2023, the Bundesnetzagentur was notified by the customs authorities of more than 5,100 suspicious consignments. Of these, 92% were particularly conspicuous and had received no clearance for the European market. More than 860,000 products were affected by the import ban.

In order to improve the reporting options for non-compliant products, a web-based platform went live in September 2023 (<https://verwaltung.bund.de/leistungsbeantragung/de/leistung/99118055261000/herausgeber/LeKa-103356009/region/00#0>).

Free choice of terminal equipment

In order to gain network access at the passive network termination point, users of public telecommunications networks can choose whether they wish to obtain a telecommunications terminal device from their network operator or one that is commercially available on the market. The rights and obligations of network operators and customers in this regard are set out in the Telecommunications Act in sections 73 and 74 TKG. The freedom of choice of telecommunications terminal equipment is often referred to in the media as “router freedom”. However, this term is misleading, as the statutory freedom of choice covers not only the functions of access router but also those of modems irrespective of whether these devices are integrated or physically separate units (modem and router).

According to section 73(2) TKG, the Bundesnetzagentur may permit exemptions from the principle of the passive network termination point by virtue of a general administrative order. Such exemptions, however, must be due to compelling grounds that are objective and verifiable.

In 2023, associations of the fibre optics industry and network operators jointly submitted an application to the Bundesnetzagentur to grant an exemption for passive optical access networks. Such networks would render the modem (optical network termination) a component of the network, whereby the consumer would no longer be entitled to freely choose between a device provided by the operator and a commercially available device.

The application review procedure involved the analysis of the technical information provided in

numerous documents and on-site visits to the laboratories of telecommunications terminal equipment manufacturers and network operators. In this regard, the key issue was to assess if adhering to the currently applicable passive network termination point principle would inevitably lead to a severe, systemic impact on operations and security in fibre-optic networks. The extensive work associated with this was carried out and was completed in December 2023. The decision on the application submitted by the associations is subject to technical assessment by the specialist section and is expected in 2024.

Investigating interference – the radio monitoring and inspection service

In the wake of the rising impact of digitalisation and increasing technical challenges in our everyday lives, the Bundesnetzagentur continues to make an important contribution to consumer protection by dealing with radio interference through its radio monitoring and inspection service. In 2023, the radio monitoring and inspection service resolved over 2,900 cases of electromagnetic incompatibility and radio interference on site. More than 1,600 of those cases concerned people with direct consumer issues related to everyday radio applications in households such as radio reception, WLAN networks, mobile service, wireless headphones and wireless garage door openers. In well over 16,000 cases of radio interference reported in 2023, the help desk staff of the fault reporting service was responsible for providing telephone advice and responding to online queries from consumers.

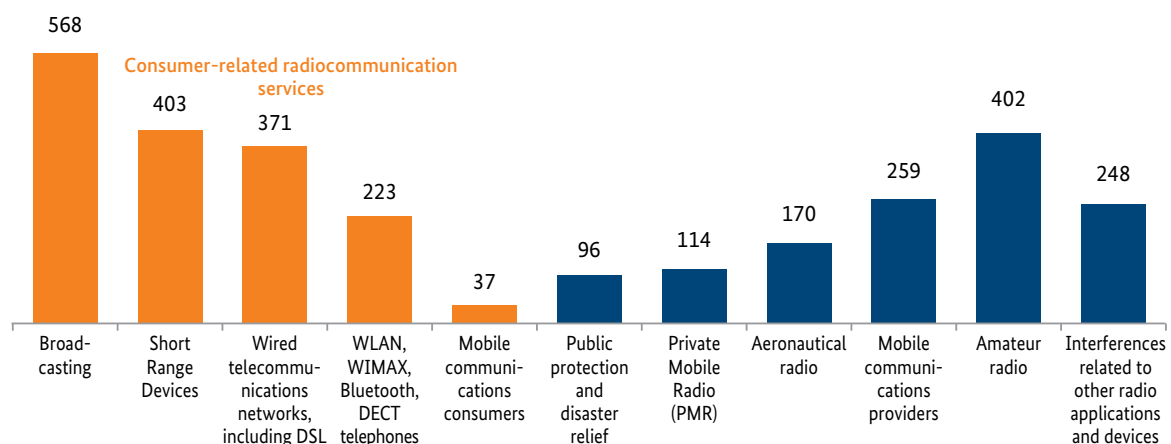
In addition to dealing with consumer-related interference, the radio monitoring and inspection service is also responsible for ensuring the interference-free operation of safety-critical

radio and telecommunications services, in particular aeronautical radio, radio communication for public protection and disaster relief, and maritime and inland waterways services. To fulfil these responsibilities, the fault reporting help desk is open around the clock and the radio monitoring and inspection service is always on standby. Thanks to its availability and organisational set-up, the radio monitoring and inspection service makes an important contribution to the efficient and interference-free use of the frequency spectrum and maintaining and safeguarding the critical infrastructure.

As part of the German government's digitalisation initiative, the radio monitoring and inspection service's portfolio was expanded in 2023 to include the online fault reporting service. Since autumn 2023, citizens, companies and institutions can also avail of the user-friendly and interactive form on the Federal Portal to report radio interference conveniently to the Bundesnetzagentur online.

The radio frequency interference service is available free of charge to institutions, companies, consumers, as well as to those who have unintentionally caused radio interference.

Interference volumes by type of service 2023



*Rulings,
activities and
proceedings*



The regulatory decisions issued by the Bundesnetzagentur safeguard competition in the telecommunications market and provide a framework for undertakings to invest in modern networks. The Bundesnetzagentur ensures a level playing field. In 2023, it intensively prepared the future usage of mobile spectrum that will become available again after 31 December 2025.

Gigabit Forum

Set up by the Bundesnetzagentur in March 2021, the Gigabit Forum is a platform where market players, ministries and authorities meet and discuss the framework conditions for promoting investment and competition for an accelerated transition to gigabit infrastructure. The German government's Gigabit Strategy highlights the Gigabit Forum as the key platform for reaching understanding on common principles, positions and standards for the rollout of high-capacity networks and the migration from copper to fibre networks.

Copper to fibre migration

As the fibre rollout continues, the subject of copper to fibre migration is becoming increasingly important. In this connection, relevant, migration-related issues are already being discussed at an early stage in the Gigabit Forum on an ongoing basis.

A multitude of practical issues arise in connection with the migration to fibre networks – and especially with regard to the prospective decommissioning of the copper infrastructures. In light of this, the Gigabit Forum established in February 2024 a framework for the launch of the first pilot projects for the copper to fibre migration. These projects focus on, among other things,

communication with end-users, the cooperation between the telecommunications undertakings involved, and the processes and IT implementations that the rollout will involve. The aim of these pilot projects, which are limited to very small areas, is to gather practical experience with these matters in the course of actual normal operations. This will make it possible to gain valuable insights for facilitating the later overall process. The Wissenschaftliches Institut für Infrastruktur und Kommunikationsdienste (WIK) will conduct accompanying research for these projects and evaluate them.

In addition to these pilot projects, attention is already being directed to the pending transition and to best answering open questions for the groups that will be particularly affected by the copper-fibre migration, namely, business customers and building owners. These activities aim to raise awareness at an early stage among this group and motivate it to migrate to fibre.

Open Access

Another focus of the Gigabit Forum is on open access, when operators voluntarily open up their fibre networks to other providers of telecommunications services. The players represented in the Gigabit Forum have the common goal of achieving market-negotiated open access for all fibre networks.

A three-stage plan has been developed to achieve this goal. It can be retrieved (in German) under the header Open Access at www.gigabitforum.de. Building on the assessment conducted in 2023, which determined the status quo of voluntary open access in the marketplace, work now revolves around developing reference points for agreements on open net access in order to help surmount existing obstacles in negotiations and reduce transaction costs. The focus here is firstly on layer 2 bitstream access since, according to a market survey, this is the wholesale product most in demand. In addition, work is being taken up on standardisation issues for further wholesale products, such as fibre local loops.

Aiming to support market-wide open access at technical and process level as well, a working group for interfaces and processes is developing a modern interface architecture for the exchange of access products that accommodates the requirements of fibre networks. This is being done parallel to the work by the project group.

Monitoring of duplicate fibre infrastructure projects

In the course of the currently very rapid expansion of the fibre network, undertakings are increasingly competing to be the first to develop the respective areas. The competition over the rollout has been a key driver behind the progress already achieved in increasing the availability of fibre lines. German and European Union lawmakers clearly declared their commitment to this by including the introduction of infrastructure competition in their objectives.

However, when the playing field is not level in terms of fairness and equal opportunity, competition over a rollout area can potentially lead to individual undertakings adjusting their rollout plans with the result that there is initially no rollout in individual subareas. The withdrawal of individual undertakings from rural areas in particular could thwart the goal of a nationwide rollout.

In light of these countervailing mechanisms, public discussion has given growing attention to the subject of “duplicate fibre infrastructure” over the past year. This issue is being increasingly addressed by Deutsche Telekom AG’s competitors and the industry associations of the undertakings that compete with Deutsche Telekom. It is clear from the published expert opinions and position papers just how diametrically opposed the positions of the market participants involved are. This is a highly complex topic of enormous economic importance because of its potential consequences. In light of this, a valid basis and thorough review are needed in order to be able to assess the issue.

The Bundesnetzagentur and the Federal Ministry for Digital and Transport (BMDV) therefore established a monitoring unit in July 2023 to identify and collect information on duplicate fibre infrastructure projects. This monitoring unit is a key element in the German government’s Gigabit Strategy and has the task of conducting a comprehensive situation analysis. The primary focus of this work is on systematically collecting data on duplicate fibre infrastructure projects on an ongoing basis in order to be able to make an informed, sound assessment of the competitive situation – including possible impediments.

Assessing the competitive situation requires the most precise possible insights into the planning and rollout processes locally. The monitoring unit will enable such insights. It focuses on two groups of players in particular: firstly, the telecommunications undertakings involved in rollouts and, secondly, local authorities and their departments and/or decision-makers. Moreover, players that are involved in or affected by this issue in some other way can also contact the unit.

The focus of the Bundesnetzagentur’s analysis is on bundling similar cases and, where applicable, identifying any patterns of possibly objectionable practices. The purpose here is not to handle or solve individual cases but rather to generate an overall picture from a large number of individual cases and the critical assessments of them.¹ It should be noted in this connection that it is not possible to analyse the respective undertaking’s strategic motives based on the accounts provided by the telecommunications undertakings or local authorities. Additionally, it is in some cases not possible on the basis of said accounts to unequivocally reconstruct the respective circumstances and particularly the chronological order of the

¹ Where necessary, the Clearing House for Duplicate Fibre Rollout at the Federal Government’s Gigabit Office can review individual cases (<https://gigabitbuero.de/clearingstelle-glasfaser-doppelausbau-des-gigabitbuero-des-bundes/>).

rollout planning and announcements.

In light of this and in order to further round out the overall picture, the Bundesnetzagentur conducted a more extensive assessment of a selection of cases in the course of in-depth talks. The cases were chosen on the basis of various criteria. One crucial criterion was the potential for obtaining insights that would lead to a more precise understanding of the competitive environment. As another criterion, when selecting cases for further analysis, the Bundesnetzagentur attached great importance to having a balanced sample of the players involved plus geographic heterogeneity.

At the time of the cut-off date for this report it was not yet clear whether and to what extent it would be possible to identify specific patterns and assess them on an overall basis despite the previously mentioned complex interrelationships and attendant heterogeneity.

Market regulation

Issue of a regulatory order to Lebara Limited concerning the mobile termination market

On 16 March 2023, Ruling Chamber 3 issued a regulatory order for Market 2 regarding Lebara Limited.

Lebara Limited is a mobile services provider that has operated a nationwide public (virtual) cellular mobile network as a full mobile virtual network operator (full MVNO) since May 2022, offering termination service using mobile services phone numbers. Prior to this time, Lebara Limited had operated as a light MVNO. Lebara Limited originally used Telekom Deutschland GmbH's mobile network to provide its services. When it began operating as a full MVNO, it switched to the mobile access network of Telefónica Germany GmbH & Co. OHG from which it has purchased wholesale products since August 2022 in order to provide retail services. Since switching network operators, Lebara Limited manages not only retail customer relations, but has also assumed the management and operation of the virtual mobile network. It has its own blocks of telephone numbers for mobile services.

In light of this development, the President's Chamber of the Bundesnetzagentur updated its determination BK1-20/003 of 26 October 2020. The updated determination establishes that the undertakings Argon Networks UG, Lycamobile Germany GmbH, Multiconnect GmbH, Sipgate Wireless GmbH, TelcoVillage GmbH, Telefónica Germany GmbH & Co. OHG, Telekom Deutschland GmbH, Truphone GmbH, Vodafone GmbH, Voiceworks GmbH and the respective undertakings associated with them are undertakings with market power that dominate

the national market for call termination service in individual mobile networks.

The President's Chamber of the Bundesnetzagentur stated in its summary BK1-22/002 from 15 March 2023 that "in addition to the undertakings named in the present determination, the undertaking Lebara Limited likewise has significant market power within the meaning of section 11(1) sentence 1 and 11(4) TKG in relevant national markets for call termination at wholesale level in individual mobile networks". The regulatory order of 16 March 2023 was issued to Lebara Limited on the basis of this summary determination.

This first-time regulatory order to Lebara Limited imposed on it – like other regulatory orders previously issued to the other undertakings named above – obligations to provide interconnection, to collocate, to not discriminate, to submit agreements, and to maintain transparency in the market for call termination at wholesale level in individual mobile networks.

Revocation of regulatory orders concerning the market for call termination in individual fixed networks

Ruling Chamber 1 reviewed the "market for termination services at wholesale level in individual fixed networks" (BK1-23/001). Its finding – that the market is no longer in need of regulation – was released for consultation on 20 September 2023. The results of the consultation process were published in early November 2023.

Parallel to its determination, Ruling Chamber 3 initiated for each of 65 (alternative) access network operators proceedings to revoke regulatory orders in the market for termination services at wholesale level in individual fixed networks.

The regulatory orders from 20 December 2016 and 27 July 2020 and from 29 September 2020 and 26 February 2021 imposed access and rate approval obligations on the relevant parties.

The revocations of these regulatory orders were pronounced on 18 December 2023. As a result, the market has been deregulated since 1 January 2024.

Approval of charges for removal projects

Telekom Deutschland GmbH submitted an application for the approval of charges for removal projects on 13 March 2023.

The removal of MDF collocations throughout the entire federal territory (total removal) was approved with the charge approval issued on 22 May 2023. Telekom Deutschland GmbH anticipates a nearly nationwide "decommissioning of MDF collocation areas" by the end of 2028. The removal is a consequence of the current migration from copper local loops to VULA/bitstream products and the already concluded migration from PSTN to NGN interconnection.

The competent ruling chamber approved the proposed (Excel-driven) calculation method, including its premises and parameters, for all project agreements that have already been – or will be – concluded with Telekom Deutschland GmbH for the "complete removal" of collocation areas that are specific to individual carriers.

A further element of the approval are the rate-related payment conditions set forth in the (standard) project agreement submitted by Telekom Deutschland GmbH.

The project agreement (Agreement on Standard Removal of MDF Collocation) underpinning the charge approval provides that starting 2029

Telekom Deutschland GmbH shall remove the MDF collocation areas nationwide over a period of approximately five years. Here, the collocation partners agree to make graduated advance payments for the removal costs attributable to them. They will benefit from synergies and significantly discounted charges for the overall project compared with the removal that the Ruling Chamber previously approved on grounds of “individual terminations”.

Due to the type of charge approval (approval of a calculation method), it will not be necessary to approve carrier-specific project charges in approximately 70 individual approval procedures.

The calculation method submitted for approval satisfies the bottom-up long-run incremental costs plus (BU LRIC+) criterion. The efficiencies and synergies resulting from full removal are taken into account with regard to their impact on the costs. The calculation contains several points where potential savings were pre-set on a flat-rate basis that was favourable to the contracting parties; the estimate of the potential savings would have been higher if the assessment had factored in the costs more precisely.

The Agreement on the Standard Removal of MDF Collocation enables very substantial cost advantages (that vary from carrier to carrier) for collocation partners compared with a removal that is part of a carrier-specific removal project or individual removals based on the provisions of the reference local loop offer.

Rate approvals for collocation electricity, air conditioning/ventilation technology and manual meter reading

During the reporting period, Ruling Chamber 3 issued positive decisions in two procedures to approve rates for collocation electricity and air conditioning/ventilation.

In response to the application submitted by Telekom Deutschland GmbH on 23 November 2022, it approved in the first instance on 28 April 2023 rates for the period from 1 December 2022 through 31 July 2023.

The decision covered, among other things, the extent to which price developments on the electricity spot market on the one hand and price-stabilising measures – such as the electricity price brake – on the other hand impact wholesale prices.

On 19 May 2023, Telekom Deutschland GmbH submitted a (follow-on) application for the approval of rates for collocation electricity and charges for the provisioning of air conditioning/ventilation technology starting 1 August 2023. This was the first time since 2012 that an application to charge for the manual reading of electricity meters was made.

The ruling chamber issued its decision on the application on 31 October 2023. The approval is valid until 31 July 2024.

The most recently approved rates for collocation electricity and the charges for providing air conditioning/ventilation, which are to be determined based on length of the lease agreement, are slightly higher than the previously approved rates. The charge for physically reading the electricity meters could not be approved in the course of this procedure for lack of verifiable cost documentation.

Due to the European Commission's new imputed interest rate, the ruling chamber had to forward its decision to BEREC and the national regulatory authorities in the EU area for consolidation purposes. When setting the reasonable interest rate, the ruling chamber had to take into account the WACC Communication which was issued by the European Commission on 6 November 2019 (2019/C 375/01) and whose input parameters are updated annually by BEREC. A nominal WACC of 5.06% (real: 2.96%) was approved. The Commission accepted the interest rate that the ruling chamber had set with due regard to the macro-economic situation.

Approval of charges for collocation and distributors

The subject of this procedure was the charges that had to be approved again starting 1 December 2023 for a number of services in connection with local loop collocation at the main distribution frame and for services in connection with local loop access via distribution cabinets on the main cable and via distributing boxes on the distribution cable, and with access to distributing boxes. Some of the charges could be approved as proposed. Apart from that, cuts were made to the application.

The cost statements, framework agreements and accounting documents submitted by Telekom Deutschland GmbH were largely suited for determining the costs of efficient service provision; as a result, it was possible to rely almost exclusively on these documents. The services provided by external contractors and subcontractors in the course of removal measures as well as the flat-rate charges for materials and assembly ensure that the competitors and applicant are treated equally.

The rudimentary documentation submitted by Telekom Deutschland GmbH for the costs of "manual meter reading" was not suited to serve as a basis for approving the proposal. An analysis of reference markets was then used to determine these costs.

As a result, the flat-rate charges for the "Based on working expenses" positions that were approved after being adjusted are significantly lower than the proposed values. However, the approved charges are, on average, higher than the previously approved charges.

The approved service charges (some of which were approved up to 2028) also constitute the basis for future project agreements on collocation removal (see decision BK3a-23/001 from 22 May 2023). Removal is expected to be carried out on a cross-carrier basis at most MDF locations starting 2029. The approved charges will not have any negative effects on removal agreements that have already been concluded. They will ensure the continued attractiveness of new projects that are to be negotiated.

Approval of rates for duct access

On 10 October 2023 Telekom Deutschland GmbH submitted an application for approval of its rates for access to its civil engineering; this proposal covered the rates for duct access and the use of masts and support systems for overhead lines.

The background to the application is the regulatory order BK3i-19/020 of 21 July 2022 which obligates Telekom Deutschland GmbH to grant access to conduit systems existing at the time of the request and to masts and support systems for overhead lines for the purpose of building and operating high-capacity networks at fixed locations. This obligation is broader than has been the case in the past and applies not only to conduit systems between MDF and street cabinets but also to conduit systems in the distributing box area. The obligation also includes access to microducts. This particular reference offer procedure is already pending in the ruling chamber (BK3b-23/006).

The regulatory order also obligated Telekom Deutschland GmbH to submit for approval a proposal for rates for accessing its civil engineering in accordance with section 38(1) TKG in conjunction with section 40 TKG. Telekom Deutschland GmbH fulfilled this obligation with its submission of the above-mentioned application. The

application contains provisioning charges as well as one-off charges. It does not cover the rates for the use of conduit systems in connection with local loop access at street cabinets which were approved for the period 28 June 2022 until 30 June 2025 (decision BK3a-22/003).

In reference to section 38(5) para 3 TKG (according to which rates for access to civil engineering must particularly take into account the consequences of granting access for the respective undertaking's business plan), the application for the approval of the provisioning charges uses a calculation that is completely new in this form. The calculation is based not on determining the costs of efficient service provision, but on predicted lost contribution margins (revenues less variable costs). These lost contribution margins arise when Telekom Deutschland GmbH loses customers to competitors who access its civil engineering.

The current proceedings have to decide on several new basic issues such as the fundamental acceptance of the rate calculation and structure and, where applicable, the method used to determine the Very High Capacity Networks (VHCN) surcharge on the imputed interest rate set by the WACC Communication of the European Commission and which the draft of the new Gigabit Recommendation also provides for.

The proposed rates for access to cable conduit systems can at most be compared only with previously approved rates for the main cable segment. Such a comparison indicates that the rates that Telekom Deutschland GmbH determined on the basis of section 38(5) para 3 TKG are several times higher than the most recently approved charge for the provision of one fourth of a cable duct conduit (in connection with access to cable ducts between the street cabinet and the main distribution frame); Telekom Deutschland GmbH

proposed €0.81/m as opposed to the currently approved charge of €0.06/m.

In light of the dynamic cost trend, Telekom Deutschland GmbH proposed an approval period of 1.5 years.

The Bundesnetzagentur released a draft decision for consultation in April 2024.

Vodafone GmbH's reference offer for mobile termination

The amended version of the regulatory order BK3d-20/097 which took effect on 26 February 2021 obligated Vodafone GmbH to publish a reference offer for internet protocol (IP) interconnection for mobile termination in their network. Vodafone GmbH submitted a reference offer for IP on 15 August 2023 for consideration.

The IP reference offer approved in the decision dated 19 December 2023 completely replaces the PSTN reference offer of 6 July 2007 (BK3a-06/041) which had been applicable to date. Vodafone GmbH substantially revised its IP reference offer in respect of technical innovations and legal changes that had occurred in the interim. The new offer was based on the most recently reviewed reference offers submitted by Telekom Deutschland GmbH (BK3k-21/007) and Telefónica Germany GmbH and Co. OHG (BK3k-22/006). A large share of the changes incorporated in the new offer had already been discussed in the relevant proceedings. In this respect, there were no further special conflicts of an actual or legal nature to clarify in the current decision.

Telekom Deutschland GmbH reference offer for access to civil engineering

The regulatory order issued on 21 July 2022 for Market 1 (BK3i-19/020) obligates Telekom Deutschland GmbH to, among other things, grant other undertakings starting 1 January 2024 access to the civil engineering that existed at the time the application was made in order for them to build and operate very high capacity (VHC) networks in fixed locations within the limits of the existing capacities. The access obligation applies subject to a reasonable operating reserve and Telekom Deutschland GmbH's overriding meeting of its own requirements. In its regulatory order the ruling chamber imposed a monitoring obligation on Telekom Deutschland GmbH. Further, the undertaking was additionally placed under obligation to publish a reference offer for granting access.

The reference offer is materially related to the application submitted by Telekom Deutschland GmbH on 10 October 2023 for the approval of rates for access to its civil engineering. In light of this, Telekom Deutschland GmbH submitted its reference offer already on 13 July 2023, prior to the statutory three-month submission period that began on 1 January 2024 (section 29(2) TKG). It did not include monitoring provisions in its reference offer.

The ruling chamber initiated the assessment procedure pursuant to section 29 TKG (BK3b-23/006).

The public hearings on the draft agreement were held on 7 September 2023; a first partial decision is scheduled to be issued in spring 2024.

Regulatory order in the area of high-quality wholesale business customer products

The Bundesnetzagentur issued decision BK2b 21/004 to Telekom Deutschland GmbH on 31 July 2023, modifying the regulatory order in the area of high-quality wholesale business customer products. The modification undertaken on 31 July 2023 governs the requirements for a migration of the end-of-life products that were slated to be deactivated and had until then been provided on the SDH² 1 platform and the 1850 platform of Telekom Deutschland GmbH to the “new product platforms” of Telekom Deutschland GmbH (BNG platform and OTN³ platform). The change in the regulatory requirements was undertaken outside of the framework of a regular review and was based on the findings of the current market analysis.

The modification of the list of obligations puts Telekom Deutschland GmbH in a position to deactivate the network platforms it has used for more than 30 years for business customer products with effect from mid-2024 (the SDH platform) or the end of 2024 (the 1850 platform). Looking at the timing, this decision takes a provision that Telekom Deutschland GmbH had voluntarily agreed upon with another undertaking at an earlier date and applies it to the entire market. This voluntary agreement came about after the ruling chamber declared the notices of termination that Telekom Deutschland GmbH initially issued to be inoperative; this decision was taken because the notices contravene the regulatory obligations.

The right to migrate is conditional on Telekom Deutschland GmbH offering certain successor products in a timely manner and paying compensation in connection with the migration.

Among other things, Telekom Deutschland GmbH is supposed to now offer, with effect from 1 December 2023, its existing Wholesale Premium 2.0 product (which it has provided on its OTN platform to date only for bandwidths outside the regulated range) in regulated frequency bands as well. The OTN platform is a small network that cannot be overbooked and is used to realise high-value access services such as those used to provide connectivity for business customers. This makes OTN products an ideal follow-on solution for especially high-value products.

Notification of specific charges for provisioning wholesale Ethernet VPN 2.0

On 31 March 2023 Telekom Deutschland GmbH submitted a planned change in certain charge items for provisioning wholesale Ethernet VPN 2.0, which was to go into effect on 1 August 2023. Following a review to determine whether the advised changes were anti-competitive, the Bundesnetzagentur did not object to the changes Telekom Deutschland GmbH wanted to make to several rate items (provisioning charges for accesses in the bandwidth range of 2 Mbps up to and including 10 Gbps, monthly leasing rates for access in the bandwidth range of 2 Mbps up to and including 20 Mbps (copper), provisioning charges for connections from 2 Mbps up to and including 100 Mbps). There were no obvious reasons to assume a manifest price level abuse in the prices of the wholesale products and there were no obvious indications of a price-cost squeeze as defined in section 28(2) para 2 TKG old version or for other anti-competitive pricing behaviour.

Reference offers for VPN 2.0

After Ruling Chamber 2 issued a first partial decision on 4 July 2023 requiring Telekom Deutschland GmbH to change various aspects of its reference offer for VPN 2.0, Telekom

² Synchronous Digital Hierarchy

³ Optical Transport Network

Deutschland GmbH submitted an amended reference offer on 4 September 2023. This amended reference offer will be examined in the course of a second partial decision to determine whether the stipulated changes have been correctly implemented.

In compliance with the decision BK2b 21/004 of 31 July 2023 to change the regulatory order in the area of high-quality wholesale business customer products, Telekom Deutschland GmbH submitted a reference offer on 29 November 2023 for access to its Wholesale Premium service with an Ethernet interface and a transmission rate of 150 Mbps. This reference offer is currently under review by the competent ruling chamber.

Proceedings to resolve a dispute between Multiconnect GmbH and Telefónica Germany GmbH Co.

On 6 September 2023, Multiconnect GmbH requested that a dispute resolution procedure pursuant to section 212(1) TKG be initiated with respect to Telefónica Germany GmbH & Co. OHG at the competent ruling chamber of the Bundesnetzagentur. The parties had previously conducted negotiations on full mobile virtual network operator (MVNO) access to Telefónica Germany GmbH & Co. OHG's mobile network but were unable to reach any agreement. In essence, Multiconnect GmbH alleged that Telefónica Germany GmbH & Co. OHG infringed the negotiation requirement set forth in point III.4.15 of the President's Chamber decision of 26 November 2018 by offering Multiconnect GmbH conditions that would be objectively unsuitable to ensuring the conclusion of an agreement. Multiconnect GmbH criticised several aspects of the agreement offer, including wholesale rates, the exclusion of access to 5G and exclusivity provisions, and essentially requested that Telefónica Germany GmbH & Co. OHG be ordered to submit an offer

that has been modified accordingly. Telefónica Germany GmbH & Co. OHG rejected these allegations. It maintained that negotiations were conducted without any fixed expectations regarding the results. According to Telefónica Germany GmbH & Co. OHG, the negotiation requirement encompasses the aim of concluding, in the course of private, autonomous negotiations, an agreement on access to the network of a spectrum assignment holder, but is not however suited to serve as the basis for laying down individual terms. Telefónica Germany GmbH & Co. OHG noted that the negotiation requirement is not about some form of access regulation or reference offer procedures.

This dispute resolution procedure (BK2-23/002) involves important competitive and regulatory issues regarding the content and scope of service provider regulation in the context of the special features of an MVNO access.

Leasing rate approval procedure for SDH carrier leased lines and for Ethernet over SDH carrier leased lines

Since the approvals for its rates were due to expire, Telekom Deutschland GmbH applied on 18 October 2023 for the approval of new leasing rates for classic SDH carrier leased lines (BK2a-23/003) and for Ethernet over SDH carrier leased lines (BK2a-23/004).

Individual proposals were submitted for numerous bandwidths – 2 Mbps, 34 Mbps, 155 Mbps, 16x2 Mbps, 21x2 Mbps, 63x2 Mbps for SDH carrier leased lines and 2.5 Mbps, 5 Mbps, 10 Mbps, 12 Mbps, 50 Mbps, 100 Mbps and 150 Mbps for Ethernet over SDH carrier leased lines.

Since these are point-to-point connections, two access lines (customer location or collocation) and a junction line (locally or between two local networks) would have to be paid. For these two procedures, Telekom Deutschland GmbH applied for the approval of rates for a total of 108 individual rate items.

In its application, Telekom Deutschland GmbH noted that, due to the platform migration to the successor products Ethernet 2.0 carrier leased lines and VPN 2.0, the predominant share of the carriers no longer has a need for SDH-based carrier leased lines. However, since a few carriers will still have a remaining inventory of SDH carrier leased lines or Ethernet over SDH carrier leased lines in 2024, it applied for the approval of the rates for SDH carrier leased lines and Ethernet carrier leased lines until 31 December 2024.

Telekom Deutschland GmbH further pointed out that although the total costs for the SDH network are on the decline, the unit costs for the remaining SDH or Ethernet over SDH leased lines are rising significantly as a result of the enormous energy costs for their continued provision.

These applications are currently under review by the competent ruling chamber.

Leasing rate approval procedure for carrier leased lines as high-quality access products

Since the approvals for its rates were due to expire, Telekom Deutschland GmbH applied on 2 November 2023 for the approval of new leasing rates for leased lines in native Ethernet (Ethernet 2.0 carrier leased lines) for the period beginning 1 April 2024. The application has the number BK2a-23/005.

The rates proposed by Telekom Deutschland GmbH are all higher than the previously approved rates. It attributes these rate differences in particular to the civil engineering rates which, from its standpoint, are currently on the rise. Additionally, it noted that in the area of junction lines, changes in the usage profiles and the development of traffic volumes have a decisive impact on how rates develop.

Furthermore, Telekom Deutschland GmbH for the first time applied on the basis of the requirements laid down for the Ethernet 2.0 carrier leased lines reference offer (BK2c-18/004 of 25 November 2022) for approval to charge for the following additional services: 6-hour express fault clearance, changing the network terminating unit, and modifying or replacing the physical interface.

The draft decision was released on 24 January 2024 for national consultation.

Rate approval procedure for access to wholesale premium rate service with an Ethernet interface and a transmission rate of 150 Mbps as a high-quality access product.

In compliance with the decision BK2b 21/004 of 31 July 2023 amending the regulatory order in the area of high-quality wholesale business customer products, Telekom Deutschland GmbH for the first time applied on 30 November 2023 for approval of its charges for first-time provision, monthly leasing rates and charges for additional services for wholesale premium rate service with an Ethernet interface and a transmission rate of 150 Mbps (BK2a-23/006).

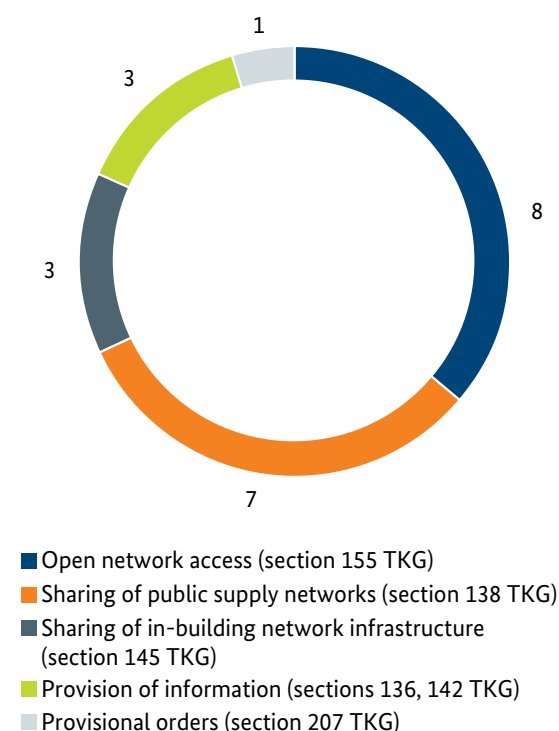
This service involves a point-to-point fixed connection between two lines in Telekom Deutschland GmbH's optical transport network (OTN). It enables competitors to offer their own business customer services nationwide thanks to the exceptionally high connection quality it provides.

The rate approval that Telekom Deutschland GmbH requested for the first time is directly related to the regulatory order BK2b-21/004, which contains provisions regarding the deactivation of so-called old SDH platforms (by 30 June 2024) and 1850 platform (by 31 December 2024) that Telekom Deutschland GmbH requested and, in this connection, which instructs Telekom Deutschland GmbH to submit the application involved here.

Dispute settlement through the national dispute settlement body under the Digital Networks Act

The national dispute settlement body under the Digital Networks Act (DigiNetzG) was again frequently contacted by market participants in 2023. In addition to two already pending procedures, 20 new requests for dispute settlement were submitted. The dispute settlement procedures initiated in 2023 revolved primarily around sharing public supply networks and granting open access to publicly funded infrastructure.

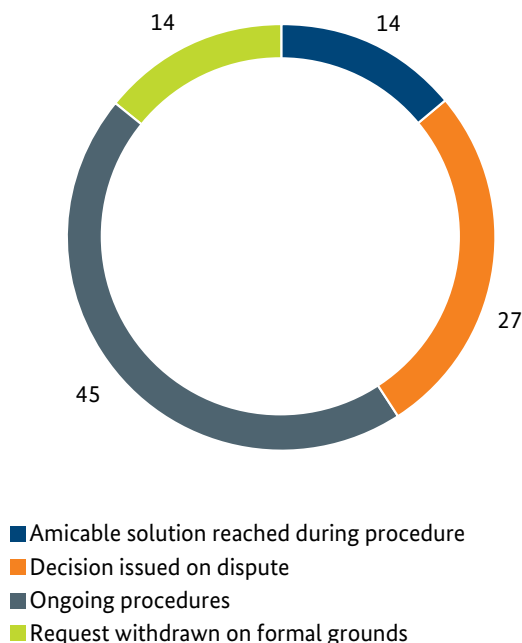
Breakdown of dispute resolution cases in 2023



To step up the broadband rollout, German lawmakers created several sets of tools that can be used to, among other things, regulate the time frames and formal framework conditions for negotiations on information requirements, infrastructure sharing and trench sharing. In this

connection, infrastructure owners must provide information about possible grounds for refusal. However, if the parties involved cannot agree among themselves on whether a request can be granted or on the specific terms thereof, any of them can request the national dispute settlement body – Ruling Chamber 11 – to open a dispute settlement procedure. The national dispute settlement body then examines the issue, mediates between the parties and makes a decision on the basis of a public hearing. The ruling chamber can, for example, require an offer to be made or an agreement to be amended to achieve fair and reasonable terms and conditions, including the rates for infrastructure sharing, trench sharing or open access, and can use coercive measures to enforce this requirement.

Dispute resolution procedures concluded in 2023



Dispute settlement procedure on open access

Once again in 2023, requests for non-discriminatory, open network access to publicly funded telecommunications lines or telecommunications networks on fair and reasonable terms in accordance with section 155 TKG comprised a large block of the dispute settlement procedures requested. In each case the matter in dispute was the actual granting of access or the specific terms and conditions for access.

In April 2023, the ruling chamber decided in the case Arche Net Vision GmbH v. Telekom Deutschland GmbH (BK11-22/012) that the material prerequisites were not given for requiring the respondent to grant open access in accordance with section 155(1) TKG in the form of fibre broadband in the internet connectivity (FB-IPCON) variant which the applicant had requested. Based on section 155(1) TKG, this resale product does not fall within the scope of open network access to publicly funded networks. For this reason, the request was denied.

In addition, the four procedures initiated by Deutsche Glasfaser Wholesale GmbH against Telekom Deutschland GmbH (BK11-23-007; -009; -017 and -019) as well as a request for a provisional order (BK11-23-018) constituted a major share of the six total procedures for open access in 2023. Following the summary assessment conducted as required in proceedings for interim measures, the request for a temporary order pursuant to section 207 TKG (BK11-23-018) was rejected. The request was rejected for lack of urgency and grounds for issuing an order. The pending dispute settlement procedures touch on issues involving non-discriminatory open network access to ducts and conduits in the partially state-funded telecommunications network of Telekom Deutschland GmbH and the assumption of the costs of preparing an offer.

A decision was issued in October 2023 in another dispute settlement procedure, namely, between M net Telekommunikations GmbH as applicant and Vodafone GmbH as respondent. This procedure (BK11-23-003) marked the first time that prices for wholesale layer 2 bitstream products were defined in a procedure conducted pursuant to section 155(1) TKG.

The dispute to be settled revolved around open, non-discriminatory wholesale bitstream access in a publicly funded gigabit-capable broadband/optical fibre network. More specifically, the applicant applied for an adequate margin between the respondent's wholesale rates and corresponding end-user rates.

In its decision, the ruling chamber set wholesale rates for the first time on the basis of reference prices which themselves were drawn from the findings of a market survey conducted for this purpose. For this exhaustive survey data was requested in 2022 from all undertakings known to be or that could be assumed to be the owner or operator of a publicly available FTTB/FTTH telecommunications network.

In corresponding summary proceedings the competent Cologne administrative court ruled in favour of Vodafone GmbH. A decision is currently still pending in the principal proceedings.

Dispute settlement procedures involving shared use

DB Netz AG was a party to a dispute for the first time, namely, as the respondent in the dispute settlement procedure BK11-23-008. Since it asserted during the procedure that its critical infrastructure also constituted grounds for refusal, the Federal Office for Information Security (BSI) was consulted.

In this procedure Telekom Deutschland GmbH requested the sharing of a duct that traverses a railway crossing. It also requested that the respondent DB Netz AG bear the cost of preparing the offer because DB Netz AG initially rejected a request to share use of the duct on the grounds that, among other things, Telekom Deutschland GmbH should bear the cost of the project planning necessary for generating an offer. In its ruling issued in September 2023, the ruling chamber decided – contrary to DB Netz AG's opinion – that DB Netz AG should bear the cost of preparing an offer and it placed DB Netz AG under the obligation to submit an offer to Telekom Deutschland GmbH within a period of one month.

DB Netz AG filed an appeal against this decision with the competent Cologne administrative court. It also requested an expedited ruling, which the court refused. Since the question of who should cover the planning costs needed to prepare an offer for the shared use of a duct was also an issue in other procedures, this decision will also act as a signal to the market.

In another dispute settlement procedure initiated by Telekom Deutschland GmbH against Flughafen München GmbH (BK11-23-011), the applicant requested the sharing of public supply networks on property owned by the respondent. In this instance the applicant has been using this

infrastructure since 2005 on the basis of an existing agreement and wanted to use the dispute settlement procedure to negotiate better financial terms. A public hearing was held. The ruling chamber denied the request because the sharing of the particular physical infrastructure had already been regularised in the existing agreement.

Dispute settlement procedure over critical infrastructure

In addition to its first dealings with the use of critical infrastructure as possible grounds for rejecting the application in the aforementioned dispute settlement procedure *Telekom Deutschland GmbH v. DB Netz AG*, the national dispute settlement body received two further requests for dispute settlement which involve the option of citing critical infrastructure as grounds for refusal.

In the dispute settlement procedure *Telekom Deutschland GmbH v. Fraport AG* (BK11-23-010), Fraport AG refused to provide information about its passive network infrastructure, citing the presence of critical infrastructure. The ruling chamber confirmed the involvement of critical infrastructure in this specific case. The application for the provision of information was rejected. The Federal Office for Information Security (BSI) had been consulted prior to this. The decision is not yet final.

In another dispute settlement procedure between *Telefónica Germany GmbH & Co. OHG* as applicant and the federally owned *Autobahn GmbH* as respondent (BK11-23-020) – which is currently in abeyance – the respondent refused to allow shared use of a cell mast near a motorway, also citing the presence of critical infrastructure as the ground for refusal.

Resolution of a dispute over in-building infrastructure

In April 2023, Vodafone GmbH requested in three dispute resolution procedures that it be allowed to also use in-building network infrastructure owned by the Schönebeck and Wiesbaden housing associations and that it be allowed to install its own in-building hardware components (BK11-23-004, -005, -006). Following hearings, the parties were able to come to an amicable solution in all three pending procedures. The applicant withdrew its request for a dispute resolution procedure in each case.

Spectrum management

Provision of spectrum for mobile broadband

Spectrum usage rights in the bands 800 MHz, 1800 MHz and 2600 MHz that are important for mobile communications will be expiring at the end of 2025. The Bundesnetzagentur continues to move forward with the reprovisioning of these frequencies. Aiming to get interested parties involved in the discussion at an early point in time, the Bundesnetzagentur published a spectrum compass back in 2020 and a scenario paper in 2021 and initiated consultations on them. The year 2022 saw further steps in the consultation process that built on these documents and included points of orientation and a demand survey as well as a position paper that the Bundesnetzagentur used to open discussion on, among other things, voluntary swapping of the durations of usage rights in the 800 MHz band (which is particularly important for LTE coverage) for the 900 MHz band.

The insights gained from the comments on the position paper provided the foundation for the next step in the process. On 13 September 2023, the Bundesnetzagentur subsequently published for consultation the demand update and the framework conditions for an interim decision. Here, the Bundesnetzagentur continued to hold its assessment that in the case of frequency shortages, award proceedings would be a suitable method for allocating spectrum. At the same time, external factors were identified that could speak in favour of not ordering award proceedings to be held immediately and instead delaying such proceedings for the time being until a later date. The aim of the interim solution put forward for

discussion was to be able to additionally include usage rights that expire in 2033. This would in particular prevent regulation-induced frequency shortages. It would also make it possible to bring the various durations into line with one another.

One important issue for the Bundesnetzagentur in connection with the provision of bandwidth is to improve mobile coverage in rural areas and along transport routes. For this reason, the Bundesnetzagentur put up for discussion various points in the framework conditions, including obligations to provide broadband coverage in sparsely populated areas and along roads and rail lines.

In addition to the provision of broadband mobile coverage, efficient competition is crucial for ensuring that a wide selection of high-performance products is available at fair prices to consumers. In the framework conditions, the Bundesnetzagentur also considered measures to promote competition. When formulating the specific provisions, the Bundesnetzagentur drew upon forward-looking assessments of the competitive environment. In this connection, the Bundesnetzagentur had the competitive conditions in the mobile market assessed with respect to the provision of spectrum. For this purpose, it commissioned the consultancies WIK Consult GmbH and Ernst & Young GmbH to prepare an expert opinion.

During the next stage of provisioning spectrum in the 800 MHz, 1800 MHz and 2600 MHz bandwidths, it will be necessary to determine whether measures are needed to maintain or achieve effective competition in the German mobile market. The findings from the expert opinion will be taken into account for this.

Further details have been or will be published on an ongoing basis at:

www.bnetza.de/mobilebroadband

Competitive independence

In 2023, the Bundesnetzagentur took further action in the area of spectrum management. For example, 1&1 Mobilfunk GmbH was enjoined on 20 October 2022 to end its dual role as service producer/mobile virtual network operator (MVNO) on the one hand and – new – mobile network operator on the other. In accordance with the Bundesnetzagentur's determinations, 1&1 Mobilfunk GmbH had to end its sales operations as a service provider/MVNO by the end of 2023 and then all of its business activities in this field by the end of 2025.

These determinations were based on the principle of competitive independence. The principle of competitive independence means that operators of mobile networks may not also act as service providers/MVNOs in another operator's network. This is because a network operator also acting as a service provider/MVNO in a competitor's network could potentially have an unfair competitive advantage. It could also be interested in the success of the other operator's network that provides coverage to its customers. This would reduce or distort competition in the medium term.

The Bundesnetzagentur had allowed the above exception to this principle during the last spectrum award in 2019 in order to give possible new entrants time to transition their business model. Its aim here was to promote competition by having a fourth network operator enter the German mobile market.

National roaming

National roaming is an important instrument for promoting competition in the wake of a fourth network operator entering the market. With national roaming, a network operator is able to use a competitor's network everywhere it does not (yet) have a network of its own. This makes it possible to avert gaps in coverage and reduces any competitive disadvantage a new entrant might have because it naturally does not have a dense network of its own when it begins network operation. For this reason, during the spectrum auction held in 2019 the Bundesnetzagentur enjoined the established mobile network operators to negotiate on national roaming (negotiation requirement) with the new entrant that had purchased bandwidth at the auction.

In 2021, 1&1 Mobilfunk GmbH accepted an offer made by Telefónica Germany GmbH & Co. OHG regarding national roaming.

The ability to use nationwide roaming in the network operated by Telefónica Germany GmbH & Co. OHG puts 1&1 Mobilfunk GmbH in a position to offer nationwide mobile service as it gradually rolls out its network. With the start of national roaming service, 1&1 Mobilfunk GmbH has been able to use Telefónica Germany GmbH & Co. OHG's network everywhere that it does not yet have its own mobile network.

In addition, in August 2023 1&1 Mobilfunk GmbH signed a preliminary agreement with Vodafone GmbH on national roaming cooperation. Based on this agreement, Vodafone GmbH's network will provide non-discriminatory, technology-neutral national roaming service to 1&1 Mobilfunk GmbH.

The successful negotiations between Vodafone GmbH and 1&1 Mobilfunk GmbH show that the negotiation requirement is having an effect. Nevertheless, the Bundesnetzagentur always examines the implications that such agreements have for competition and frequency regulation on a case-by-case basis.

Coverage obligations for households and transport routes

The assignments for the mobile spectrum auctioned in 2019 contain coverage obligations that require the three established mobile operators Telekom, Telefónica and Vodafone to provide coverage with minimum of 100 Mbps for at least 98% of the households in each of Germany's states and for all motorways, most important trunk roads, and busy rail lines by the end of 2022. The coverage obligations additionally include the requirement to put into operation 500 base stations with a minimum of 100 Mbps in designated white spots. Furthermore, all holders of a frequency assignment – including the new entrant 1&1 – were obligated to put 1,000 base stations for 5G applications into operation by the end of 2022.

In January 2023, the mobile network operators submitted their end reports which were reviewed and analysed to determine whether the respective provider had met their coverage obligations on time. The analysis of the end reports issued by the three established mobile network operators revealed that since the auction in 2019 all three have made discernible efforts and have noticeably improved mobile coverage in Germany.

As a result, the established mobile network operators were also able to fulfil a large portion of the coverage obligations within the designated time frame. In most cases where the obligations were not fulfilled on time, the mobile network

operators were not responsible for the delays. Reasons for the delays included the need to involve third parties in order to provide mobile service in tunnels and objections filed by lower-level nature conservation authorities or citizens' action groups. As a result, the mobile network operators themselves were responsible for delays in only a very few locations. The network operators are currently being heard in this connection.

The new entrant 1&1 did not fulfil its obligation to put 1,000 base stations into operation by the end of 2022. The undertaking made extensive submissions on the reasons for the delay. The Bundesnetzagentur acknowledged and reviewed 1&1's reasons and submissions. 1&1 was heard in this connection. The statements provided by 1&1 are currently being evaluated.

The assignment holders have to fulfil additional coverage obligations arising from the spectrum assignments for the mobile spectrum auctioned in 2019. The established mobile operators have to provide by the end of 2024 coverage with a transmission rate of at least 100 Mbps for all remaining trunk roads and coverage with at least 50 Mbps for all other major roads, all remaining rail lines, seaports and the core network of waterways. 1&1 has to provide coverage for 25% of households by the end of 2025.

Spectrum assignments in the exclusive economic zone

On 23 August 2023, the Bundesnetzagentur published the framework conditions for spectrum assignments ranging from 700 MHz to 3.7 GHz for mobile broadband in the exclusive economic zone (EEZ). This elevated the connectivity of wind turbines and work platforms to a new level. The Bundesnetzagentur is advancing the transition to sustainable energy structures in the area of spectrum regulation as well.

Until now, the mobile technologies used in the offshore field have been primarily narrowband. The significantly greater capacities in the broadband spectrum ranges are opening up new application possibilities. The range of these bands additionally ensures technological development at all levels. Another aim here is to improve the working and living conditions of workers on platforms and service ships.

Since the exclusive economic area is not part of Germany's federal territory, special regulations had to be developed for mobile communication. Spectrum is being assigned upon application on the basis of these regulations.

Short-term assignments

The Bundesnetzagentur issues short-term assignments for spectrum to be used at sporting, cultural and other media events and for state visits. The spectrum is usually only needed for a few hours or days at a time. Many of the spectrum users are from outside Germany and frequently apply to use spectrum designated in Germany for other purposes. In these cases the Bundesnetzagentur checks whether the spectrum can be used for a short time without interfering with other designated uses. This is a complex task if an event is held near the border to another country because the Bundesnetzagentur then needs to coordinate with the neighbouring country.

Several major events of international importance took place in 2023 in which the Bundesnetzagentur's spectrum team was involved. These included two exhibition games played by the American National Football League (NFL) in Frankfurt and the drawing in Hamburg of the groups for the 2024 European Football Championship. The Bundesnetzagentur provided numerous frequencies for users from all over the world and its radio monitoring and inspection service was on site to ensure interference-free spectrum use.

Satellite communications

Satellite communications, data networks and cable have turned the world into an information space. Satellite communication technology has had an eventful history. It was initially the only option available for transmitting broadband signals between continents but was later superseded by optical fibre and is today experiencing a renaissance. The new race for outer space has led to new space infrastructures being established, with entire satellite constellations being put into service in the low Earth orbit. Examples of this include Starlink from SpaceX, Kuiper from Amazon, and OneWeb. Such constellations will provide broadband connectivity (for the most part in Ku band or Ka band) nearly everywhere on Earth and thus offer the possibility of closing the digital gap in remote areas as well. Satellite communications play an increasingly important logistical role in peacekeeping missions, safeguarding domestic and international security and in crisis situations such as natural disasters. However, the aim of global connectivity is still far from being fully achieved.

In 2023 the Bundesnetzagentur submitted filings for 55 new satellite systems to the ITU. German satellite operators submitted a total of 3,800 coordination requests to the ITU for hundreds of frequencies used in orbit. The subsequent bilateral negotiations with other countries and their satellite operators guarantee that all satellite systems can use the spectrum without interference.

Mobile communications monitoring

The interactive mobile communications monitoring map displays transparent data about each provider's actual mobile coverage across the country. Anyone interested can access tailor-made information on mobile availability at www.gigabitgrundbuch.bund.de/GIGA/DE/MobilfunkMonitoring/start (in German).

The Bundesnetzagentur collects the data needed for this from the network operators based on uniform rules once a quarter. It validates the operators' information using data from the dead spot app.

In addition the download section includes a detailed report on mobile coverage along transport infrastructure and maps displaying the percentage of dropped voice calls for each provider. The information provided was expanded in November 2023 to include maps, statistical analyses and geodata for regions where there are areas with deployment deficits in mobile service provision.

As required by section 103(5) TKG, the Bundesnetzagentur prepared a second mobile communications report for submission to the German Bundestag's Committee on Transport and Committee on Digital Affairs. The report contains details of:

- the status and development of mobile coverage as identified by mobile communications monitoring and
- the level of compliance with the secondary conditions (coverage obligations) attached to mobile spectrum assignments.

Mobile network coverage in October 2023

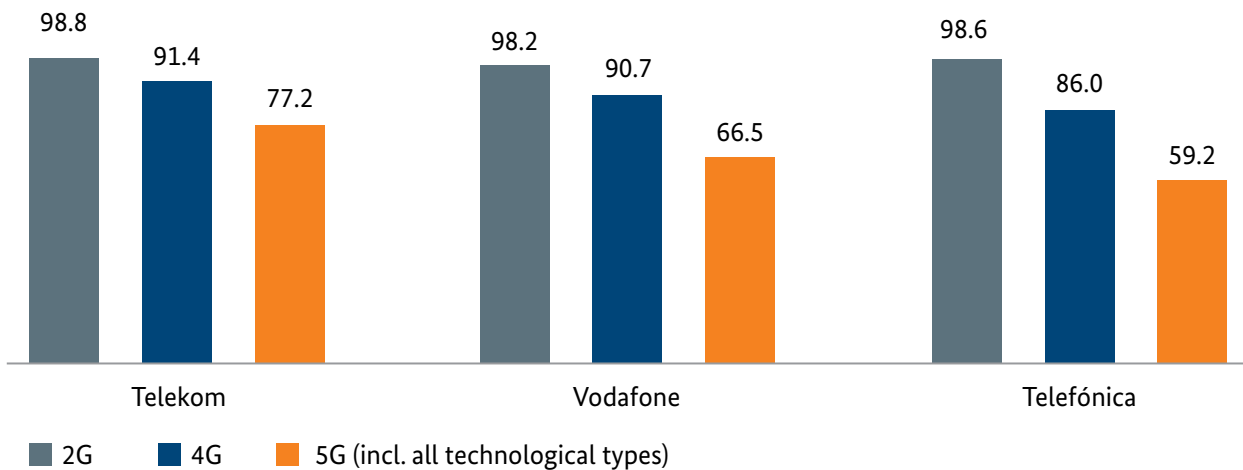
An analysis of the data collected in October 2023 shows that almost the entire country (99.8%) has 2G coverage and nearly the same percentage (around 97%) has 4G coverage. The following diagram compares the level of the individual network operators' coverage. It shows that 2G and 4G coverage are both very high.

5G network coverage

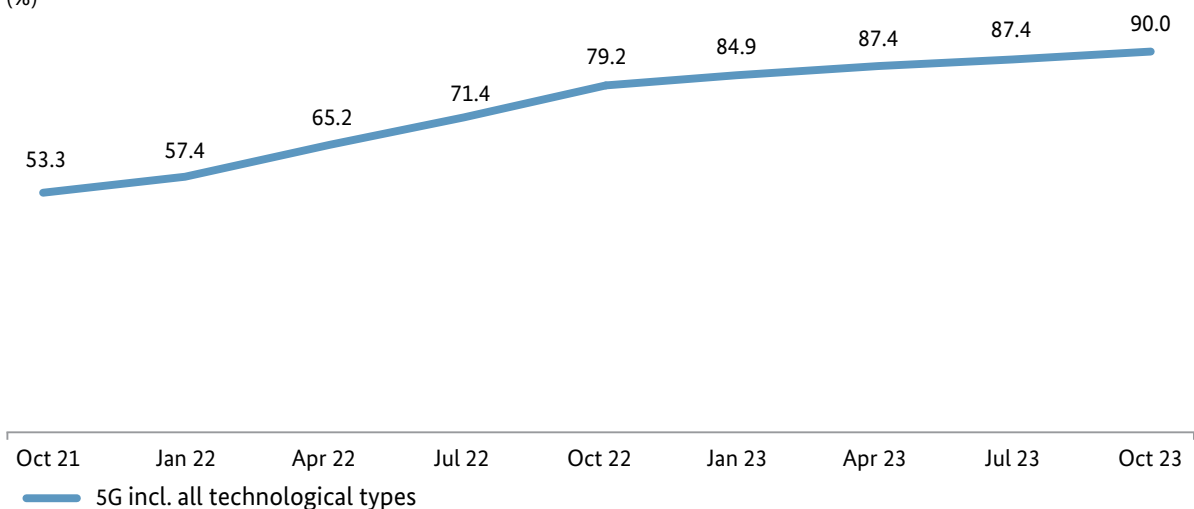
The level of 5G coverage nationwide varies between 59% and 77%, depending on the network operator. These figures take all technological variants into consideration.

Today, 90% of the country has 5G coverage from at least one network operator. An analysis of the

Technology coverage by mobile network operator (%)



Nationwide 5G coverage by at least one network operator (%)



5G data shows dynamic development in the level of 5G coverage in the years since this data was first collected in October 2021. Within two years, 5G coverage increased by some 37 percentage points.

White and grey spots

The percentage of the country affected by white spots⁴ (2.5%) and grey spots⁵ (16.0%) continues to decline. The percentage of the country without any mobile coverage at all (dead spots) has also fallen and is now 0.2%.

Areas with deployment deficit

Maps and statistics on areas with deployment deficits have been published for Germany's federal and state governments in the Gigabit Register since November 2023.

Areas with deployment deficits are defined as areas in which there is currently no service and no rollout plan involving a mobile network with very high capacity or 4G or 5G mobile technology and will likely not have any service or rollout plan during the 12 months following the date of the survey. In contrast to the analysis of existing white spots, the analysis of grey spots additionally takes into account the mobile operators' rollout plans for a period of 12 months starting from the survey date.

Revision of the Amateur Radio Ordinance

Amateur operators use amateur service for training, for communicating with other amateur operators and for technical studies. Amateur service offers amateur operators a means of conducting radio communication with other

amateur operators around the world. In Germany, everyone is permitted to hear amateur radio broadcasts and own amateur radio equipment. However, operating an amateur station transmitter requires special knowledge and a licence to participate in amateur service. Persons who are issued a licence are assigned a personal call sign together with their licence. Amateur operators may build their own transmitting station provided that the station complies with the relevant technical regulations. Amateur operators can prove they have the requisite knowledge by sitting an exam held by the Bundesnetzagentur or another telecommunications authority whose test certificates are recognised. Germany had 61,139 registered amateur operators as of the end of 2022.

A special aspect of amateur service in Germany is that it is not governed by the Telecommunications Act but rather by separate legislation: the Amateur Radio Act. This act, together with the Amateur Radio Ordinance, constitutes the statutory foundation for amateur service in Germany.

The second Ordinance Amending the Amateur Radio Ordinance was published on 23 June 2023. It will enter into force one year after its promulgation. This gives the Bundesnetzagentur the lead time it needs to adjust its processes and IT system.

This new ordinance brings the Amateur Radio Ordinance into line with current technical possibilities and updated international legal frameworks. In addition, it establishes a new licence class – N – as a low-threshold route to taking up amateur radio as a hobby.

The new ordinance regulates remote operation – operating a fixed amateur radio station from a place other than where the station is actually lo-

4 Areas with no 4G or 5G coverage

5 Areas with 4G or 5G coverage from at least one but not all network operators

cated – for the first time. For example, a fixed amateur radio station can be located in an allotment garden but operated from the kitchen table at home when all the relevant provisions are observed.

Another new feature is the future waiver of a call sign for radio operations instruction. To date, persons who are not themselves amateur operators can gain practical experience with amateur radio under the direct guidance and supervision of an experienced amateur operator when the amateur operator providing the instruction has been issued a special call sign for radio operations instruction. This requirement will no longer apply in future.

Limiting previously open-ended spectrum assignments for traditional PMR

A time limit is to be imposed on all spectrum assignments in the area of private mobile radio (PMR) that have been open-ended to date. The reasons for this are, firstly, changes in the channel spacing to make more channels available and, secondly, more efficient spectrum usage. This step is aimed at averting spectrum scarcity in various frequency bands. This will particularly affect spectrum assignments that are 20 or more years old. Many assignments are presumably currently no longer being used. Time limitations are to be imposed as retroactive ancillary provisions in spectrum assignments by means of general rulings issued to specific persons. Interested parties had the opportunity to comment on this in the summer of 2023. Following an analysis of the responses, the Bundesnetzagentur made minor changes in the proposed course of action and re-opened the consultation process. A decision is expected in the first quarter of 2024. Further information is available on the website of the Bundesnetzagentur.

Campus networks

The provision of spectrum in the range 3,700 MHz – 3,800 MHz since 2019 and subsequently in the 26 GHz range since 2021 for local broadband applications has drawn considerable national and international attention. For the Bundesnetzagentur this was a new approach to provisioning spectrum through a modern assignment procedure – initially for campus networks and then, since 2021, for the public as well.

Campus networks are local, site-specific networks that are used for internal telecommunications. They can be implemented in both bands. 5G technology offers new possibilities, particularly for mobile applications such as autonomous driving.

Fixed service

The 26 GHz spectrum band is currently still being used in some cases by point-to-point fixed links. However usage numbers are on the decline. Spectrum assignments for fixed link service are an integral part of the infrastructure rollout for digitalisation and the rollout with high-speed internet. Even though the fibre rollout is forging ahead, fixed links continue to be in strong demand.

There has been a marked increase in those bands that enable high-speed transmission with the greatest possible stability.

During the development planning stage, the Bundesnetzagentur notifies the planning authorities for wind farms or individual wind turbines of the operators of existing fixed links. This helps ensure that the fixed links have the requisite stability and additionally helps foster the transition to sustainable energy structures.

Setting rates and end of offline billing

After coordinating with market participants, the Bundesnetzagentur in July 2023 set standard rates for calls to (0)900 numbers for premium rate services and 118 numbers for directory enquiry services – irrespective of the caller’s provider – with effect from 1 December 2024. A statutory regulation aimed at increasing price transparency for value-added telephone services provided the basis for setting these rates.

The work to determine the rates took into account that as of 31 December 2024 the market participants will discontinue the offline billing procedure that has been used to date to bill calls made from a fixed network to (0)900 and 118 numbers. The online billing procedure that is already being used for calls from mobile networks will be used across all networks in future.

In the case of 118 numbers for directory enquiry service, the new pricing contains a list of retail rates that is binding for the assignment holders of directory enquiry numbers.

Looking at (0)900 numbers for premium rate services, tariff ranges will replace the system of flexible charging for the individual telephone numbers. To ensure that flexible prices between €0.49 and €2.99 continue to be possible, the number ranges (0)900-0, -2, -4, -6, -7 und -8 for fixed rates will be added to the already open number ranges (0)900-1, -3 and -5.

The transparent and non-discriminatory introduction of the new number ranges will be ensured by the use of a “day one procedure” whereby all applications received by a specified deadline will be treated as if they had all been

received on the same day. With the introduction of the tariff ranges, each inventory assignment will be allocated to a specific tariff range that the assignment holder cannot influence. In the event the assignment holder wants to switch tariff ranges because the particular tariff is not suitable and, in the process, embed its existing telephone number, it will be granted preferential treatment in the day one procedure.

Since the offline billing procedure is being discontinued, the telephone numbers for carrier selection (call-by-call) and preselection, for narrowband internet access (online services) and for virtual private networks will also be done away with.

Public safety/security

Implementation of intercepts

Under Germany's statutory provisions (the Code of Criminal Procedure (StPO), for example), anyone providing or cooperating in providing telecommunications services must enable telecommunications to be intercepted and recorded and provide information about user, customer and traffic data. Sections 170 and 174 TKG set out whether and to what extent telecommunications undertakings must make relevant arrangements. Section 171 TKG requires mobile network operators to cooperate with investigations involving mobile terminal equipment, such as searches for missing persons.

One of the Bundesnetzagentur's tasks is to stipulate the technical details for these requirements in the Technical Directive relating to the Telecommunications Interception Ordinance (TR TKÜV). Any changes to the TR TKÜV are made in consultation with the authorised bodies and with the participation of industry associations and manufacturers. In 2023, technical requirements for the duty to cooperate under section 171 TKG and for the new mobile communications specification 3GPP TS 33.128 were developed and existing technical requirements underwent further development in the new versions 8.1 and 8.2 of the TR TKÜV. The current version 8.2 went into effect on 4 October 2023.

Disaster preparedness

The regulations for disaster preparedness must be adhered to in special exceptional circumstances (obligation of provision) in order to ensure a minimum provision of basic telecommunications services. In addition, the telecommunications undertakings that are under obligation here have

to give precedence to priority users when providing their service or services. The Bundesnetzagentur continued in 2023 to remain in close contact with the obligated telecommunications undertakings to ensure that the statutory requirements for safeguarding and prioritising telecommunications are observed and implemented.

Automated information procedure

The automated information procedure enables statutorily authorised bodies (mainly the police, state criminal police, federal agencies, state security authorities and emergency call centres) to request subscriber data including names, addresses and telephone numbers from telecommunications undertakings via the Bundesnetzagentur's automated and highly secure systems 24 hours a day. At present the procedure is used by 122 systems in their capacity as authorised bodies with 110 telecommunications undertakings obligated to participate.

Information can now be provided extremely rapidly – if necessary, within a few seconds – thanks to technological improvements. The procedure is consequently being used as an investigative tool and receives up to 171,000 requests for names and telephone numbers every day. The Bundesnetzagentur's systems processed a total of 25.8 million requests in 2023.

The Bundesnetzagentur stepped up its oversight work with the aim of optimising the data quality in the responses of the undertakings obligated, which in some cases was inadequate: compared to the previous year, the number of complaints from authorised bodies increased by approximately 250%, resulting in a significant upsurge in administrative proceedings to look into incorrect information.

The developments in data quality outlined here have induced the Bundesnetzagentur to develop and publish explanatory notes for sections 172 and 173 TKG as part of an initiative to increase transparency and compliance. The first document to be published contained explanatory notes and comments regarding section 172(1) TKG. Further explanatory notes are to be successively developed and refined by the Bundesnetzagentur in consultation with the parties concerned.

In addition, the issue of data quality was discussed with sector representatives and individual representatives from the authorised bodies at a compliance summit held in December 2023. The event was conceived as the kick-off for a joint process for developing and implementing solutions. A continuation is already planned for 2024.

Work on revising the requirements for identification procedures in the prepaid mobile sector and the attendant conformity assessment programme continued through 2023 and is scheduled to be completed in 2024. The backdrop for this is the amendment of the Telecommunications Act that is being undertaken for the purpose of the Telecommunications Network Rollout Acceleration Act and expected to be completed in 2024. A ministry draft of the amended law has already been prepared.

Following this, the Customer Data Information Ordinance is to be revised to lay the foundation for drafting a new Technical Directive for the Automated Information Procedure (TR-AAV). As usual, the Bundesnetzagentur will closely involve the parties concerned.

Implementation of Technical Directive DE-Alert

The undertakings obligated under section 164a TKG have been required since 23 February 2023 to comply with the Technical Directive DE Alert (version 1.1).

This date marks the start of the official operation of the new Cell Broadcast warning system as part of the array of methods used by the German government's central alert system. With this technical directive, the Bundesnetzagentur has laid down the technical details for this based on section 164a(5) TKG. In the time since going into regular use, the technical directive with its technical provisions has proven its worth. This was also confirmed by this year's Nationwide Alert Day when the public warning systems are tested.

Public safety/security – Technical safeguards

Protecting the privacy of telecommunications and personal data, protecting systems against disruptions, and managing the risks to the security of telecommunications networks and services are the key objectives of section 165 TKG.

To achieve these objectives, the Bundesnetzagentur, together with the Federal Office for Information Security (BSI) and the Federal Commissioner for Data Protection and Freedom of Information (BfDI), has outlined details in a catalogue of security requirements. This catalogue provides the basis for security concepts that operators of public telecommunications networks and providers of publicly accessible telecommunications services are required to prepare. The work on updating the catalogue continued through 2023.

Building on the strategy paper on the resilience of telecommunications networks that was developed in coordination with the BSI and published in September 2022, the Bundesnetzagentur is informing interested stakeholders about this subject and is working on guidelines on the application of the strategy paper, for example by small and medium-sized telecommunications undertakings.

In 2023 the Bundesnetzagentur carried out random checks at 225 undertakings on the implementation of their security concepts. Additionally, 19 new and 549 revised concepts were submitted to the Bundesnetzagentur for review to determine compliance with section 166(1) TKG.

During the reporting period the Bundesnetzagentur received 58 reports of security incidents within the meaning of section 168 TKG.

Technical regulation

Online form for reporting non-compliant radio and EMC products

As part of the implementation of the Online Access Act which aims to improve online access to administrative services, the Bundesnetzagentur developed an online form for reporting non-compliant radio and EMC (electromagnetic compatibility) products. It was made available to the public in September 2023. The online form also addresses the requirement set forth in Regulation (EU) 2019/1020 on market surveillance to take into account “consumer complaints and other information received from other authorities, economic operators, media and other sources that might indicate non-compliance” for the products to be checked. The aim of the online form is to make it much easier to contact the Bundesnetzagentur and therefore accommodate consumer protection interests. The reports to the Bundesnetzagentur help to identify distortion of competition and remove non-compliant and unsafe equipment from the market.

German Market Surveillance Conference 2023

The German Market Surveillance Conference is jointly organised by the Federal Ministry for Economic Affairs and Climate Action (BMWK), the Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen (BNetzA), and the Federal Institute for Materials Research and Testing (BAM).

The aim of the conference is to provide an information and discussion forum for organisations dealing with market surveillance issues as well as for interested parties in all sectors. The conference is held every autumn in Berlin. In 2023, the conference was held on 20-21 September as a hybrid event at the Federal Institute for Materials

Research and Testing. The conferences are organised by the Federal Ministry for Economic Affairs and Climate Action (BMWK).

The Office of the German Market Surveillance Forum (DMÜF), which is part of the Bundesnetzagentur, helped to prepare and host the conference.

The conference was attended by about 200 participants in person and by 150 online. It offered attendees an opportunity to discuss current market surveillance issues with representatives of the European Commission, the German Electro and Digital Industry Association (ZVEI), the German Institute for Standardization (DIN) and association and industry representatives.

This year’s conference revolved around market monitoring of artificial intelligence (AI). It also addressed other important areas of critical importance to future development such as digitalisation in market monitoring and new product safety requirements for radio equipment.

Radio equipment/EMF protection

The Bundesnetzagentur’s site certification procedure ensures that the electromagnetic field (EMF) exposure limits are not exceeded at sites where radio equipment is operated. A total of 16,370 site certificates were issued in 2023, with 2,957 of these sites being assessed using the field theory-based WattWächter assessment method.

The WattWächter tool was expanded in 2022 with the addition of a feature to take material attenuation into account. This feature incorporates the reduction in the intensity of electromagnetic waves emanating from radio equipment as a result of the use of reinforced concrete ceilings. This feature has proven itself in the site certification procedure. This method was further

expanded in November 2023 to allow metal and tiled roofs to be taken into account.

At the request of several municipalities, the EMF monitoring system for the long-term measurement and assessment of local emissions from radio equipment was deployed in various locations in 2023. Using the Bundesnetzagentur's new system, a maximum exposure level of 1.34% in the lower spectrum band (9 kHz-10 MHz) and maximum exposure level of 0.048% in the upper spectrum band (up to 6 GHz) were measured. All the measurement results are shown on the EMF map. In addition, the new system was successfully tested for measuring the relevant field strengths of neighbouring radio equipment during the site certification procedure. It is planned to actively use the system in this procedure in future.

Further information about the site certification procedure and the Bundesnetzagentur's measurements can be found in the EMF section of the Bundesnetzagentur website at <https://www.bundesnetzagentur.de/866790>

Radio interface specifications

The Bundesnetzagentur develops radio interface specifications on the basis of the Radio Equipment Act. Radio interface specifications are technical specifications for air interfaces for radio equipment that can be operated in spectrum bands whose use is not harmonised (standardised) at European level. These specifications contain all the information necessary for manufacturers to conduct the relevant tests of their choice for the basic requirements applicable to their radio equipment.

More than 90 specifications for a wide variety of radiocommunication services can currently be retrieved from the Bundesnetzagentur website: <https://www.bundesnetzagentur.de/656566>.

The main focus of the work done in this respect in 2023 was on determining the extent to which the older specifications still meet current requirements. This work led the Bundesnetzagentur to rescind two fixed link specifications and five land mobile service specifications. Five successor specifications were drafted for land radio service (LA), aeronautical service (FL) and radio determination service (OR). They went into effect in 2024 following notification of the European Commission and a three-month standstill period. Further specifications for land radio service and maritime and inland waterway services (SE) are being prepared.

Measures and checks undertaken pursuant to the Radio Interference Suppression Ordinance

Pursuant to the statutory mandate set forth in sections 3 and 5 of the Radio Interference Suppression Ordinance, the Bundesnetzagentur implemented measures to check and eliminate prohibited interference emissions from cable networks and monitoring measures to protect security-related transmitting and receiving systems. In addition to the focus on protecting public telecommunications networks, the scope is to be extended in future to non-public mobile services and to mobile services provided by authorities and organisations concerned with public safety.

Approval of one-off charges for provisioning and monthly rates for leasing Ethernet 2.0 carrier leased lines

Telekom Deutschland GmbH is required to obtain approval for its prices for its Ethernet 2.0 carrier leased lines with bandwidths between 2 Mbps and 155 Mbps.

Since the previously granted approvals were due to expire, approval was again granted on 5 April 2022 (BK2a 21/008) for the rates for leasing Ethernet 2.0 carrier leased lines until 31 March 2024 and on 29 September 2022 (Bk2a-22/005) for the charges for provisioning until 30 November 2025. Differentiated rates for leasing SDSL (up to and including 8 Mbps) and VDSL (up to and including 20 Mbps) copper lines were proposed and approved, superseding the flat-rate system used in the past. The pricing system for pure fibre lines was not changed but the rates approved were noticeably lower than those proposed and previously approved. The connection rates for all bandwidths except the 2 Mbps bandwidth were also lower.

In step with the rate system for leasing copper lines, differentiated charges for provisioning SDSL (up to and including 8 Mbps) and VDSL (up to and including 20 Mbps) fibre lines were likewise applied for and approved. While the pricing system for fibre lines remained unchanged, the charges approved for provisioning were all lower than those last approved, with a considerable decrease observed particularly in the provisioning charges for collocation lines.

International cooperation



In 2023 the Bundesnetzagentur again played an active role within the EU's Body of European Regulators for Electronic Communications (BEREC) and contributed directly to its deliverables, such as the analysis of the Commission's proposal on the Gigabit Infrastructure Act (GIA) and the Gigabit Recommendation or the comments on the EU Commission's exploratory consultation on the future of the telecommunications sector.

Cooperation with and collaboration at BEREC

The activities of the Bundesnetzagentur in the EU's Body of European Regulators for Electronic Communications (BEREC¹) and its working groups, which deal with a number of issues relating to the EU's internal telecommunications market, are of key importance at international level. BEREC's work is based on its three strategic priorities for 2021 to 2025: connectivity, sustainable and open digital markets, and empowering end-users and their rights.

In 2023 the Bundesnetzagentur continued to be actively involved in all of the projects described and served as one of the two co-chairs in three working groups: Fixed Network Evolution, Open Internet, and Remedies and Market Monitoring.

In February 2023 Bundesnetzagentur Vice President Dr Wilhelm Eschweiler was appointed Vice Chair and became part of the six-member BEREC Mini-Board. The Mini-Board acts as a central point of contact and represents BEREC at the European institutions and the stakeholders.

As part of the Mini-Board, Dr Eschweiler is automatically also a member of the high-level group (HLG) of the Digital Markets Act (DMA), which comprises representatives from BEREC and

¹ In accordance with Article 5a of Regulation (EU) 2015/2120

other European bodies and networks. The group, which met in May and November, advises the EU Commission on the application of the DMA provisions.

International roaming and intra-EU calls

As a result of the price caps for intra-EU communications² (ie calls and text messages to other EU countries³), consumers have been paying a maximum of 19 cents per minute and a maximum of 6 cents for a text message (both excluding VAT) since 2019. As these regulations expire on 14 May 2024, BEREC prepared a relevant opinion⁴ in spring 2023, basically pointing out to the EU Commission that the percentage of price-regulated intra-EU services has remained relatively stable over time and that intra-EU communications may already be substituted by (free) messaging services today.

In addition, BEREC issued an opinion on the review of the Commission Implementing Regulation supplementing the Roaming Regulation⁵ on fair use policy and the sustainability of the abolition of roaming surcharges, emphasising that fair use policies are still necessary to ensure the provision of roaming services as at home.

End-user rights / consumer protection

The regulatory framework provides for end-users to have access to at least one independent comparison tool. These tools are designed to enable end-users to compare different internet access services, number-based services and, optionally, number-independent services with regard to prices and, in some cases, quality of service. Independent comparison tools must set out clear and objective criteria and include a broad range of offers covering a significant part of the market. Tools fulfilling the requirements must be certified by competent authorities upon request by the providers of the tools. BEREC has drawn up an overview of the comparison tools available and planned in Europe.⁶

Currently BEREC is also revising the Guidelines detailing Quality of Service Parameters published in March 2020⁷, which are due to be approved in March 2024 following a public consultation. The Guidelines cover the definitive quality of service parameters, including the parameters relevant for end-users with disabilities, and the applicable measurement methods for these QoS parameters, as well as statements on the content and format of publication of the QoS information and the quality certification mechanisms. National regulatory authorities can request the operators to publish detailed information for end-users on the quality of their services, to the extent that they control certain elements of the network. The same goes for the measures taken to ensure equivalence in access for end-users with disabilities. In doing so, national regulatory authorities must take utmost account of the BEREC guidelines.

² These price caps also apply in Norway, Liechtenstein and Iceland.

³ BoR (23) 44

⁴ BoR (23) 63

⁵ Regulation (EU) 2022/612

⁶ BoR (23) 22

⁷ BoR (20) 53

Right to be supplied with telecommunications services / universal service

BEREC must prepare a regular report on best practices to support the defining of adequate broadband internet access in the context of the universal service rules. Universal service aims to ensure access to an affordable, available, adequate broadband internet access service and to voice communications services at a fixed location. The adequate bandwidth is to be defined by the Member States in line with national conditions and in consideration of the minimum bandwidth used by the majority of consumers in the relevant country and must be able to support a minimum of explicitly mentioned services, such as email, search engines, internet banking etc. For defining the adequate bandwidth the BEREC report must be taken into account. The second report is expected to be adopted in March 2024 following a public consultation.

Market regulation

In BEREC produced a report providing a snapshot of the regulatory treatment of business services and an overview of the geographical scope of business markets.⁸ As regards the competition amongst very high capacity network (VHCNN)⁹ operators the EU Recommendation on relevant markets specifically requires a thorough analysis of any geographic differences in competition within a Member State. This is why BEREC produced a report on competition amongst multiple VHCN operators in the same geographical region.¹⁰ In many Member States 11-50% of homes have access to two and 0-25% to three VHCNs, whereas only relatively few have access to more than three networks. The study shows that the

existence of several VHCNs has an impact on retail prices in Germany.

Finally, BEREC updated its VHCN Guidelines¹¹ according to Article 82 of the EECC with a view to performance thresholds for wireless networks using data from 5G network operators. The BEREC Guidelines define the criteria to be met by a communications network to be considered a very high capacity network.

Digital Services Act

In November 2022 a comprehensive body of legislation for digital markets and services entered into force in the EU with the aim of creating a level playing field for all market participants and protecting users from illegal content and products. The Digital Services Act (DSA) regulates the obligations and responsibilities of online service providers, from small to very large, with respect to the removal of illegal content and products and the fundamental rights of all users.

Implementation of the provisions of the Digital Services Act, by contrast, is largely carried out by the competent authorities. The European Commission has supervisory and enforcement powers for very large online platforms. It is supported by a European Board for Digital Services, which consists of Digital Services Coordinators entrusted with implementation at national level. In preparing for their role as DSC some regulators who will be assigned responsibility (including the Bundesnetzagentur¹²) maintain a regular dialogue.

⁸ BoR (23) 89

⁹ Very High Capacity Networks

¹⁰ BoR (23) 87

¹¹ BoR (23) 164

¹² Under the draft Digital Services Act of 1 August 2023 the Bundesnetzagentur will assume the role of DSC for Germany.

Data Act and Artificial Intelligence Act

Two further European legislative proposals will govern the regulation of artificial intelligence (Artificial Intelligence Act) and access to data (Data Act). Both legislative procedures were completed at the end of 2023. The provisions are expected to be applied by 2025/2026.

BEREC has examined the potential and challenges of artificial intelligence (AI) looking at various applications and areas in which national regulatory authorities can use artificial intelligence. The draft report¹³ was put out for public consultation at the end of 2022 and published at the beginning of June 2023.

On 21 April 2021 the EU Commission presented the draft Artificial Intelligence Act (AI Act) with the aim of making the EU a global centre for “trustworthy AI”. Its purpose is to promote AI innovation and minimise or prevent risks associated with the use of AI. The AI Act takes a risk-based horizontal approach categorising AI systems according to risk levels, focusing on so-called high-risk AI systems. These AI systems will be authorised in the EU in the future if they meet strict safety and transparency requirements.

The trilogues between the Council and the European Parliament, which began in June 2023 and were concluded at the end of 2023, focused on different topics including the national governance structure, requirements for providers and users of high-risk AI systems, the integration of standards, the form of the conformity assessment and the consideration of basic models and general-purpose AI systems in the regulatory framework.

¹³ BoR (22) 191

Net neutrality and IP interconnection

The national regulatory authorities and BEREC have been monitoring compliance with EU rules to ensure net neutrality for many years.¹⁴ In 2023 the debate continued about content and application providers making a financial contribution to network costs, which the large European telecommunications network operators have been demanding in particular from the large content and application providers for some time. As part of the EU Commission’s exploratory consultation in spring 2023 (see below), which includes a section on a “fair contribution” by all digital players, BEREC reaffirmed its preliminary assessment from 2022 reiterating that there was no evidence of market failure that would justify regulatory intervention in the market. Any market intervention would have to take into account the consequences for competition, consumers, innovation, net neutrality and the openness of the internet, along with sustainability. A contribution to network costs would affect all market players, including small and medium-sized enterprises and end-users, as the cost increase resulting from network cost contributions would usually be passed on to them.

If only certain content and application providers were required to pay, this would likely violate the principle of non discrimination under the net neutrality rules.

Cybersecurity and resilience

Cybersecurity was more topical than ever in 2023. In this context, the Directive on measures for a high common level of cybersecurity (NIS2 Directive) and the Directive on the resilience of critical entities (CER Directive) are particularly worth mentioning. The two Directives were

¹⁴ Regulation (EU) 2015/2120

published in the EU Official Journal on 27 December 2022 and must be transposed into national law by October 2024. Implementation at national level will take place in two legislative proposals, which will be monitored by the Bundesnetzagentur as the competent authority.

Building on the activities carried out in 2022, BEREC has evaluated a questionnaire to collect relevant information from the European markets to gain a better understanding of the status of resilience and security of electronic communications infrastructures and networks in the EU. The two relevant reports¹⁵ were adopted in October and December 2023.

Environmental sustainability

As regards environmental sustainability BEREC has prepared a report on sustainability indicators for electronic communications networks and services.¹⁶ The report analyses the current and future relevance of 21 sustainability indicators for both national regulatory authorities and stakeholders. As part of this project BEREC has started a dialogue with DG Connect and the Commission's Joint Research Centre on preparing a Code of Conduct. To develop this Code of Conduct it will be crucial to select suitable environmental indicators.

In addition BEREC has presented a report on empowering end-users by providing transparency on the environmental impact of digital products and services¹⁷. It examines tools to improve the comparability of digital products and services, such as labelling systems. The project also involves preparing a communications campaign to raise consumer awareness.

Broadband Cost Reduction Directive (BCRD) / Gigabit Infrastructure Act

On 23 February 2023 the EU Commission presented its proposal for a Gigabit Infrastructure Act (GIA), a regulation to replace the Cost Reduction Directive dating from 2014 (BCRD)¹⁸. The GIA aims at achieving the EU's gigabit targets for 2030 by reducing network rollout costs and speeding up the expansion of very high capacity networks, in particular fibre to the home and 5G.

The main changes compared to the BCRD include a change of targets (VHCNs instead of >30 Mbps), strengthening the single information point, shorter deadlines, in particular for the

15 BoR (23) 180; BoR (23) 213

16 BoR (23) 166

17 BoR (23) 207

18 Directive 2014/61/EU

dispute settlement bodies, new rules for in-building fibre wiring for new buildings and after renovation works and, in general, a higher degree of harmonisation due to the GIA taking the legal form of a regulation.

BEREC closely examined the proposed regulation and submitted its analysis¹⁹ to the European legislative bodies and the EU Commission. The co-legislators are planning to adopt the regulation before the European elections in May 2024.

Satellite connectivity for universal service / LEOs

Given the increasing importance of satellites for ensuring connectivity BEREC turned its attention to non-stationary satellite systems, especially low-earth-orbit satellites (LEOs), in 2023, looking at potential regulatory challenges, in particular regarding the rollout of new networks and services and the effects on the electronic communications market.

Gigabit Connectivity Recommendation

The draft Gigabit Connectivity Recommendation is part of the EU's Connectivity Package published by the EU Commission on 23 February 2023. The Gigabit Recommendation replaces the NGA Recommendation²⁰ of 2010 and the Recommendation on consistent non-discrimination obligations and costing methodologies²¹ of 2013 (NCDM Recommendation). The draft focuses on the so-called SMP remedies, ie the regulatory obligations under Article 68 et seq of the EECC (Code) that can be imposed on an operator with significant market power. As a result of the 2018 Code²² and the new 2020 Relevant Markets

Recommendation²³ the NGA Recommendation and the NDCM Recommendation²⁴ had to be updated. They define the principles of which the national regulatory authority has to „take utmost account“ when it imposes obligations (such as access obligations, price control obligations etc.).

In the draft Gigabit Recommendation all principles on imposing obligations (non-discrimination obligation, „granting price flexibility through not imposing price control obligations“, costing methodologies to encourage the rollout of very high capacity networks, in particular fibre networks when imposing price control obligations, rules for determining the weighted average cost of capital (WACC) and a VHCN risk premium) are mainly aimed at and tailored to meeting the connectivity objective (that is the rollout of very high capacity networks, see below). The Gigabit Recommendation only applies to SMP operators in the wholesale market for local access provided at a fixed location (market 1 of Recommendation 2020/2245/EU).

While both the 2010 and 2013 recommendations were specifically aimed at promoting competition (NDCM Recommendation) and „regulated access“ (NGA Recommendation) as goals and means of imposing obligations, the Gigabit Recommendation now focuses on the connectivity objective. This shift in focus determines the revision of the principles for imposing obligations, some of which also go beyond the provisions laid down in the Code.

In close cooperation with the Bundesnetzagentur BEREC prepared and published an opinion²⁵ on the EU Commission's draft in May 2023. BEREC criticises, in particular, the exclusive focus on the connectivity objective, which leads to the other

19 BoR (23) 120

20 Recommendation 2010/572/EU

21 Recommendation 2013/466/EU

22 Implemented in Germany by the Telecommunications Act.

23 Recommendation 2020/2245/EU

24 Both of them often referred to as „Access Recommendation“.

25 BoR (23) 83

objectives of the Code being neglected, such as promoting sustainable competition, taking into account the interests of consumers and developing the internal market.

BEREC also warns against lowering regulatory standards in a way that is no longer compatible with the Code. This entails the risk of premature deregulation, which means that regulatory measures are withdrawn in certain areas, where they would still be necessary given the identified competition problems. This in turn involves the risk of “remonopolisation”, which would also jeopardise the connectivity objective.

In its recommendations on the calculation of the cost of capital BEREC clearly states that in the applicable WACC a distinction must be made between taking into account the short-term increase in the rate of inflation and calculating a VHCN risk premium. A risk premium should only apply to investments in new network projects (and not in general), as provided for in Article 74 of the EECC. The short-term increase in the inflation rate for the generally applicable WACC should be in line with the provisions of the 2019 WACC notice, which is not being revoked by the Commission. Under no circumstances should a WACC decision (have to) be adjusted at a later date by applying a new inflation rate. This is only possible with regard to the future. Changing an expected inflation rate at a later date contradicts the logic of an expectation, which by nature always relates to the future. Such an approach would lead to legal uncertainty and contradict the principle of predictability, which is also laid down in the EECC.

The Commission is obliged to follow the BEREC opinion as closely as possible. It is not yet clear when exactly the EU Commission will adopt the recommendation. BEREC has argued in favour of granting a certain transitional period before

the recommendation enters into force as many national regulatory authorities (including the Bundesnetzagentur) have already initiated procedures to impose obligations, which are still based on the previous recommendations.

EU Commission’s exploratory consultation

As part of the EU Connectivity Package the EU Commission launched an exploratory consultation on 23 February 2023 publishing a questionnaire on the future of the electronic communications sector and its infrastructure. The consultation addresses questions on technological and market developments, fairness for consumers, barriers to the internal market and a “fair contribution” by all digital players.

In cooperation with the Bundesnetzagentur BEREC has prepared an opinion reiterating the objectives of the EU regulatory framework with regard to market and technological developments, the relevance of new business models for investments in network rollout and the need for taking into account sustainability given the increasing spread of digital technology. With respect to fairness for consumers BEREC points out that universal service is not meant to be a tool for achieving the connectivity objectives, but for providing access to a minimum level of electronic communications services. Likewise BEREC sees no obstacles to the internal market and thus no reason to further centralise national practices or further harmonise spectrum award or consolidate markets. Nor, due to a lack of market failure, is there a need to introduce payments from large traffic generators to contribute to network investments (in the local exchange area).

On 12 October 2023 the EU Commission published a summary of the comments²⁶ received on its website, together with three brief main conclusions focusing on investments to provide connectivity. In preparing for the EU Commission's planned activities and the revision of the 2025 regulatory framework BEREC has launched a first discussion of these conclusions.

Independent Regulators Group

The Independent Regulators Group²⁷ (IRG) was established by independent national regulatory authorities from countries within and outside the EU (eg Switzerland and the United Kingdom) in 1997. As a group, IRG is able to cover regulatory issues that are beyond BEREC's remit.

IRG held a number of events in 2023 as well to facilitate an intensive dialogue between the various market players, including a webinar on the EU Global Gateway, the first IRG Ted Talks on cloud computing and the EU Data Act, and the first Info-Shot on the Digital Markets Act. IRG also organises regular workshops on current topics for members of the national regulatory authorities.

²⁶ <https://digital-strategy.ec.europa.eu/en/library/results-exploratory-consultation-future-electronic-communications-sector-and-its-infrastructure>

²⁷ <http://www.irg.eu>

IIC International Regulators' Forum 2023

The Bundesnetzagentur invited a number of representatives from regulatory authorities from over 40 countries across all continents to attend the International Regulators' Forum (IRF) of the International Institute of Communications (IIC) in Cologne on 16 and 17 October 2023. The ICC is an independent organisation in the telecommunications and media sector, with the Bundesnetzagentur being a member since 2021.

The IRF 2023 hosted several panel discussions, covering topics such as technical trends, cybersecurity and network/supply chain resilience, 5G rollout and space and satellite communications, empowering consumers in a digital world, fixed broadband rollout and the regulation of digital platforms and intermediary services. The forum clearly demonstrated that cooperation between the national regulatory authorities is more important than ever to exchange ideas and learn from each other, since many authorities are facing the same challenges.

International spectrum management

ITU Radiocommunication Sector

As the coronavirus pandemic subsides, ITU Radiocommunication Sector (ITU-R) meetings are usually conducted as hybrid meetings. The meetings are divided between preparations for the World Radiocommunication Conference (WRC) and ITU-R's normal tasks.

Various meetings in the run-up to the World Radiocommunication Conference 2023 again brought to light different positions. These differences are mainly due to the wide range of user interests represented by the administrations and industry (for example in the 6 GHz and UHF bands or with Russia regarding the 4.8-5 GHz band). Apart from the enhanced use of compatible technologies in many frequency bands the use of satellite systems for broadband coverage, measurements or the Internet of Things is becoming increasingly important. At the same time there is a continuing need for clear regulations on a global level to ensure the control of aircraft (UAV), the protection of fixed satellite services (FSS) in the C-band or sustainability in the use of space resources. The common positions agreed as part of the preparatory work at European level proved to be highly agile during the negotiations at the World Radiocommunication Conference 2023 and often formed the basis for successful negotiations.

Alongside many other topics ITU-R already adopted initial reports on technological trends for the next decade's generation of mobile communications under the title "IMT framework for 2030 and beyond".

CEPT's Electronic Communications Committee

The Bundesnetzagentur cooperated with other European spectrum management authorities to offer support with numerous technical and regulatory studies and help finalise European spectrum rules (<https://docdb.cept.org/>).

The European regulatory framework is developed by the Electronic Communications Committee (ECC) within the European Conference of Postal and Telecommunications Administrations (CEPT). The ECC's tasks include producing ECC Decisions and ECC Recommendations, studies on radio spectrum issues (ECC Reports) and reports from CEPT in response to mandates issued by the European Commission.

The focus of the work in 2023, alongside the response to the Commission's mandate to develop compatibility between MCV services using 5G NR non-AAS systems and terrestrial systems capable of providing electronic communications services in the paired bands at 1800 MHz and 2600 MHz, included the development of harmonised technical conditions at 2300-2400 MHz for mobile/fixed communications networks (MFCN).

In addition CEPT prepared a recommendation on cross-border coordination for the future railway communication system FRMCS in the 1900-1910 MHz band, which is very important in particular with regard to trans-European railway corridors.

Radio Spectrum Committee

The European Commission's Radio Spectrum Committee (RSC) draws up implementing decisions binding on all Member States with the aim of harmonising radio spectrum policy.

In close cooperation with the Bundesnetzagentur the RSC dealt with a number of issues in 2023.

Based on the deliverables provided by the ECC in response to mandates a solid draft revision of the implementing decision for mobile communication services on board ships was put together, defining harmonised conditions of use to enable network connections on board ships based on 5G NR technology in the future.

Furthermore a solid draft of a new implementing decision for wireless network access in the 40.5 - 43.5 GHz band was developed in order to provide spectrum for wireless network access enabling very high data rates, particularly in locations with high capacity requirements. The conditions of use are such that they do not compromise the scope for using the existing services in the band.

There was also a discussion on revising the implementing decision for ultra-wideband applications (UWB) to enable new and innovative scenarios for the use of UWB, in particular in the industrial, transport and logistics sectors.

The draft of a new mandate to CEPT focuses on studies for conditions of use for communication of drones and other aircraft with public mobile networks (see also: <https://ec.europa.eu/digital-single-market/en/radio-spectrum-committee-rsc>).

Radio Spectrum Policy Group

The Bundesnetzagentur's activities for the Radio Spectrum Policy Group (RSPG), the high-level advisory group that assists the European Commission with spectrum policy issues, involved supporting the Federal Ministry for Digital and Transport (BMDV) and providing input for various opinions and reports. A number of opinions and reports have been adopted, including the "RSPG Opinion on assessment of different possible scenarios for the use of the frequency bands 1980-2010 MHz and 2170-2200 MHz by the Mobile Satellite Services beyond 2027", the "RSPG Opinion on 5G developments and possible implications for 6G spectrum needs and guidance on the rollout of future wireless broadband networks", the "RSPG Report on the role of radio spectrum policy to help combat climate change", the "RSPG Opinion on Strategy on the future use of the frequency band 470-694 MHz beyond 2030 in the EU", the "RSPG Opinion on The future of the electronic communications sector and its infrastructure" and the related "Addendum on satellite authorisations", the "RSPG Report on Mobile technology evolution – experiences and strategies" and the "RSPG Peer Review Report 2023" (https://radio-spectrum-policy-group.ec.europa.eu/opinions-and-reports_en).

International technical regulation

Reforms at the European Telecommunications Standards Institute

The European Telecommunications Standards Institute (ETSI) is a non-profit organisation based in Sophia Antipolis (France) responsible for European telecommunications standardisation. Representatives of network operators, service providers, administrations, users and manufacturers work together in a number of technical committees and working groups to develop European standards (EN), technical specifications and reports. Harmonised European Standards are particularly important for market participants when it comes to placing products on the market (declaration of conformity).

The European Commission's new standardisation strategy and proposal for an amendment of Regulation (EU) 1025/2012 presented on 2 February 2022 introduced new requirements for European standardisation organisations' processes for developing and adopting mandated harmonised European standards. As a recognised European standardisation organisation ETSI has therefore also undergone reform and adapted its internal processes, coordination procedures and weighting of votes to the requirements set by the EU Commission. The Bundesnetzagentur has been actively involved in these reforms in consultation with the Federal Ministry for Economic Affairs and Climate Action (BMWK).

Standardisation for radio equipment within ETSI

The Bundesnetzagentur maintained its active cooperation with ETSI in 2023 to promote radiocommunication services in information and communication technology, with the aim of developing modern, open and high-quality standards for radio equipment for a wide range of radiocommunication services (including mobile radio, broadcasting, satellite communications, fixed links, aeronautical, maritime and inland waterways, radiodetermination and radio-navigation, WLAN and short range devices (SRD) applications) and incorporating the regulatory objectives defined in the Telecommunications Act as far as possible in the standardisation process.

Recognition of conformity assessment bodies

Before a product is placed on the market a conformity assessment is conducted, which includes an assessment of the product's compliance with the essential requirements (eg product-specific standards) and the relevant confirmation by the manufacturer or by way of a certificate from a recognised certification body. In general, the manufacturer is responsible for carrying out the conformity assessment procedure within the scope of Directives 2014/30/EU (EMC) and 2014/53/EU (radiocommunication).

If the conformity assessment is based on harmonised standards, the manufacturer's declaration that their product complies with the essential requirements of these standards is usually sufficient. In addition they may choose to make use of the expertise of a conformity assessment body, which is referred to as "notified body" if it has been recognised by the State.

If harmonised European standards do not exist, it is mandatory to involve a notified body.

Notified bodies fall within the remit of the Bundesnetzagentur under the German Ordinance concerning the requirements and the procedure for the recognition of conformity assessment bodies in the field of the electromagnetic compatibility of equipment and in the field of the making available of radio equipment (conformity assessment body recognition ordinance – AnerkV) in conjunction with the Radio Equipment Act (FuAG) and the Electromagnetic Compatibility Act (EMVG). Notified bodies are examined and recognised by the Bundesnetzagentur, notified to the European Commission as part of the notification procedure and listed in the NANDO (New Approach Notified and Designated Organisations) database. The NANDO information system is managed by the European Commission and provides information to the public on all accreditations and recognitions relating to all European directives and regulations, including certificates of accreditation and other proof of competence. In Germany the Bundesnetzagentur is the central agency for entering data into the NANDO database and manages the coordination platform of the designating authorities (KBeB) to facilitate coordination with the authorities and ministries.

In 2023 the Bundesnetzagentur also looked into the implementation of Delegated Regulation (EU) 2022/30 under the Radio Equipment Directive, which will enter into force on 1 August 2024 and introduce changes to the essential requirements regarding cybersecurity.

To support global trade the European Union has signed free trade agreements or Mutual Recognition Agreements with countries such as the USA, Canada and Japan, covering the mutual recognition of recognised bodies in the respective economic zones. These agreements make it possible

for conformity assessment bodies of a particular economic zone to assess certain products according to the legal requirements of the partner countries or zones. In this context the Bundesnetzagentur is responsible for telecommunications and electromagnetic compatibility.

The list of recognised bodies is available on the Bundesnetzagentur website at:

www.bundesnetzagentur.de/697504

Artificial intelligence (AI)

Currently a law on regulating artificial intelligence is being negotiated at European level (AI Act), focusing on the risk assessment and monitoring of such systems.

The Bundesnetzagentur therefore placed particular emphasis on risk and conformity assessment as well as market surveillance for AI in its standardisation activities. It played an active part in the work of the European Telecommunications Standards Institute (ETSI), the Comité Européen de Normalisation (CEN) and the Comité Européen de Normalisation Électrotechnique (CENELEC) and made an essential contribution to developing test procedures for machine learning models, for example with regard to robustness, reliability and safety to support a reliable conformity assessment for AI systems.

The Bundesnetzagentur also led activities in international standardisation bodies (ISO, IEC and ITU) for developing standards for the classification of artificial intelligence (AI) systems, primarily focusing on the comprehensive standard ISO/IEC 42102 (“Taxonomy of AI system methods and capabilities”).

As such, the Bundesnetzagentur’s efforts played a key role in promoting “reliability” and “transparent application of artificial intelligence” in standardisation.

International Telecommunication Union: World Telecommunication Standardization Assembly (WTSA) und Plenipotentiary Conference (PP)

The Bundesnetzagentur represents Germany's interests in meetings at the International Telecommunications Union (ITU) on behalf of the Federal Ministry for Digital and Transport (BMDV) in accordance with section 221 of the German Telecommunications Act (TKG).

In cooperation with the other European Member States the Bundesnetzagentur successfully countered advances made by various (non-European) countries relating to “networks of the future (quantum internet)” and “privacy (embedding state surveillance in the metaverse outside democratically legitimised purposes and dimensions)”. As regards the quantum internet, established practices for developing market-relevant standards could be maintained, thus preventing premature standardisation interfering with the freedom of research. With regard to privacy Chinese companies' attempts to enable specific forms of total surveillance and access control by the police and government agencies were thwarted, as these would have contradicted European values and set a precedent for the international legitimisation of such practices with extensive consequences. In each case the procedure was closely coordinated with the EU Commission.

The Bundesnetzagentur, in consultation with the BMDV, is involved in coordinating the negotiations and contributions of the European region (Com-ITU, CEPT) for the upcoming WTSA in October 2024.

Preparations for the 2026 Plenipotentiary Conference (PP 26), ITU's highest policy-making body, will start soon. The Bundesnetzagentur and the BMDV will jointly draft contributions coordinated

at national and European level and present them at the Conference. Resolutions adopted at these conferences have a significant impact on the strategic focus of ITU's activities.

Cybersecurity

Increasingly connected devices in combination with shortcomings in IT security lead to a massive rise in the risk of attacks on sensitive data. This is why the EU legislative and regulatory framework has been modified through various initiatives, for example on the Radio Equipment Directive (RED). Additional legislative initiatives, including the Cyber Resilience Act (EU law on cyber resilience), are being drafted or have yet to be implemented through national legislation, such as the Network and Information Security (NIS) Directive (NIS2 Directive).

The RED delegated act from 2022 significantly tightened the IT security requirements for placing radio equipment on the market. The Bundesnetzagentur plays an active role in the national and European standardisation bodies when it comes to developing the standards for implementing the new requirements. The main responsibility for drawing up these standards lies with the mandated European standardisation organisations CEN/ CENELEC. However, at present these standards are yet to be reviewed and approved.

Standardisation in the field of electromagnetic compatibility

A fundamental study commissioned by the Bundesnetzagentur on examining EMC requirements in the 6-40 GHz band was successfully completed. The results provide an essential basis for incorporating appropriate standardised measurement methods in this spectrum band, in particular to protect 5G applications from unwanted emissions.

The standardisation of EMC characteristics in the field of electromobility continued to be one of the main areas of activity. Electric vehicle charging takes place over a longer period of time and often close to residential areas, which raises challenges in terms of ensuring electromagnetic compatibility to protect radiocommunication services, in particular radio reception, and smooth operation of the relevant system components.

5G/6G standardisation

The 3rd Generation Partnership Project (3GPP) is the major driver behind 5G and future 6G standardisation. The Bundesnetzagentur represents Germany's interests in mobile communications standardisation at the 3GPP meetings on behalf of the Federal Ministry for Economic Affairs and Climate Action (BMWK) in accordance with section 221 TKG.

During the period under review work on Release 18 continued and basic studies and work on Release 19 started. As a result of the ongoing discussions a specific content package for Release 19 was finally adopted at the end of 2023, including innovations in areas such as artificial intelligence, satellite mobile communications, the Internet of Things and energy consumption. In addition plans were made to launch the first 6G studies in 2024.

Setting itself up for the 6G challenges at national level as well, the Bundesnetzagentur participated in planning, organising and implementing a 6G workshop at the BMWK in Berlin, which presented the interim results of the 6G research hubs to a specialist audience. The research hubs facilitate an innovation ecosystem for exploring and developing future communication technologies relating to 6G. They were established in Germany in August 2021 and are led by renowned professors and institutes. The Bundesnetzagentur is following these research activities to be able to provide impetus in international standardisation bodies.

Tasks and organisation



The Bundesnetzagentur aims to ensure nationwide fibre, mobile and spectrum coverage. As a federal authority it is also strongly committed to consumer protection. It acts as a mediator in citizens' complaint procedures. The Bundesnetzagentur covers a wide range of constantly increasing responsibilities.

Tasks and structure

The Bundesnetzagentur, originally known as the Regulatory Authority for Telecommunications and Post, was set up on 1 January 1998 as a separate higher federal authority under the Federal Ministry for Economic Affairs and Climate Action. It took over the responsibilities of the former Federal Ministry of Post and Telecommunications and the Federal Office for Post and Telecommunications. In 2005, on being assigned responsibilities under the Energy Industry Act and subsequently the General Railway Act, the Regulatory Authority for Telecommunications and Post was renamed the Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen.

First and foremost, the Bundesnetzagentur's remit is to promote competition through regulation in the energy, telecommunications, postal and railway network infrastructures and to guarantee non discriminatory network and thus market access. Alongside regulatory measures in the energy sector, as the planning authority the Bundesnetzagentur is also responsible for electricity transmission lines crossing national or federal state borders in the context of the energy transition. In the telecommunications and postal sectors it ensures appropriate, adequate and nationwide services and provides regulations for the use of frequencies and numbers. Furthermore, the Bundesnetzagentur is the competent authority under the Electronic Signatures Act (SigG).

The Bundesnetzagentur's tasks are complex and highly diverse. They range from cases addressed in quasi-judicial proceedings in regulation areas, reporting requirements and planning authority responsibilities, consumer protection and information activities in the regulated sectors, to the nationwide investigation and processing of frequency interference complaints.

Below the management level the Bundesnetzagentur comprises ruling chambers and departments. The President's Chamber takes decisions in specific cases, in particular on award proceedings for scarce radio spectrum resources and the imposition of universal service obligations. In the telecommunications sector it determines which markets require regulation and which companies have significant market power in these markets. On the basis of these determinations, the ruling chambers then decide on the regulatory measures to be imposed on companies with significant market power. This is how decisions on specific details of obligations are reached, for example in the field of network access conditions or ex ante or ex post price reviews. In the postal sector the ruling chamber focuses on (ex ante and ex post) rates approval and the control of anti-competitive practices, including the regulation of access to the postal network. In the energy sector the ruling chambers have decision-making powers on general and individual issues regarding access to electricity and gas networks and network charges.

The departments perform specialised and central administrative functions. These include economic and legal policy issues in the various areas of regulation and the relevant international coordination, as well as technical aspects of frequencies, standardisation, numbering and public safety. The Bundesnetzagentur is involved in international standardisation bodies, cooperating in the development of next-generation networks and new radio systems.

All of the Bundesnetzagentur's responsibilities have a strong international element. Coordination at European level, in particular, has always been an important aspect of its regulatory activity. This is reflected by the fact that the international activities are mostly concentrated and dealt with in one department.

In the telecommunications sector the Bundesnetzagentur is mainly responsible for the key decisions and objectives that promote investment, innovation and competition for the benefit of all citizens. In the context of Industry 4.0, ideas are being developed to promote the spread of digital technology and internetworking in key future-oriented fields; at the same time economic opportunities offered by the digital revolution and internetworking are being assessed with respect to growth, employment and competitiveness in the national economy.

Consumer protection remains another key focus area in the telecommunications sector. In this regard, particular emphasis is placed on investigating problems that hinder a smooth change of supplier. Furthermore, the Bundesnetzagentur continues to vigorously combat misuse as regards the unlawful use of telephone numbers, anti-competitive behaviour and cold calling. In protecting the consumer, particular attention is given to preventing the illegal billing of call queues. Another primary function is to ensure transparency of consumer contracts, especially with respect to the bandwidth guaranteed in the contract. The Bundesnetzagentur also maintains a database of sites of fixed transmitters operating above a specified power level. Also of particular importance for consumers are the resolution of radio interference, the dispute resolution procedure and general consumer services. Moreover, the Bundesnetzagentur plays an essential role in ensuring public safety. Its tasks include checking the technical protection measures for critical telecommunications

infrastructure, protecting personal data and telecommunications privacy, the technical implementation of interception measures, and implementing and safeguarding information procedures.

In the energy sector it is the Bundesnetzagentur's duty to create and secure the basis for efficient competition in the electricity and gas markets. This is done in particular through unbundling and regulating non-discriminatory access to the energy networks, including tariff regulation. In addition, the statutory decision in 2011 to phase out nuclear power as part of the Energiewende and the continued expansion of renewable energy require state measures with respect to the various market players, including monitoring the electricity and gas wholesale markets and intervening where necessary to safeguard security of supply. The Bundesnetzagentur also monitors the development of upstream generation and import markets along with consumer markets. In the event of an electricity or gas deficit situation, the Bundesnetzagentur immediately acts as the federal load distributor, taking on the statutory duty of distributing energy resources.

One of the major tasks for the Bundesnetzagentur in the context of the energy transition is the fast, large-scale expansion of the electricity transmission networks. To achieve this, the Bundesnetzagentur has been given wide-ranging authority in network development planning and in approving network expansion measures. This includes implementing the federal sectoral planning for extra-high voltage lines crossing federal state and national borders and, as of 2013, their planning approval. As part of the statutory planning process, the network development plan is constantly being updated to take account of the latest developments. This also involves network planning and connection in the offshore sector.

In rail regulation the Bundesnetzagentur monitors compliance with the legislation on rail infrastructure access. A core task here is to ensure non-discriminatory use of the rail infrastructure by railway undertakings and other access beneficiaries. The term rail infrastructure includes the infrastructure and services connected with both tracks and service facilities (eg stations, freight terminals). Rates regulation includes the examination of the level and structure of infrastructure charges and of other charges levied by the infrastructure managers.

A nationwide presence is vital for the Bundesnetzagentur to perform its duties. To ensure consistency the work of the Bundesnetzagentur's regional offices, which are the contact point with consumers, businesses and industry, is managed and coordinated by the relevant specialist departments.

The regional offices are mainly responsible for technical matters. They provide information, for example, on compliance with regulations on electromagnetic environmental compatibility and telecommunications. They are also in charge of frequency assignment, for instance for private mobile radio systems, for granting site certificates and for sampling equipment under their market surveillance duties. Another important area is the investigation and processing of radio interference using state-of-the-art measuring equipment, monitoring compliance with regulations generally and carrying out radio monitoring and inspection tasks.

Additional executive tasks are carried out by specific regional offices. In particular, this involves activities in number administration, number misuse and cold calling, consumer protection and information, the core energy market data register and the registration of railway infrastructure. They also carry out some human resources

management functions for other government bodies and institutions, primarily those falling under the Federal Ministry for Economic Affairs and Climate Action.

The Bundesnetzagentur also opened a new main location in Cottbus in 2021. The 2021 budget provided us with around 100 new positions to build up this location with interesting and important areas of focus. All of the Bundesnetzagentur's new tasks involving the right to fast internet were established in Cottbus in order to improve the basic provision of internet in Germany. New quality assurance tasks in the core energy market data register and Energiewende database are also performed in Cottbus. Approval procedures for new power lines that are necessary for the energy transition in Germany to be a success and, not least, the work of the Bundesnetzagentur's Legal Office and inter-divisional tasks of departments ITS and Z are also carried out in Cottbus.

Human resources management

Human resources management is a top priority at the Bundesnetzagentur. It is important both to deploy staff optimally and to recruit new qualified staff. This is only possible when human resources management takes account of work requirements and staff skills and preferences in equal measure. Only a combination of pro-active, appropriate staff deployment and motivated employees will allow the Bundesnetzagentur to perform its responsibilities in an efficient way even in times of tight budgets. Aspiring to modern human resources management, the Bundesnetzagentur offers not only corporate health schemes, but also models for balancing work and family life. In this regard the Bundesnetzagentur was certified in 2021 for the third consecutive year by the berufundfamilie Service GmbH for having personnel policies that take both family life and the various stages of life into account. By signing the Diversity Charter the Bundesnetzagentur underscores its commitment towards recognising, appreciating and embracing diversity as one of its core principles.

In recruiting new staff the Bundesnetzagentur requires excellent specialist knowledge as well as the ability to structure and address complex new tasks in an interdisciplinary team quickly and with a flair for practical solutions.

Given its diverse areas of activity, the Bundesnetzagentur attaches particular importance to an interdisciplinary work approach. In total the Bundesnetzagentur employs around 3,000 specialists, including legal experts, economists, engineers, technicians, computer scientists and natural scientists as well as professionals from various other fields, to ensure the efficient, proper performance of tasks in all areas.

Retirements and posts created as a result of new tasks have opened up numerous opportunities for new recruits in the fields mentioned above, providing interesting career prospects for new arrivals. The Bundesnetzagentur follows a sustainable human resources development policy that helps to recognise staff members' potential to perform and develop, to maintain that potential while taking into account constantly changing demands, and to foster potential by including individual staff members' career goals. Bundesnetzagentur employees have a wide range of options for obtaining advanced training and advancement qualifications as well as for active involvement in international institutions.

The Bundesnetzagentur has been offering apprenticeships since 1999. In view of the recruitment of future staff and the challenges of demographic change, the training qualifications offered by the Bundesnetzagentur have become ever more diverse. In 2023, a total of 177 trainees and students were trained at the Bundesnetzagentur in various vocational training and study programmes. Vocational training is available for office management trainees, electronic equipment and systems trainees, and for IT trainees in system integration. Since 2011 the Bundesnetzagentur has also offered a vocational training-integrated dual study programme, now available at five locations, for students to gain a Bachelor of Engineering/Electrical Engineering or Bachelor of Science to qualify them to work as technicians for electronic equipment and systems at the Bundesnetzagentur. For the first time in 2021 the Bundesnetzagentur also hired students for a practice-integrated dual study programme in electrical engineering in Mainz. This programme is now also available in Karlsruhe and Constance. In 2022 the Bundesnetzagentur added a vocational training-integrated dual study programme for business informatics students (Bachelor of Science) in combination with posts as IT trainees in Mainz. Moreover, civil servants

preparing for the rank of Regierungsinspektor have been able to take a university degree in IT in public administration since 2012 and in the new Digital Administration and Cyber Security programme since 2020. Vocational and university training courses are offered at a total of ten Bundesnetzagentur locations, which especially includes regional offices.

Budget

The Bundesnetzagentur's income and expenditure is budgeted for in the federal budget as part of the departmental budget of the Federal Ministry for Economic Affairs and Climate Action.

The table below shows the income for 2023 (target and performance) and 2024 (target):

Type of income

The additional income expected in 2024 under other administrative income is attributable to income relating to the Offshore Wind Energy Act. Successful bidders for off-shore wind power installations in 2023 must make a financial contribution to marine nature conservation and fishing through the Bundesnetzagentur at the latest by mid-2024.

The table below shows the expenditure for 2023 (target and performance) and 2024 (target):

Type of expenditure

Expenditure in 2023 is marked by additional measures to mitigate the energy crisis. At the same time, part of the expenditure was used for implementing new legal requirements, setting up and expanding new organisational units and filling vacancies.

Type of income	Target 2023 €'000	Performance 2023 €'000	Target 2024 €'000
Fees, contributions and other charges in the telecoms sector	47,235	61,414	50,257
Fees and other charges in the postal sector	15	9	17
Fees and other charges in the rail sector	0	12	586
Fees and other charges in the energy sector (electricity, gas, EEG)	13,174	7,975	13,140
Fees and other charges under the Grid Expansion Acceleration Act	32,770	31,885	35,000
Other administrative income, eg fines and rental and sale income	20,745	37,670	807,045
Administrative income	113,939	138,965	906,045

Type of expenditure	Target 2023 €'000	Performance 2023 €'000	Target 2024 €'000
Staff costs	175,930	174,602	181,015
General administrative expenditure, appropriations and special financing expenditure	106,821	83,263	70,342
Investments	18,178	13,956	15,951
Total expenditure	300,929	271,821	267,308

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