

2021

Annual Report

Securing our future



Bundesnetzagentur

- 1 Editorial
- 2 Foreword
- 4 Annual overview
- 6 Press comments



8 Energy

- 10 Market trends
- 12 Security of supply
- 28 Consumer protection and advice
- 30 Rulings, activities and proceedings
- 42 International cooperation



46 Telecommunications

- 48 Market trends
- 66 Consumer protection and advice
- 82 Rulings, activities and proceedings
- 102 International cooperation



108 Post

- 110 Market trends
- 120 Consumer protection and advice
- 130 Rulings, activities and proceedings
- 134 International cooperation



138 Rail

- 140 Market trends
- 144 Rulings, activities and proceedings
- 154 International cooperation

156 The Bundesnetzagentur's core tasks and organisation

163 List of abbreviations

170 Contacting the Bundesnetzagentur

171 Publisher's details

How is it possible to look back at 2021 from the perspective of May 2022 without thinking of the war in Ukraine? Take the energy transition: as well as publishing the capacities of the newly installed renewable energy installations, we have coordinated the auctions for photovoltaic installations, wind power and combined heat and power plants. The tendering processes to reduce the production of electricity from coal went ahead as planned too. All these activities are set out in the Renewable Energy Sources Act (EEG) with the aim of reducing Germany's carbon emissions.

The year 2021 was all about combating the climate crisis, and for good reason. Now the expansion of renewables has gained another dimension. We need it because we want to become independent from Russian energy sources. Yet because we cannot replace fossil fuels with climate-friendly energy overnight, we are always keeping a close eye on gas flows from Russia and the levels of gas storage facilities, without losing sight of our goal of climate neutrality. It is hard to imagine now that in 2021 "gas deficit situation" was just a piece of jargon used by experts, if at all.

Our view of the energy issue has shifted.

But energy is not the only sector for which the Bundesnetzagentur is responsible. At a time when we are in crisis mode, the annual report is an opportunity to reflect on all the important developments besides the gas supply – last year and into the future.



The President of the Bundesnetzagentur
Klaus Müller

Dear Reader,

2021 was another year of crisis. The coronavirus pandemic did not loosen its grip, no matter how much we may have wanted to shake it off once and for all. Yet, in contrast to 2020, we did settle into a sort of routine of dealing with it. We knew what demands were being placed on the networks and met them in cooperation with the providers of telecommunication services, electricity and gas. The networks remained stable.

When I took over as President of the Bundesnetzagentur on 1 March 2022, the next crisis was already well underway. Russia's invasion of Ukraine, as well as raising great concerns about the people in the war-hit area, directly brought up the issue of security of supply in our country. The early warning level was declared for gas and crisis teams set up. All that was and is a challenge for us. Nevertheless, in my early time in office I have set many other goals that I am keeping in my sights. The energy transition with the expansion of the electricity grid, progress in digitalisation and the elimination of dead spots are all tasks that my colleagues and I have made our mission. Of course they follow on from the

dynamic process that has been underway at the authority for years already.

In this report you can read what a wide range of topics we have. First, some highlights of our activities:

In March the Bundesnetzagentur determined the route corridor for the last two sections of the SuedLink direct current transmission line, one of the key projects of the energy transition. The approval procedure for SuedLink was launched in 2017 following widespread public participation. Its aim was to decide on a route corridor about 1,000 metres wide that was suitable for laying underground cables. SuedLink is intended to transport offshore wind power from the North Sea to the densely populated regions of southern Germany along the Main and Neckar rivers. It is planned to go into operation in 2028.

Every five years, the energy sector eagerly awaits the determination of the rates of return on equity for electricity and gas network operators, which the

Bundesnetzagentur published in autumn. The rate of return on equity before corporate tax is 5.07% for new assets and 3.51% for old assets. The lower rates of return reflect the lower rates on the capital markets. Investments in the networks remain attractive for the long term.

The results of the coal tenders are impressive. Seven rounds of tendering by 2026 are prescribed by law to speed up the phase-out of coal-fired electricity generation. Awards totalling around 8,967 MW have already been made in the first four rounds. The statutory target of 13,902 MW for the remaining hard coal-fired and small lignite-fired power plants for the target year 2023 will actually be exceeded.

In the fixed telecommunications networks, a modern regulatory regime needs to provide incentives to invest as well as securing competition. These requirements are reflected in the Bundesnetzagentur's decisions. We published the draft regulatory order on access to the "last mile" in October. It allows for differentiated regulation that takes account of investments in the fibre roll-out and the associated risks. To maximise investment incentives, we are banking on a paradigm shift towards "light-touch regulation". With this regulatory framework, we are paving the way for a faster fibre roll-out.

Clear progress was made on mobile coverage for main transport routes, the result of monitoring the coverage obligations for the spectrum auctioned in 2015. All three mobile network operators have met their obligations. A total of 97% of households in each federal state and 98% in the country as a whole had to be supplied with mobile broadband by each of the three mobile network operators. The main transport routes are now fully covered by LTE as well.

On 1 December, the new German Telecommunications Act (TKG) came into force, strengthening the rights of consumers regarding telephone, internet and mobile contracts. Among the most important changes are shorter notice periods when contracts are automatically extended, a right to a reduction in price when bandwidth is not delivered, as well as compensation payments for telephone or internet outages and for when a technician fails to keep an appointment. Our customer protection staff provide clear, comprehensive information about the new rights. If disputes arise with providers, our dispute resolution panel seeks joint solutions.

We have taken on additional tasks in the field of digitalisation and are involved in developments in various digital technologies and services such as Gaia-X, blockchain, artificial intelligence and over-the-top services. The Gaia-X project, for example, aims to set up a competitive and trustworthy digital data infrastructure. The goal is to create an open and transparent digital ecosystem in which data and services can be made available, collated and shared in an environment of trust. The Bundesnetzagentur announced the winning consortia in the Gaia-X funding competition organised on behalf of the German Federal Economics Ministry in summer. In the first round of funding, the Ministry is expected to award a total of around €122mn. This sum is sufficient to fund 11 of the 16 winning project abstracts. The ideas selected cover the fields of health, law, education, finance, mobility, geo-information, energy, aerospace, agriculture, construction and the public sector.

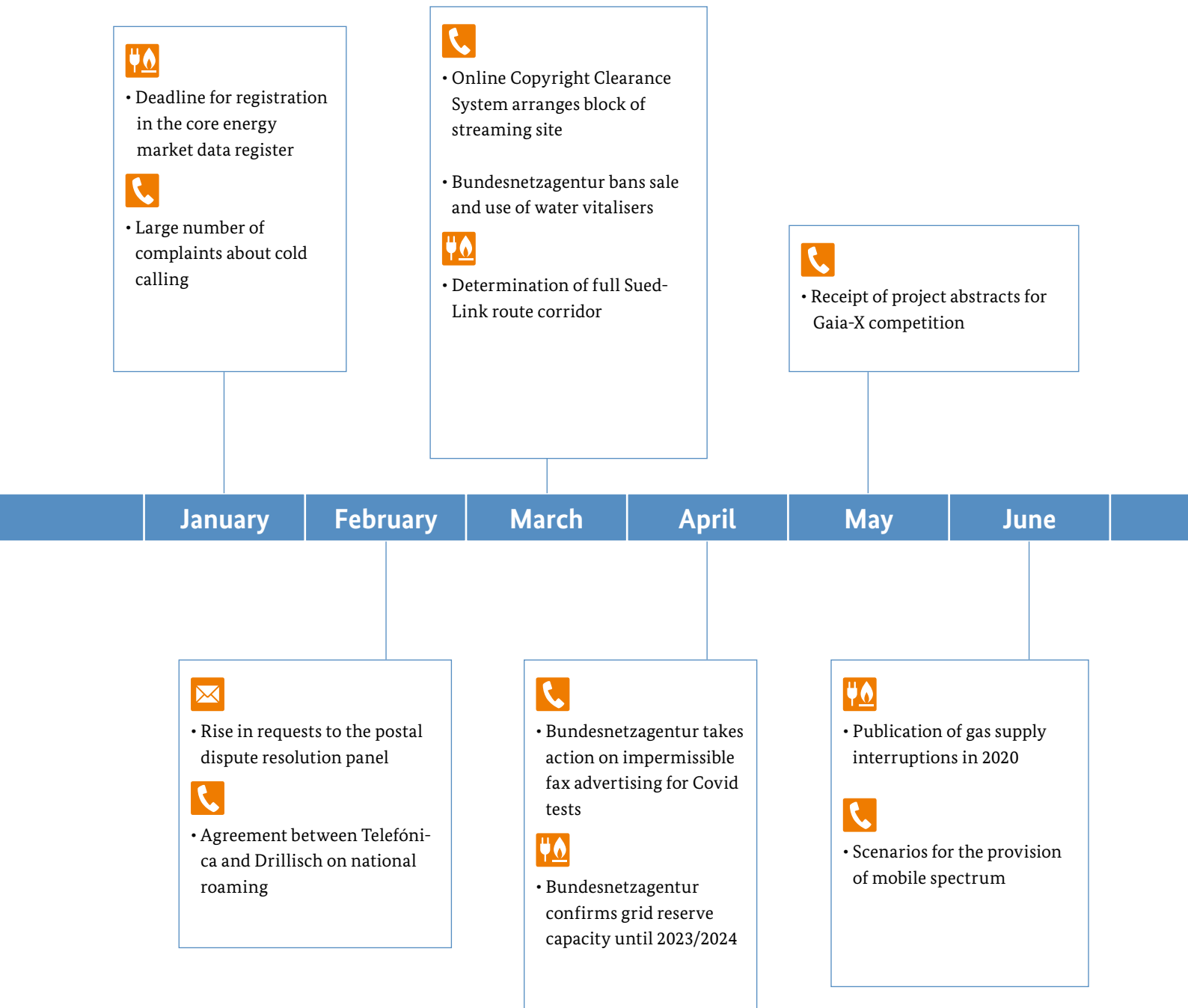
In 2022 the Bundesnetzagentur will continue to build on its successes. It is true that we are going through a major crisis and no one can say with certainty what the future holds. It is thus all the more important to keep sight of our aims: functioning competition that benefits people and modern, powerful infrastructure that meets the needs of consumers and supports our economy. If I was pushed to state a top priority, though, right now I would have to say the energy transition and climate neutrality. Several objectives coincide in these two and achieving them is crucial for everyone's future.

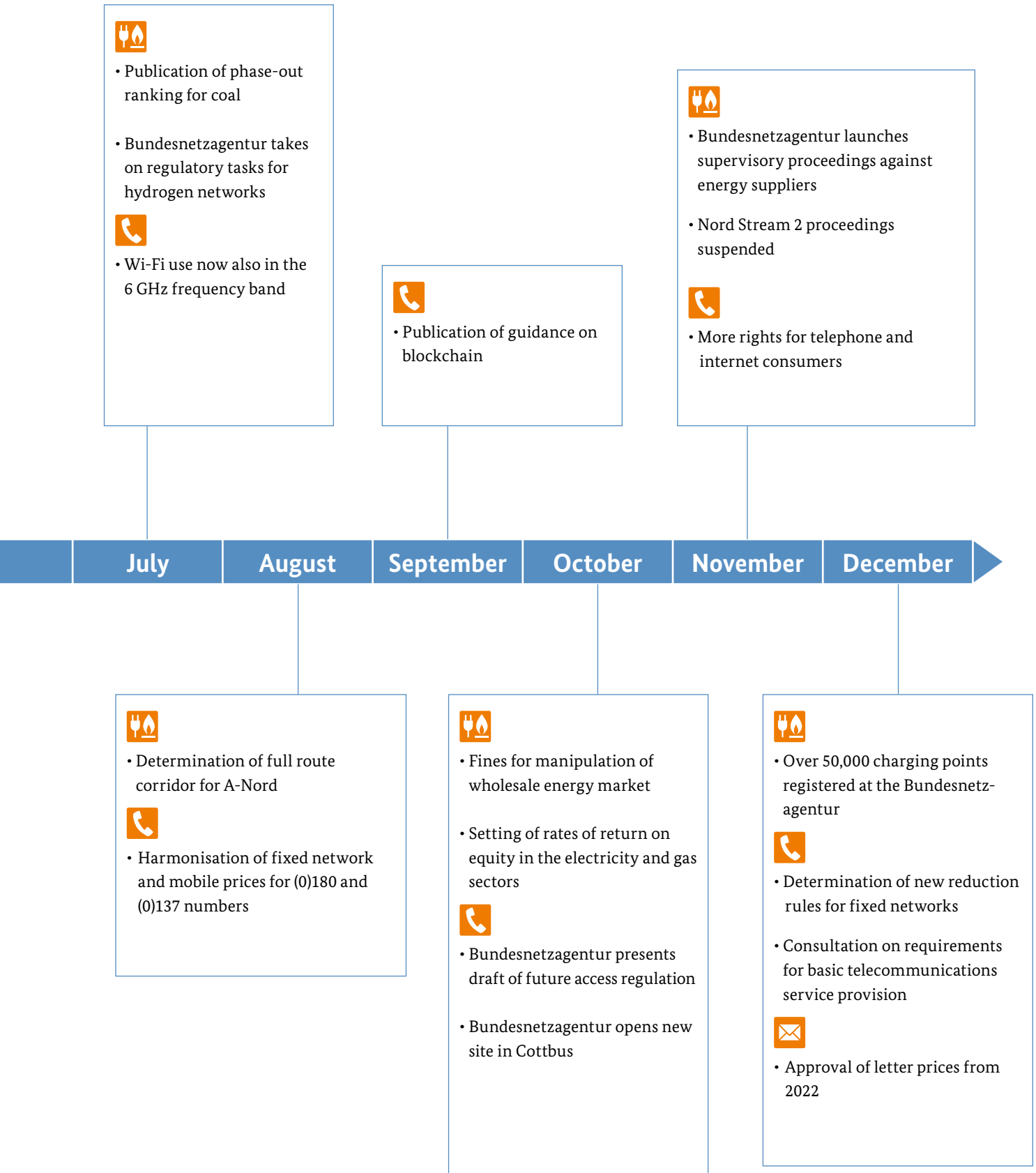
I would like to conclude with sincere thanks to my predecessor, Jochen Homann, and Vice President Peter Franke, both of whom stepped down in March 2022 after ten years in their respective roles.



Klaus Müller
President of the Bundesnetzagentur

Annual overview 2021





Press comments 2021

4 January 2021

SÜDDEUTSCHE ZEITUNG

IT IS POSSIBLE AFTER ALL

by Michael Bauchmüller

Excerpt from an article about renewable electricity

"At the weekend, the Bundesnetzagentur presented new figures on renewable electricity in German networks showing that green energy made up nearly half of electricity last year, more than ever before. At the same time, coal power station operators were recently lining up to bid for awards to close down their plants, while nuclear has gone into its last year. The energy transition is progressing, but it doesn't just happen of its own accord."

1 March 2021

FRANKFURTER ALLGEMEINE ZEITUNG

NO ACCESS

by Helmut Bündler und Corinna Budras

Excerpt from an article about the Online Copyright Clearance System

"Of particular note is the role of the Bundesnetzagentur, which is responsible for enforcing EU net neutrality rules in Germany. This used to be more about technical issues regarding whether certain services were allowed to be given priority online. Recently the focus has shifted to the protection of children and young people using security filters. But checking content for copyright violations is a completely new task for the authority..."

24 June 2021

SÜDDEUTSCHE ZEITUNG

ON THE PHONE IN THE TUNNEL

by Benedikt Müller-Arnold und Markus Balser

Excerpt from an article about mobile coverage on rail routes

"Reception on railway lines has long been regarded as one of Germany's biggest mobile coverage problems. The government ordered network operators to improve reception on main transport routes as part of a spectrum auction in 2015. The actual deadline was the end of 2019. ...The Bundesnetzagentur recently confirmed that providers have only supplied 'between 94.4 and 98.2%' of the main rail routes in Germany with the required bandwidth."

15 July 2021

FRANKFURTER ALLGEMEINE ZEITUNG

NETWORK AREAS TO WORK ON

by Helmut Bündler

Excerpt from an article on the setting of the rate of return on equity

"...the timing was presumably just a coincidence, but nevertheless striking. The day after the Federal Minister for Economic Affairs raised his forecast for electricity consumption and called for new electricity highways, the debate on the lowering of returns for network investors has heated up. It will be a delicate balancing act for the Bundesnetzagentur. On the one hand, network charges, which already made up about a quarter of the electricity price, must not be allowed to drive up prices. Clearly, the times of low and negative interest rates are over. Yet the network roll-out cannot be allowed to be even further delayed but finally needs to gain momentum."

10 August 2021

HEILBRONNER STIMME

**BUNDESNETZAGENTUR SETS SIGHTS ON
ESOTERICISTS**

by Jürgen Kümmerle

On the water vitaliser ban

"Amateur radio enthusiasts in the region have a problem. Their spectrum is clashing with the spectrum used by a 'water vitaliser', which is highly popular in esoteric circles. The Bundesnetzagentur prohibited its use and sale in March. (...) The Bundesnetzagentur is not only acting in the interests of amateur radio users. It said that its tests had shown there was a 'high risk' from the equipment."

12 August 2021

DEUTSCHE PRESSEAGENTUR

About the price differences between fixed and mobile networks for medium rate services

"The massive price differences between fixed and mobile networks for calls to (0)137 and (0)180 numbers will soon be a thing of the past. (0)180 numbers, which are used for services like advice hotlines, are to have their prices aligned as of 1 December, while for (0)137 numbers for mass calling services the change will come into effect on 1 April 2022. (...) The Bundesnetzagentur can take the step because the competition authority was for the first time granted the power to set retail prices for calls to medium rate and mass calling service numbers from mobiles with the entry into force of the new Telecommunications Act (TKG) on 1 December 2021."

17 November 2021

DIE WELT

NORD STREAM PREDICAMENT

by Daniel Wetzel

About the suspension of certification for Nord Stream 2

"The Bundesnetzagentur has suspended the procedure to certify the Nord Stream 2 AG pipeline, which is a controversial foreign policy issue. The reason is apparently legal uncertainty about whether a Switzerland-based pipeline subsidiary of the Russian Gazprom group can be officially classed as an Independent Transmission Operator."

10 December 2021

WIRTSCHAFTSWOCHE

GERMANY'S LONGEST POWER LINE

by Florian Güßgen

On the implementation of SuedLink

"So when will SuedLink be ready? TransnetBW says that an 'ambitious yet realistic schedule' would see electricity flowing in 2028, although this timeframe does not take account of possible lawsuits. The Bundesnetzagentur does not want to commit to a date. It says it wants to 'put the new government in the picture' in the near future."

12 December 2021

DIE WELT AM SONNTAG

CHECK TILL YOU DROP

by Thomas Heuzeroth

On the Bundesnetzagentur's new speed checker app

" (...) an administrative order of the Bundesnetzagentur, which comes into effect on Monday, will help you to assert your new rights. The agency has even provided the software you need to prove that you are paying for more speed than you are getting.

It is not an easy undertaking and we recommend you take some holiday to do it, because the requirements for measuring internet speeds with the software are demanding. A total of 30 measurements have to be taken across three different days within a 14-day period. There needs to be a free day between the measurements, when of course you can go to work."

23 December 2021

FRANKFURTER ALLGEMEINE ZEITUNG

10 MB ENOUGH FOR BASIC SERVICES

by Helmut Bänder

"The political objective is gigabit internet speeds for everyone, but the new legal entitlement to internet

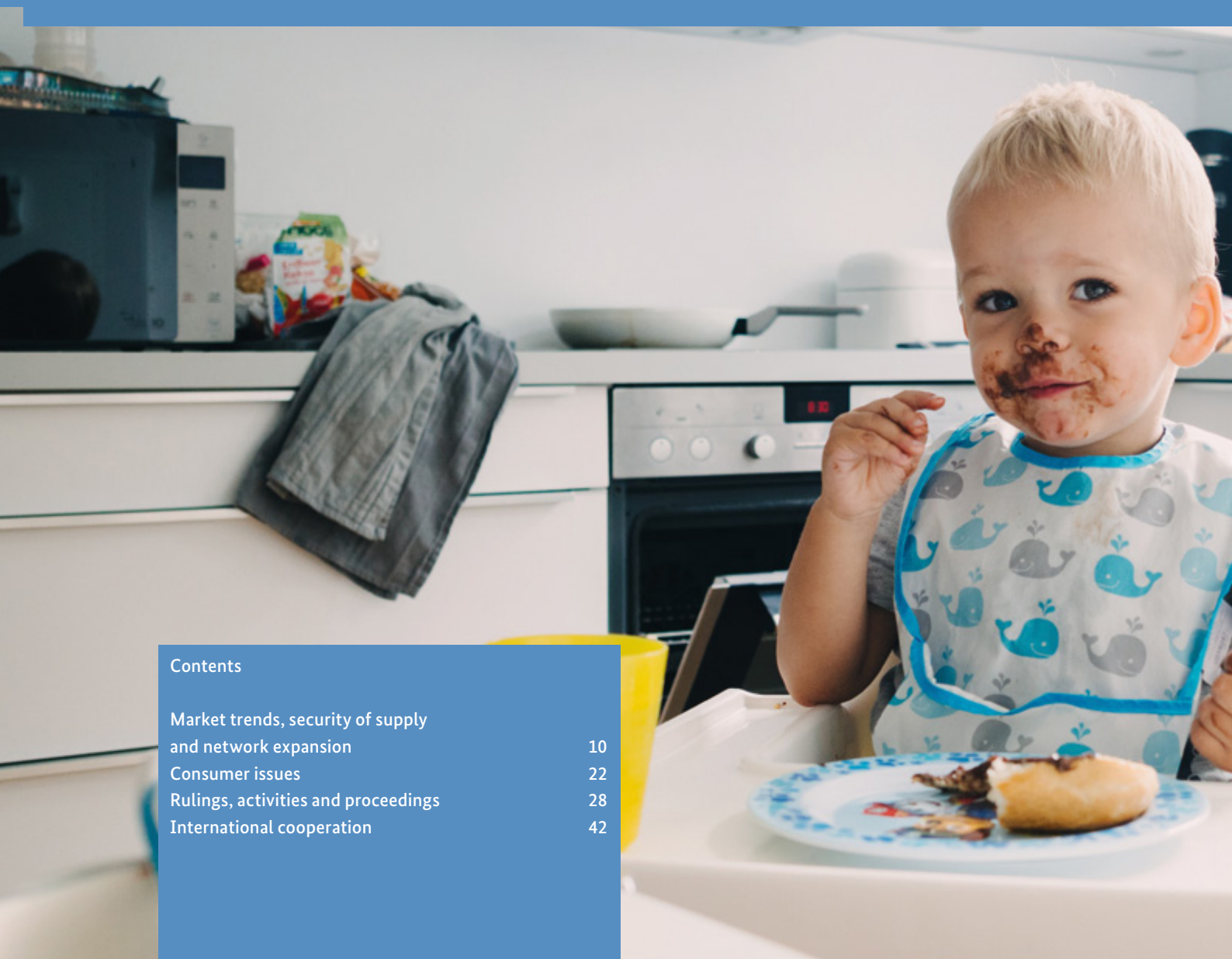
access will turn out to be much more modest. According to a proposal of the Bundesnetzagentur, download speeds of 10 Mbps are currently sufficient to use the services necessary for basic service provision. What exactly this means, the authority has to explain by 1 June next year."

The energy transition is changing the generation landscape

The decline in conventional energy generation, the feed-in of energy from renewable sources and the expansion of the electricity grid pose challenges for the energy market. Against this backdrop, the Bundesnetzagentur is monitoring developments in competition, holding auctions for renewable installations and tenders to reduce coal-fired generation, and approving new power lines.

Contents

Market trends, security of supply and network expansion	10
Consumer issues	22
Rulings, activities and proceedings	28
International cooperation	42





As part of the phase-out of coal, the Bundesnetzagentur conducts tendering procedures in accordance with the Act to Reduce and End Coal-Fired Power Generation (KVBG). A total of seven rounds of tendering will be held by the target year 2026 to reduce the amount of electricity generated by burning coal in hard coal-fired and small lignite plants, creating an incentive to remove plants that are damaging to the environment from the grid quickly.

There has been an increase in the number of measures to ensure the security and reliability of the electricity supply system in recent years due to the changing generation landscape, delays in grid expansion and the effects of weather. According to current information, the total costs for congestion management measures were still high at €1.4bn in 2020.

The Bundesnetzagentur approved the Electricity Network Development Plan (NDP) 2021 – 2035 on 14 January 2022. There is a need for additional measures covering just over 1000 km of transmission routes compared with the Federal Requirements Plan Act (BBPlG) of 2021. About 900 km of these are new-build measures within Germany, while the remaining around 100 km are reinforcements of the existing networks.

Market trends, security of supply and network expansion

At 530.7 TWh, Germany's net electricity generation in 2020 was lower than the 2019 level (561.3 TWh). There was a 3.4% increase in generation from renewable energy sources to 236.6 TWh. Generation from renewable energy thus accounted for 45% of gross electricity consumption in 2020.

According to current information, the total costs for congestion management measures were still high at €1.4bn in 2020.

The projects currently listed in the Federal Requirements Plan Act BBPlG as at the end of the second quarter of 2021 comprise lines with a total length of about 10,412 km.

Development of conventional and renewable energy

At 530.7 TWh, Germany's net electricity generation in 2020 was lower than the 2019 level (561.3 TWh). The main reason for the lower total electricity generation in 2020 was the fact that consumption was lower than in 2019 due to the Covid-19 pandemic. The decline in the overall level of net electricity generation was accompanied by a decrease in generation from non-renewable energy sources of 30.6 TWh or 11.6%. For the second year in a row, there was a particularly large drop in net electricity generation from coal-fired power plants: 13.5 TWh less was generated in hard coal-fired power plants (25.2%) and 20.6 TWh in lignite-fired power plants (19.7%). Continuing the trend that began in 2015, natural gas power stations produced more electricity (5.5 TWh/7.3%).

There was a slight increase (3.4%) in generation from renewable energy sources to 236.6 TWh. The share of renewables in gross electricity consumption in 2020 was 45%.

Installed generating capacity was characterised by an increase in renewable capacity in 2020. Overall, renewable capacity growth amounted to 6.1 GW. The largest increases in 2020 were in solar photovoltaic (+4.6 GW) and onshore wind (+1.2 GW).

Total installed generating capacity thus increased to 233.8 GW at the end of 2020, with 103.3 GW of non-renewable and 30.6 GW of renewable capacity. The non-renewable generating capacity includes power stations operational in the market and power stations outside the market (for example standby lignite and grid reserve power plants).

Phase-out of coal

Results of coal tenders

The Bundesnetzagentur announced the successful bids in the second tendering phase in accordance with the KVBG on 1 April 2021. The volume put out to tender of 1,500 MW was oversubscribed. Three bids with a total volume of 1,514 MW were awarded a tender. The awards ranged from €0 to €59,000 per MW, showing that competition pushed the prices of the successful bids well below the maximum price set of €155,000 per MW.

The tender volume for the third round with a deadline of 30 April 2021 was 2,480.826 MW. Eleven bids for a total capacity of 2,132.682 MW were awarded a tender in this round on 14 July 2021. As this round was undersubscribed, all valid bids were successful. The award price per MW ranged from €0 to €155,000, which was the maximum possible price. The ban on producing electricity from coal for the plants from the third round will enter into force on 31 October 2022.

The announcement of the fourth tendering process was made on 23 July 2021 and the bid deadline was 1 October 2021. The volume was 433.016 MW and the highest possible price €116,000 per MW. The fourth tendering round was oversubscribed. Three of the bids for termination of coal power generation were successful, with a total net nominal capacity of 532.514 MW. The successful bids were for between €75,000 and €116,000 per MW of net nominal capacity. The ban on coal-fired operation for the plants awarded in the fourth round will come into effect on 22 May 2023. The tendering results were published on the Bundesnetzagentur website at www.bnetza.de/kohleausschreibung21-3 on 15 December 2021.

Awards totalling around 8,967 MW have already been made in the first four rounds. The legal target of 13,902 MW for the remaining hard coal-fired and small lignite-fired power plants for the target year 2023 will actually be exceeded. This is due to the closure of power plants outside the procedures set out in the KVBG as well as those awarded in the tendering rounds.

Coal phase-out ranking list

A total of seven tendering processes will take place up to and including the target year 2026. From 2024 onwards (fifth to seventh rounds of tendering), if the tenders are undersubscribed, the statutory reduction using a ranking list will come into effect for the volume remaining after tenders have been awarded. In this case, plant operators will not receive any financial compensation. From 2027 onwards, the ending of coal power will be implemented using statutory reduction only.

The list ranking hard coal plants and small lignite-fired power plants by age (section 29(4) KVBG) comprises all existing plants with coal as their main energy source, which have a total capacity of 24,534 MW (hard coal 23,658 MW, lignite 876 MW). All plants are ranked by their commissioning date, oldest first.

More information may be found at

www.bnetza.de/altersreihung.

Evaluation of minimum generation

The Bundesnetzagentur published its third report on minimum generation on 8 October 2021. The report examines why, in certain situations, conventional power plants do not respond flexibly when prices on the power exchange are low or even negative and sometimes accept losses. The results of the previous analyses were confirmed once again. Only a minority of the total price-inelastic generation capacity is the minimum generation, ie the amount of generation required for the operation of the grid. The majority of it is due to other reasons, such as the provision of heating and self-generation. This proportion has been falling since 2015. The next report is planned for 2023.

Congestion management: redispatching and feed-in management

There has been a large increase in the number of measures used to ensure the security and reliability of the electricity supply system in recent years due to the changing generation landscape, delays in grid expansion and the effects of weather. Redispatching involves measures intervening in the market-based operating schedules of conventional generating units to shift feed-in geographically in order to take pressure off those elements of the grid that are under strain. In addition, feed-in management is also used to temporarily curtail the priority feed-in of electricity from renewable energy installations and combined heat and power (CHP) installations if network capacity is insufficient.

According to current information, the total costs for congestion management measures were still high at €1.4bn in 2020.

Redispatching measures (operational plants) comprised a total volume of 16,561 GWh. The transmission system operators (TSOs) estimated the costs for these measures at about €221mn. The costs of reserving and using grid reserve power plants were about €283mn for the year with an activated volume of 635 GWh. The total curtailed energy due to feed-in management was

6,146 GWh in 2020. The estimated compensation payments claimed by installation operators for this period amounted to approximately €761mn.

The information obtained from reports on these measures is published every quarter at www.bnetza.de/systemstudie.

The revised Grid Expansion Acceleration Act (NABEG 2.0) changed the rules for redispatching and feed-in management. More information on what is known as "Redispatch 2.0" may be found in the "Rulings, activities and proceedings" section under "Redispatch 2.0 – making network security fit for the future".

Electricity: congestion management measures

		2018	2019	2020	Q1 - Q3 2021
Redispatching					
Total volume ^[1] of operational plants	GWh	14.875	13.323	16.561	11.261
Cost estimate ^[2] for redispatching	€mn	388	227	221	180
Kostenschätzung Countertrading	€mn	37	64	134	155
Grid reserve power plants					
Volume ^[3]	GWh	904	430	635	478
Cost estimate for activation	€mn	137	82	88	59
Capacity ^[4]	MW	6.598	6.598	6.596	5.670
Annual costs of holding in reserve ^[5]	€mn	279	197	195	157
Feed-in management					
Volume of curtailed energy ^[6]	GWh	5.403	6.482	6.146	4.334
Estimated compensation	in Mio. Euro	635	710	761	557
Feed-in adjustments					
Volume	GWh	8	9	16	12

[1] Amounts (reductions and increases) including countertrading measures according to monthly reports to the Bundesnetzagentur.

[2] TSOs' cost estimate based on actual measures.

[3] Activation of grid reserve power plants including test starts and test runs. The feed-in of grid reserve power plants is only increased.

[4] Total capacity of German and foreign grid reserve power plants in MW. As at 31 December of the respective year.

[5] Plus other costs not dependent on deployment.

[6] Reduction of installations remunerated in accordance with the EEG or KWKG.

Grid reserve

On 28 April 2021, the Bundesnetzagentur confirmed the required grid reserve capacity of 5,670 MW for winter 2021/2022 and 4,169 MW for winter 2023/2024 based on this year's system analysis carried out by the TSOs. Both of these figures are lower than in last year's analysis. One of the reasons for the drop in 2021/2022 is the return of two gas power plants (Irsching 4 and 5) from the grid reserve to the market. For winter 2023/24, it was assumed that grid expansion will proceed according to plan and the TSOs' forecasts. The figures show that expansion is working. The grid reserve requirements can be met by domestic grid reserve power plants in both time periods.

Expected power plant closures

The coal phase-out set out in the KVBG will lead to widespread reductions in coal-fired generation capacity in the coming years. In addition, there are the nuclear power plants that are to be decommissioned as required by law, lignite-fired power plants that will not return to the market once their period of security standby has ended and market-driven closures carried out by plant operators. The latter are power plant closures that have been notified to the Bundesnetzagentur.

The total capacity planned to leave the German market by 2024 is 15,138 MW as at 21 December 2021.

It should be noted that these figures are subject to a degree of uncertainty. For example, ending coal-fired electricity generation at a plant does not necessarily mean that all the plant's capacity will be removed from the market since it is possible for plant operators to convert their plants to other energy sources.

Capacity reserve

The capacity reserve serves to procure reserve capacity outside the market. If the security or reliability of the electricity supply system is jeopardised or disrupted, the capacity reserve makes up for any deficits caused by the incomplete balancing of supply and demand on the electricity markets in the German grid control cooperation. Bids for the capacity reserve tendering processes can be submitted for generating installations, storage facilities and controllable loads. The costs of the contracted capacity reserve plants form part of the transmission network charges.

The bidding deadline for the second tender of capacity reserve was postponed in December 2020 to 1 December 2021. In the meantime, the Bundesnetzagentur issued a determination amending the requirements to participate and the award procedure. That will expand the potential field of providers and increase competition so that the 2 GW of reserve capacity foreseen by law can be contracted. In preparation for the tender, which will be conducted by the four TSOs, the standard terms and conditions were approved on 11 August 2021.

The tender was announced by the TSOs on 1 September 2021 and the awards are expected by mid-February 2022 at the latest.

System split on 8 January 2021

A major incident occurred in the Continental Europe Synchronous Area on 8 January 2021. Starting from the Ernestinovo substation in Croatia, the transmission system split into two "network islands", with frequency that was too high (surplus of power) in the north-west and too low (deficit of power) in the south-east. The disruption was caused by the overloading and subsequent tripping of a busbar coupler that connected the lines from the south-east to the north-east. ENTSO-E classed the incident as scale 2 on the European Incidents Classification Scale and carried out a thorough investigation, in which the Bundesnetzagentur participated. A detailed investigative report with recommendations for action was published on 15 July 2021.

Monitoring of electricity supply security

The Bundesnetzagentur took over the task of monitoring the security of supply in 2021. Security of supply is assessed from both a market and a network perspective.

The monitoring was carried out together with an expert consortium and in close cooperation with the Federal Ministry for Economic Affairs and Energy (BMWi) and the TSOs. The Bundesnetzagentur submitted the first report to the ministry as required by law and on time on 31 October 2021.

The assessments show that a secure electricity supply, in terms of sufficient generation and network capacity, is possible in principle in the coming years and with the continued development of the energy supply system. For the Germany-Luxembourg bidding zone, no hours with expected loss of load were identified up to 2031. On the network side, secure operations can in principle be guaranteed provided that the current targets for grid expansion are kept to and the potential for congestion management is exploited.

However, this positive assessment depends on a number of conditions, some of which must be implemented proactively. For one, the speed of expansion of renewable energy needs to be considerably faster than in the past 20 years. A reliable framework and refinancing options on the market are needed for the necessary investments in gas-fired power plants and load flexibility. The implementation of cross-border redispatching is also essential for secure European network operations. Moreover, the grid expansion in accordance with the Power Grid Expansion Act (EnLAG) and the Federal Requirements Plan Act (BBPlG) needs to be put into place quickly.

Catalogue of IT security requirements as per section 11(1) EnWG

For the first time in 2021, operators of energy installations had to be certified to prove their implementation of the catalogue of IT security requirements set out in section 11(1b) of the Energy Industry Act (EnWG) and published in 2018. However, those involved in this process faced particular challenges. The coronavirus pandemic hindered necessary steps and there were also delays in the accreditation of certification bodies. In response to these difficulties, the Bundesnetzagentur did not require the certificate itself to be submitted by the original deadline of 31 March 2021, but only required evidence to be provided that the operators were ready for certification. Proof that a certification body has been engaged and a date for the audit need to be provided to the Bundesnetzagentur by 31 March 2022.

Operators of electricity and gas networks, plus operators of energy installations classed as critical infrastructure under the BSI Critical Infrastructure Ordinance (BSI KRITIS-VO) are still required to implement the Bundesnetzagentur's catalogue of IT security requirements. In light of forthcoming changes in international IT security standards, the Bundesnetzagentur has started the process of adjusting the national IT security requirements. Mapping is used to support companies as they implement the provisions to ensure that the certification procedure goes smoothly and IT security keeps up with the latest technology after the turn of the year. There will be a transitional period of two years to implement the new rules.

The Bundesnetzagentur also receives IT fault reports describing incidents at operators of energy supply networks and energy installations classed as critical infrastructure. This year, too, isolated reports of faults that led to minor supply interruptions were received. The number of reports was around the same as last year. In its 2021 status report, the Federal Office for Information Security (BSI) acknowledges that the threat to the digital society from cyber criminals continues to increase. Even taking account of the general threat situation, the Bundesnetzagentur considers that the level of cybersecurity in the electricity and gas sector remains high. The report may be downloaded from the BSI website at www.bsi.bund.de/SharedDocs/Downloads/DE/BSI/Publikationen/Lageberichte/Lagebericht2021.html.

Electricity Network Development Plan 2021 – 2035

The Bundesnetzagentur approved the Electricity Network Development Plan (NDP) 2021 – 2035 on 14 January 2022. There is a need for additional measures covering just over 1000 km of transmission routes compared with the BBPIG of 2021. Around 900 km of these are new-build measures within Germany (of which about 700 km are high-voltage direct current (HVDC) systems), while the rest are reinforcements of the existing networks. The NDP also includes optimisation measures such as dynamic line monitoring and innovative technical approaches. As well as the Federal Requirements Plan projects, the Bundesnetzagentur has confirmed a total of 28 new measures concerning lines, including two additional HVDC transmission corridors by 2040. One of these corridors will run from Schleswig-Holstein to Mecklenburg-Western Pomerania, while the other will go from Lower Saxony to Hesse.

The use of multi-terminal converters for HVDC transmission was examined for the first time in the NDP 2021 – 2035. The use of such converters, rather than individual point-to-point structures, can reduce the number of converters needed and thus also save costs. On the basis of the TSOs' proposals to prepare certain HVDC connections to be more closely meshed in the future using the multi-terminals, the Bundesnetzagentur has worked out an overall solution that it judges to be logical and confirmed the relevant projects. This will make the future grid expansion more efficient and create opportunity for innovation in network technology and operations.

The final report of 26 January 2019 by the Commission on Growth, Structural Change and Employment was also taken into consideration in the latest NDP. This assumes a complete end to electricity produced by coal by 2035, except in Scenario A 2035.

The amendment to the Climate Change Act (KSG), which came into force on 31 August 2021 and sets out the continuation of the emission reduction targets for 2031 onwards, can only be fully considered in the next process, the NDP 2023 – 2037. However, by focusing on the scenarios that contain a high proportion of renewable energy sources, large parts of it were already anticipated in this confirmation.

Offshore

The NDP takes full account of the expansion of offshore wind energy – 20 GW by 2030 and up to 40 GW by 2040 – decided on by the federal government. These offshore wind farms will require eleven transmission links in the North Sea and Baltic Sea by 2040, in addition to those already planned. The links will ensure that the wind farms can be integrated into the German transmission system and the electricity they generate can be transported onwards.

Widespread public participation

A ten-week public participation process took place before the NDP was confirmed. The Bundesnetzagentur received nearly 300 responses to its consultation. All the responses were recorded and evaluated and the arguments put forward considered in terms of their importance to the decision-making process. In addition, the authority held virtual information events across Germany.

Although some of the responses tended to focus on general issues of energy policy rather than on the decision-making process for a single measure, they are extremely important for the entire process and for acceptance of the grid expansion.

Network expansion

In the year 2019, final consumers were able to choose from an average of 156 electricity suppliers in their network area. About 5mn consumers switched supplier during that year. In addition, about 1.8mn household customers changed energy supply contract with the same supplier.

In 2019, a relative majority of 40% of household customers were on non-default contracts with their regional default supplier. The percentage of household customers on default contracts stood at 26%, while 34% of all household customers were served by a supplier other than their local default supplier.

Federal sectoral planning

The Bundesnetzagentur conducts the approval procedures for the projects in the Federal Requirements Plan designated as crossing federal state or national borders within the meaning of the NABEG. The federal sectoral planning serves as the first step in concrete spatial planning. A route corridor up to 1,000 m wide is determined as part of this stage. In addition to the 19 route corridors it determined in 2021, the Bundesnetzagentur concluded the federal sectoral planning for seven more projects or project sections with decisions in accordance with section 12 NABEG. In a decision of 6 August 2021, the route corridor in section D of project 4 BBPlG determined in the federal sectoral planning decision of 30 October 2020 in the simplified procedure was changed. Nine projects or project sections totalling about 610 km are currently in the federal sectoral planning procedure. The Bundesnetzagentur has granted the project promoter's request not to undergo the federal sectoral planning procedure in accordance with section 5a NABEG for the following projects: project 10 BBPlG (sections A and B), project 12 BBPlG (section B), project 20 BBPlG (sections 1 and 2).

Planning approval

In the course of the planning approval procedure, the exact route of the line and the technical design it will take have to be decided.

The Bundesnetzagentur approved the route requested by project promoter 50Hertz for project 11 BBPlG on 15 October 2021. Construction has already begun, according to the project promoter.

Planning approval procedures were opened for 29 projects or project sections in 2021, bringing the number of projects or project sections in the planning approval procedure to 68. These include all sections of

project 1 BBPlG (A-Nord), projects 3 and 4 BBPlG (SuedLink), project 5 BBPlG and the south part (between Börde rural district and Isar) of project 5a BBPlG (SuedOstLink). Progress was also made on project 2 BBPlG (Ultranet), for which the planning approval procedure was opened for section C1 in addition to sections A1 and B1.

It was not necessary to conduct a planning approval procedure for section A of project 10 BBPlG, as the planned measure does not contain any construction but only the current-carrying capacity will be increased from 2,520 to 3,600 amperes.

Further information on individual projects, including the current status of proceedings, the relevant application documents and the federal sectoral planning decisions can be accessed at www.netzausbau.de/vorhaben.

Monitoring the status of projects under the EnLAG and the BBPlG

As part of its monitoring role, the Bundesnetzagentur provides quarterly updates on the progress in planning and construction that has occurred for individual projects in the transmission system during the previous three months. This covers the projects from the Power Grid Expansion Act (EnLAG) and the Federal Requirements Plan Act (BBPlG) as well as transmission links to offshore wind farms.

It also measures the status of the planned and implemented measures to optimise the network. The activities of network operators designed to increase the utilisation of the existing transmission system are presented.

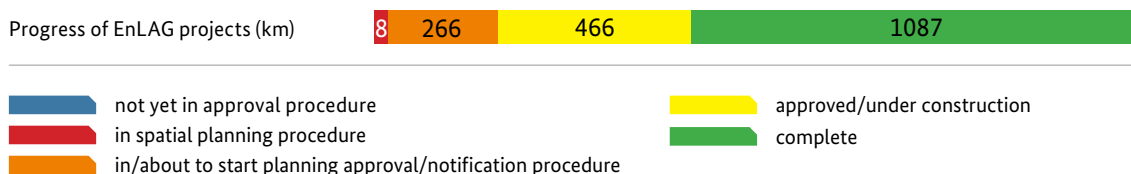
Current status of EnLAG projects

The spatial planning and planning approval procedures are the responsibility of the relevant federal states.

The projects currently listed in the EnLAG as at the end of the second quarter of 2021 comprise lines with a

total length of about 1,827 km. Of these, 1,087 km of lines had been completed by the end of the second quarter of 2021. A further 466 km have been approved and are under construction. Around 8 km are currently in the spatial planning procedure and around 266 km are in or about to start the planning approval procedure.

Planungs- und Baufortschritts der Vorhaben nach dem EnLAG zum 2. Quartal 2021



Current status of BBPlG projects

The amendment of the BBPlG on 4 March 2021 added 36 new grid expansion projects to the Federal Requirements Plan, increasing the total length of the projects by around 4,400 km compared to the previous BBPlG.

A total of 79 projects have now been confirmed as necessary to meet energy supply requirements and requiring urgent implementation in order to guarantee secure and reliable network operation.

The projects currently listed in the BBPlG as at the end of the second quarter of 2021 comprise lines with a total length of about 10,412 km. 29 projects and two project sections are designated as crossing federal state or national borders. The Bundesnetzagentur is responsible for the procedures for these projects, whose total length as at the second quarter of 2021 was around 6,397 km. However, this largely depends on the

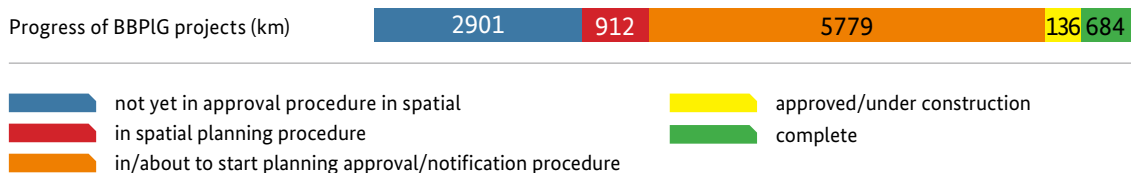
route of the north-south corridors and will not be definite until a later stage of the procedure.

Most of the other projects are the responsibility of the federal states. The procedures for a further 218 km are carried out by the Federal Maritime and Hydrographic Agency (BSH).

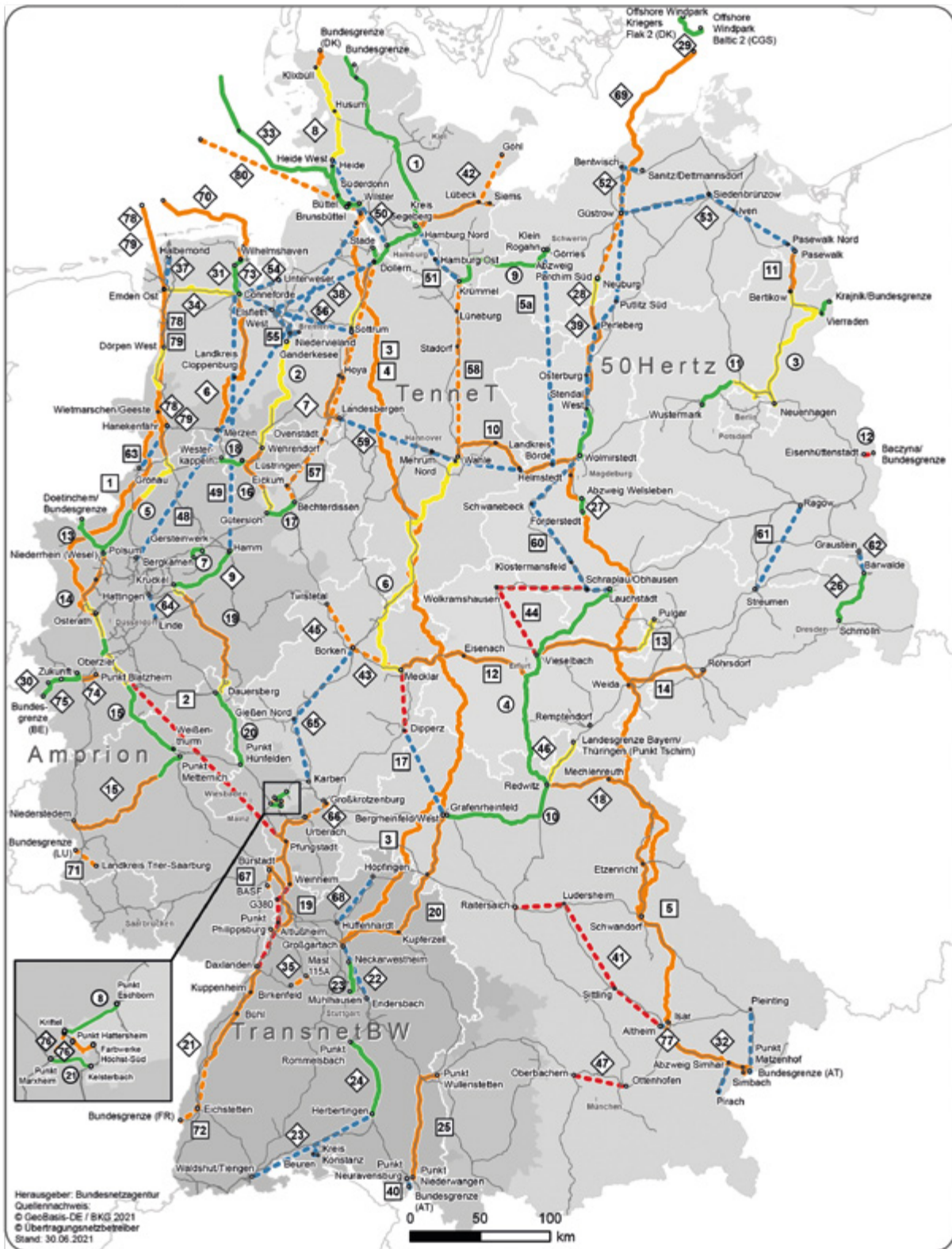
As of the second quarter of 2021, 684 km of lines had been completed. A further 136 km have been approved and are under construction or about to be so. Around 912 km are in the spatial planning or federal sectoral planning procedure, while about 5,779 km are in or about to start the planning approval or notification procedure. About 2,901 km are ready to start the approval procedure. Additionally, around 100 km have already been approved in the procedures carried out by the BSH.

The status of projects under the EnLAG and the BBPlG can be found at www.netzausbau.de/vorhaben.

Progress in planning and construction of BBPlG projects Q2 2021



Status of projects from the BBPIG and EnLAG at the end of Q2 2021



Participation and dialogue

The formal procedures give the public many opportunities to get involved and play an active role in the planning and implementation processes.

The Bundesnetzagentur deliberately goes beyond the statutory requirements in this area. Among other things, it hosts open information and dialogue events as well as method conferences in order to make the process transparent, clear and comprehensible for members of the public.

It presented its preliminary assessment results on the NDP 2021 – 2035 and the draft environmental report in two digital events on 14 and 16 September 2021 and discussed them with interested parties.

It hosted an exchange of scientific views on 7 and 8 October 2021 in Bonn. The event focused on the presentation and discussion of specialist topics related to the field of grid expansion, including the issue of demand in the European context and the Federal Compensation Ordinance (BKompV) in planning practice. On the legal side, speakers looked at the existing lines about to be reinforced, with a particular emphasis on legislation protecting species and areas.

Marking the ten-year anniversary of the NABEG and the EnWG provisions on the identification of demand, an event bringing together legal experts was held in Hanover on 28 and 29 October 2021. Key questions regarding network development planning and grid expansion were up for discussion.

The Bundesnetzagentur provides a broad range of information on various important grid expansion issues through several channels, including its website, its newsletter and brochures/flyers. It is also present on other platforms such as Twitter and YouTube. People can also contact the energy grid expansion public liaison service if they have any questions or suggestions.

Report on the status and expansion of the distribution systems

The status and expansion of electricity distribution systems is also very important for a successful implementation of the energy transition. The Bundesnetzagentur monitors progress in distribution system expansion and has been publishing a summary of the results in the report on the status and expansion of the distribution systems since 2019. The survey of distribution system operators (DSOs) upon which the report is based has its legal basis in section 14(1a) and (1b) EnWG (old version) up to and including the 2021 survey. Owing to the amendment of the EnWG, the 2022 survey will be based on sections 14(2) and 14d EnWG for the first time.

The Bundesnetzagentur published the third report, based on the 2020 survey, on its website in spring 2021. This survey relates to the status and (planned) expansion of the systems as at 31 December 2019 and was directed at 59 DSOs operating high voltage (110 kV) networks. One additional DSO particularly affected by feed-in management measures was also asked for information. As well as the need for network expansion, reinforcement and optimisation planned for the next ten years, the survey also covers other issues that are particularly relevant to understanding the current and future status of the distribution systems. The 2020 survey, therefore, included questions on the integration of renewable energies and charging infrastructure, dealing with flexible consumers and issues of digitalisation in the network, interruptions to supply and network planning.

The annual publication of the report on the status and expansion of the distribution systems by the Bundesnetzagentur was a move towards greater transparency in distribution system expansion. As of the 2022 survey, the process will be adapted and expanded to take account of the new legal provisions in the EnWG, including by expanding the circle of recipients to about 80 network operators. The Bundesnetzagentur's aim is to present the reasons for network expansion in an even more transparent and detailed way in its report. Future reports will focus particularly on how network operators implement their new task of cooperating in planning regions in practice.

Scenario framework for the Gas Network Development Plan 2022 – 2032

The scenario framework includes all the information that is relevant to the anticipated development of gas demand and supplies as well as the expected development of the required gas transport capacities in Germany for the period to 2032. The assumptions of gas transport capacity are particularly relevant here. They form the basis for the calculation of the network expansion requirements in the gas NDP.

After modelling was included in the last NDP for the first time, this NDP process will also include the modelling of a separate hydrogen variant that will calculate demand for hydrogen pipelines, in addition to the basic variant. The network modelling of the hydrogen variant is based on the input parameters of the market survey on hydrogen generation and demand and green gases, for which over 500 project notifications were received, many times more than for the NDP 2020 – 2030.

As well as some requests for new gas power station sites, in comparison to the last NDP there were also requests for capacity increases at the planned LNG terminals at the Brunsbüttel and Stade sites and these are to be used to draw up the NDP.

The merger of the two German gas market areas set out in the amended Gas Network Access Ordinance (GasNZV) was launched at the start of the 2021/22 gas year on 1 October 2021 for operational reasons. To show the firm capacity in the single market area, the TSOs applied the calculation system in their modelling that had already been developed for this purpose in the last NDP.

The TSOs work out the gas NDP on the basis of the confirmed scenario framework. It is expected to be published in spring 2022.

Market area merger

The single German market area Trading Hub Europe (THE) started work on 1 October 2021, replacing the two previous market areas Gaspool and NetConnect Germany. The TSOs ensured a smooth operational transition to a new company with the founding of THE GmbH, the new market area manager, on 1 June 2021, laying the foundation for a successful launch of the new market area. The substantial and operational challenges of the merger were dealt with ahead of time transparently and with a focus on results, thanks not least to the close cooperation among all market participants. The Bundesnetzagentur provided regulatory support, especially regarding the growing transport opportunities arising from the geographical enlargement of the market area.

As well as positive effects on operational aspects for shippers, it is also expected that the new market area THE will benefit trading, in particular in medium and long-term gas products.

Monitoring of gas supply security

Pursuant to section 51(1) EnWG and in coordination with the Federal Ministry for Economic Affairs and Climate Action (BMWK), the Bundesnetzagentur monitored the security of supply in the field of the pipelined natural gas supply and submitted its report to the BMWK in early November 2021. The responsibilities set out in section 51 EnWG were changed in the latest amendment of the Act with effect from 1 January 2021. Since then, the responsibility for the monitoring of security of supply, also for natural gas, has lain with the Bundesnetzagentur rather than, as previously, with the ministry.

Given the changing market conditions and increasing global competition on the gas procurement markets, the security of gas supply is one of the central issues in Germany and Europe. Securing the gas supply remains highly significant as it currently has a share of about 25% of primary energy consumption and this is likely to increase in the medium term as gas acts as a bridge technology in the move towards decarbonisation. Maintaining the security of supply in the network-based energy supply is primarily a task of the companies active in the market and how they do it is generally up to them. Overall, security of supply was constantly upheld during the reporting period, illustrating that the German approach of placing responsibility to maintain supply security primarily on companies is working.

The main pillars of the German gas supply are the diversification of sources of supply and transport routes, domestic production, stable relationships with suppliers and long-term gas delivery contracts as well as the hitherto high reliability of the supply infrastructure including underground storage facilities.

The report's conclusions show that Germany's security of supply concept has proven its worth. Gas supply companies have maintained high standards both in the past and in this reporting period, so the German gas supply has been secure at all times.

Consumer issues

In 2021, the Bundesnetzagentur's energy consumer advice service received around 21,840 queries and complaints. Key consumer concerns were billing, increases in prices and advance payments, delays in supplier switching and contractual disputes.

The number of charging points notified to the Bundesnetzagentur rose from 36,914 at the end of September 2020 to 48,717 at the end of September 2021.

Development of gas network charges in 2022

Average gas network charges from the DSOs for household and commercial customers have risen slightly from 2021 to 2022, by 1.75% and 1.95% respectively. Average network charges for industrial customers have remained almost the same, up 0.27%. The reason for these changes is a 2.9% rise in the revenue caps, primarily due to the higher capex mark-up and the release of credit from the regulatory account. The rise in predicted sales volumes among household and commercial customers had the opposite effect.

The development in the network charges of gas DSOs from 2021 to 2022 was identified using the data form that network operators had to submit to the Bundesnetzagentur by 1 January 2022 in accordance with section 28 of the Incentive Regulation Ordinance (ARegV). Of the 126 gas DSOs under the direct or delegated responsibility of the Bundesnetzagentur, 103 submitted their data by 5 January 2022.

The TSOs in the single German market area THE have binding entry and exit charges for firm, freely allocable yearly capacity, which for 2022 are both €3.51/kWh/h/a. This is 7.6% lower than in the fourth quarter of 2021.

The reduction in charges is largely due to the lower validated revenue caps, mainly caused by the payout of additional revenue of some large TSOs via the regulatory account.

The market area conversion charge is almost stable. It is €0.7335/kWh/h/a for 2022 (2021: €0.7291/kWh/h/a). The biogas charge has fallen 8% from €0.6250/kWh/h/a in 2021 to €0.5740/kWh/h/a.

Developments in the gas markets (supplier diversity, supplier switching, gas prices)

In 2020, final consumers were able to choose from an average of 113 gas suppliers in their network area. The number of supplier switches by household customers hit a new high in 2020, passing the 1.6mn mark. Around 1.3mn of these household customers changed by cancelling their previous contract. The remaining around 0.3mn chose an alternative supplier rather than the default one when moving home. The number of customers changing contract, which usually means changing to a less expensive contract, remained stable at around 0.6mn. The percentage of household customers who had a contract with a supplier other than the local default supplier increased further to

35%, while the percentage of customers with a default supply contract remained stable at 17%. The local default suppliers supplied 48% of household customers under a non-default contract.

The average gas network charge (including metering and meter operation charges) for household customers independent of the type of supply contract is currently around 1.59 ct/kWh, slightly higher than the previous year.

The volume-weighted gas price for household customers across all contract categories rose by 0.37 ct/kWh to 6.68 ct/kWh in 2021.

Market area conversion

The network operators and service providers in charge of carrying out the market area conversion from L-gas to H-gas faced a dual challenge in 2021, as they had to convert the highest number of appliances in a year so far – 560,000 – during the pandemic. They mastered the task admirably and without delays. Nevertheless, the sector cannot rest on its laurels as it needs to convert over half a million appliances each year in the coming years too. All those involved are continuing to work hard and in close cooperation to make the gas sector's most important project a success. The Fifth Market Area Conversion Forum focused on the conversion amidst the backdrop of the pandemic. After the forum had to be cancelled in 2020 due to the Covid-19 restrictions, it was held virtually for the first time in 2021. As interest in the subject remains high, a decision will be made on which form to hold the upcoming forum in, depending on the pandemic situation.

Development of electricity network charges

The (provisional) network charges of TSOs will rise in all control areas in 2022, based on model calculations for a large industrial customer connected to the extra-high voltage network (Amprion 21.1%, Transnet-BW 13.8%, 50Hertz 7% and TenneT 4.6%). The upstream network costs for a regional distributor connected to the transmission network will fall by 1.4% in TenneT's control area. In the other control areas, they will rise: by 13.7% for Amprion, 9.1% for TransnetBW and 1.1% for 50Hertz.

The aggregate revenue cap of the four TSOs will rise from nearly €4.9bn to about €5.3bn in the 2022 budget year, largely because of major investments in the transmission system. Costs for system services are considerably higher too, showing the effect of increased energy costs.

Higher fuel and carbon costs forced up the costs for balancing significantly at the end of 2021. While balancing energy is settled directly with the balance responsible parties, higher provision costs are factored into the TSOs' network charges.

There are the same effects on the expected activation costs for power plants in the grid reserve, which have to be financed from the revenue caps. These developments of the levelised cost of electricity also result in higher projected costs for balancing and the grid reserve for 2022 under the applicable rules for TSOs' pricing.

The costs for procuring loss energy are directly linked to the higher prices on the power exchange. These developments bring serious financial risks for TSOs, which is why the relevant determinations permit projected costs to be included in the revenue caps. In any case, over or underestimates will be compared with the actual volumes and prices using the regulatory account and reimbursed to TSOs or network users with interest, so neither side bears a risk.

Finally, the national harmonisation of TSO network charges in recent years has led to sharp rises at Amprion and TransnetBW. The fourth step in this harmonisation process, which is set to last five years (distribution of 80% of revenue caps Germany-wide, as opposed to 60% the year before), will take place in 2022. It will have a positive effect on network users in the TenneT control area, which covers an area from Schleswig-Holstein in the north to Bavaria in the south.

A sample of network charges for DSOs coming under the responsibility of the Bundesnetzagentur shows a noticeable rise in the German average, of 3.5% for household customers, 3.8% for commercial customers and 4.7% for industrial customers. However, there are clear differences between the individual DSOs as to the rate of change.

The aggregate revenue caps will rise by nearly 4% but there is a wide range. The principal causes are rising upstream network costs in the control areas of TransnetBW and Amprion (see above), network investments, higher non-wage labour costs and higher procurement costs for loss energy.

The Covid-19 pandemic has not had a noticeable effect on network charges.

The settlement of the regulatory accounts for 2020, which is incorporated into the revenue caps for 2022, does not show any significantly lower revenues caused by the pandemic.

The flooding that affected the states of North Rhine-Westphalia and Rhineland-Palatinate in 2021 has not so far had a relevant impact on network charges either. While there are above-average rises in network charges for some smaller networks in heavily affected areas, the costs for replacement investments and special depreciations there will only have an effect in the years to come. The undertakings were specifically allowed access to emergency funding for the flood-hit areas in order to reduce the burden on businesses and customers. Lower volumes and possibly higher upstream network costs (caused by use of dehumidifiers, etc) may have an effect on network charges in 2022.

Avoided network charges

Under section 18(1) of the Electricity Network Charges Ordinance (StromNEV), operators of distributed generation plants are entitled to payment from the operator of the distribution network into which they feed electricity. This is known as avoided network charges. It corresponds to the network charge that does not have to be paid due to feeding in less electricity at an upstream network or transformation level.

The expiry of payments to volatile generating installations (under stage III of the Network Charges Modernisation Act, NEMoG) meant that another drop in avoided network charges was expected for 2020. The network operators planned avoided network charges of €1,029mn for the year. Avoided network charges were actually beneath the €1bn mark for the first time, totalling around €986mn. Projected avoided network charges for 2021 total €1,066mn.

Non-volatile installations that are taken into operation after 1 January 2023 are ruled out of the payment of avoided network charges (stage IV NEMoG), so the costs for avoided network charges (for non-volatile installations taken into operation before 2023) are expected to stabilise at their current level from now on.

More detailed information on the effects of the NEMoG on avoided network charges may be found in the 2020 Monitoring Report.

Household customers: supplier diversity, supplier switching and prices

Supplier diversity and supplier switching

In the year 2020, final customers were able to choose from an average of 162 electricity suppliers in their network area. About 5.4mn consumers switched supplier during that year. In addition, around 1.8mn household customers switched energy supply contracts with the same supplier.

37% of household customers had a non-default contract with the local default supplier in 2020. The percentage of household customers on default contracts stood at 25%, so a relative majority of 38% of household customers are now served by a supplier other than their local default supplier.

Electricity prices for household customers

Electricity prices for household customers were higher in 2021. In the consumption band between 2,500 kWh and 5,000 kWh a year, the average volume-weighted price for household customers increased by 1.8% compared with 2020 and was 32.63 ct/kWh on 1 April 2021. The rise in retail prices is largely due to the increase in the price component "energy procurement, supply and margin". Procurement costs are significantly influenced by wholesale prices. In April 2021, there was higher demand for electricity, despite the pandemic, while at the same time there was a rise in conventional generation and a fall in renewable generation. For the electricity volumes procured at short notice, both of these factors contributed to the rise in wholesale prices. The higher prices for carbon emission allowances, which are included in the electricity price components that are not controlled by the supplier, also affected wholesale prices.

For the first time in ten years, prices for household customers on a non-default contract with their local default supplier were below the average prices of suppliers that were not the local default supplier. That, too, is a sign of an energy market that functions well and is marked by competition, in spite of rising electricity prices.

Electric mobility and charging stations

Publicly accessible charging points for electric vehicles must meet minimum technical requirements. So that these requirements can be checked as set out in the Charging Station Ordinance (LSV), the operators of charging infrastructure accessible to the public have to notify it to the Bundesnetzagentur. The Bundesnetzagentur's map of publicly accessible charging points for electric vehicles in Germany was given another routine update in 2021. Additional information was also put on the website showing the rollout of public charging infrastructure and the latest figures on the distribution of publicly accessible charging points across the federal states, districts and towns not affiliated with a district. The number of charging points notified to the Bundesnetzagentur rose to 48,717 by the end of September 2021 from 36,914 a year earlier. The current overview map of publicly accessible charging points in Germany may be found at www.bnetza.de/ladesaeulenkarte. Its data are used for other applications and analyses, such as the location tool of NOW GmbH. A project is currently underway to improve the display portal for public charging infrastructure so that the forecast number of results can be processed effectively in future.

New FAQs were published online at www.bnetza.de/elektromobilitaet in response to the lively interest in electromobility, public charging infrastructure and private wallbox chargers. With the involvement of the Bundesnetzagentur, the LSV was further developed as a basis for the requirements of publicly accessible charging infrastructure and the Bundesnetzagentur's register and the amended LSV promulgated in November 2021. As well as changes to the notification deadline and the areas of responsibility of the Bundesnetzagentur, new requirements of publicly accessible charging infrastructure were formulated. For example, in future all charging infrastructure must have a standard data-transfer interface and offer at least one payment system enabling contactless payment using a credit or debit card.

Energy consumer advice service

The Bundesnetzagentur's energy consumer advice service provides information for consumers about their rights, help available to them and possible action they can take. It deals with general energy issues and their effects on customers of energy suppliers, network operators and meter operators.

In 2021, about 21,840 enquiries were received, around 18% more than the year before. Around 11,007 queries were made by telephone, 8,934 by email, 1,480 via the online form and 419 by post.

Enquiries focused more than before on billing, increases in prices and advance payments, delays in supplier switching and contractual disputes.

At the beginning of the year, the expiring special arrangements brought in as a response to the coronavirus pandemic – such as the temporary drop in value-added tax (VAT) – led to questions from some consumers about their electricity and gas bills.

In July 2021, the European Directive 2019/944 was transposed in the new version of the EnWG. This brought expanded and improved rights for consumers. The new EnWG ensures greater transparency and consumer protection, particularly in the areas of energy bills, determining consumption, and for contracts and tariffs. Contracts may no longer be made verbally or over the phone, for example. Energy suppliers have to include more compulsory information in their bills and bills based on estimated consumptions are only allowed under exceptional circumstances.

The FAQs on the energy consumer portal (www.bnetza.de/aktuelles-enwg) were extensively reworked to take account of the legal amendments.

There was a noticeable rise in consumer enquiries in the fourth quarter of 2021 after some energy suppliers reacted to the rising prices on the electricity and gas markets.

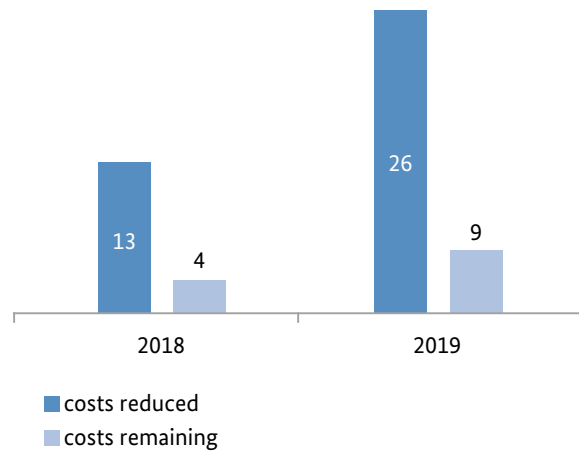
Smart meter rollouts and costs Metering

Under section 7(2) of the Metering Act (MsbG), the costs for the operation of modern metering equipment and smart metering systems are not to be factored into the revenue cap and the network operator's network charges, but rather are to be allocated to the default meter operator for modern metering equipment and smart metering systems. The nationwide rollout of modern metering equipment began in 2018.

The difference between the actual costs of meter operation for the calendar year (assuming efficient provision of services) and the revenue cap estimates for those costs is entered into the regulatory account. This difference is entered if it is caused by changes in the number of connection users and not by costs for the operation of modern metering equipment and smart metering systems within the meaning of the MsbG.

In the regulatory accounts of 2018 and 2019 the costs were determined for modern metering equipment and smart metering systems that replaced conventional metering equipment. These costs are removed from the network operator's revenue cap and are allocated to the default meter operator for modern metering equipment and smart metering systems. With this new separation of roles, however, there are also costs that remain, at least for the short term, with the network operator. The chart below shows the amount of costs removed from the network operators' revenue caps and the remaining costs for network operators after meters have been replaced.

Regulatory costs for modern metering equipment and smart metering systems
€mn



The requirement to install modern metering equipment set out in the MsbG was assessed as at 30 June 2020 in the course of the 2021 monitoring survey. Around 9.5mn meter locations have been fitted with modern metering equipment Germany-wide, around 18% of the total that are to be fitted with such equipment by 2032 under the law. However, some metering operators were behind in meeting their 10% quota. The Bundesnetzagentur is investigating these.

Full SuedLink route corridor decided (26 March)

Full SuedLink route corridor decided (26 March)

In March the Bundesnetzagentur determined the route corridor for the last two sections of the SuedLink direct current transmission line.

"The general route of SuedLink has now been decided, so we have got one of the key projects of the energy transition underway," said Bundesnetzagentur President Jochen Homann. "We welcome the intensive participation of the public and are pleased to be able to include two suggestions from the consultation."

The approval procedure for SuedLink was launched in 2017 following widespread public participation. Its aim was to decide on a route corridor about 1,000m wide that was suitable for laying underground cables.

Since early 2020, the Bundesnetzagentur has set the binding route for SuedLink in five sections.

Next step: planning approval procedure

Once the federal sectoral planning has been completed, the next step is the planning approval procedure. The transmission system operators applied for planning approval from the Bundesnetzagentur in 2021 for all sections of SuedLink.

Background to SuedLink

SuedLink is intended to transport offshore wind power from the North Sea to the densely populated regions of southern Germany along the Main and Neckar rivers. It is planned to go into operation in 2028.



Rulings, activities and proceedings

In line with the new transparency rules set out in the amended Energy Industry Act (EnWG), the Bundesnetzagentur started publishing twice-yearly, company-specific, non-anonymised data on the costs of electricity and gas network operators in the fourth quarter of 2021.

The new EnWG also brought new provisions on the regulation of hydrogen networks into force. An interim arrangement was made to get the market up and running swiftly and with legal certainty while allowing flexibility in the creation of hydrogen networks.

Transparency

The Act transposing provisions of Union law and regulating pure hydrogen networks in energy industry law of 16 July 2021 (Federal Law Gazette I 2021, page 3026) brought new transparency provisions into the EnWG in the form of sections 23b to 23d. This means that, as well as the publication requirements coming from legislation such as the StromNEV and GasNEV, the publication requirements previously contained in section 31 ARegV, which had been largely suspended following a ruling of the Federal Court of Justice (BGH), have now been transferred to the EnWG. Moreover, additional reporting requirements have been brought in, in particular regarding research and development costs pursuant to section 25a ARegV as well as the base level for the revenue cap pursuant to section 21a EnWG and the balance-sheet items used to determine the imputed rate of return on equity.

The Bundesnetzagentur has initiated the publications for the undertakings under its direct or delegated responsibility, starting with the data from 2021. The data may be found at www.BNetzA.de/netzentgelttransparenz.

The aim of the publication requirements is to make network costs and the results of regulation more transparent, enabling network users and operators to better verify their decisions. Improving transparency also benefits both these groups by, for example, making network operators' cash flows more comprehensible by publishing the balance-sheet items relevant to the rate of return on equity, investment measures and capex mark-up. This is likely to improve options for raising capital. Favourable conditions for raising capital are good for both network operators and users.

Determination of the rate of return on equity

The need to expand and maintain energy networks for the energy transition is an ongoing challenge for network operators and requires billions of euros to be invested, so it requires long-term planning and a reliable economic framework. Every five years, the Bundesnetzagentur determines the rates of return that network operators receive on their equity employed. For the coming regulatory period, the Bundesnetzagentur has determined a rate of 5.07% for new assets (down from 6.91%) and 3.51% for old assets (down from 5.12%). This new determination reflects the low interest rates that have been observed in the capital markets for a long time, which had to be taken into consideration in the interest of consumers. The return on equity is the rate before corporation tax and is made up of a base rate, based on the ten-year average for

risk-free investments, and an appropriate risk premium to reflect the risk incurred by the investing undertakings. The Bundesnetzagentur commissioned two expert reports, one on the determination of the risk premiums for electricity and gas network operators and one on the analysis of the central bank approaches to the determination of market risk premiums, partly to comply with the latest supreme-court ruling on the rate of return on equity. The base rate was lowered from 2.49% to 0.74% and the risk premium set at 3.39%. The rates guarantee that the network operators are in a position to take on the large investments required for the energy transition. Investments in networks remain attractive. The new rates will apply from the beginning of the next regulatory periods, ie from 2023 for gas network operators and 2024 for electricity network operators. The rates of return on equity remain constant for the whole regulatory period, although the Bundesnetzagentur does have means at its disposal to deal with the consequences of any unexpected, negative developments on the capital markets.

Setting the gas revenue cap

The Bundesnetzagentur has started the cost examination to determine the base level for operators of gas supply networks for the fourth regulatory period.

In accordance with determination BK9-20/605, TSOs had until 1 June 2021, DSOs using the standard procedure 1 July 2021 and participants in the simplified procedure 30 September 2021 to submit their data to the Bundesnetzagentur for the cost examination to identify the base level for determining the revenue caps. The determination sets out the scope, form and contents of the documentation to be submitted by the network operators that forms the basis of the cost examination. In total, 146 gas supply network operators were required to submit to the Bundesnetzagentur the documents necessary to set the base level. 80 network operators take part in the standard procedure and 66 in the simplified procedure.

Ruling Chamber 9 also issued two decisions on data collection for the efficiency benchmarking for all TSOs (BK9-20/604) and DSOs (BK9-20/603). TSOs and DSOs using the standard procedure thus also had to provide the Bundesnetzagentur with the structural data for the relevant efficiency benchmarking by 30 April 2021.

Using these data, in 2020 the Bundesnetzagentur started to determine the base level for operators of gas supply networks and to carry out the efficiency benchmarking.

A final determination of the revenue caps for the fourth regulatory period will be issued by the end of 2022.

Efficiency benchmarking of gas network operators

At the beginning of 2021, the decisions on data collection for the output parameters for DSOs and TSOs were published, which also marked the start of data collection. The output parameters and structural data are important for subsequently working out the efficiency scores. DSOs and TSOs had until 30 April to submit the structural data as requested. The Bundesnetzagentur then checked the plausibility of these data, a task which was largely completed by autumn. On 19 October 2021 the Bundesnetzagentur published the structural data of DSOs and TSOs on its website for the first time, as set out in the new section 23b EnWG.

Determination of the general sectoral productivity factor for gas

The Bundesnetzagentur is currently preparing to determine the general sectoral productivity factor for the fourth regulatory period, which it is obliged to do on the basis of the latest scientific methods. In light of the supreme-court ruling on the general sectoral productivity factor for gas of the third regulatory period, it is intended to continue the previous methodology for the most part and to apply both the Törnqvist quantity index and the Malmquist productivity index again. The data collection decisions were issued, or consultation on them initiated, to generate the relevant database. A consultant was also commissioned to provide the authority with expert support on the project.

Capital expenditure mark-up

The Bundesnetzagentur implemented the new instrument of capex mark-ups for gas distribution systems (section 10a ARegV) at the start of the third regulatory period on 1 January 2018. This enables DSOs to apply for an annual mark-up on the revenue cap approved by the Bundesnetzagentur for new investments that have not previously been included. They can take account of planned investments and those that have already been made.

The capex mark-up includes the annual imputed capital expenditure in the form of write-downs, rate of return on equity and trade tax and is factored into the network operator's revenue cap.

Ruling Chamber 9 has decided on 127 applications for the 2021 capex mark-up for gas network operators under its responsibility. It approved capex mark-ups totalling nearly €395mn.

For 2022, 128 applications for approval of a capex mark-up have already been received, with network operators applying for about €506mn of mark-ups. The individual applications are processed promptly in line with the aim of the ARegV to adjust the revenue cap to current changes.

Transfer of gas networks

In accordance with section 26 ARegV, when an energy supply network is partly transferred to a different network operator and when networks are split, the shares of the revenue caps for the part of the network being transferred must be determined. The Bundesnetzagentur issued decisions in 64 cases in the first half of the year for which consistent applications from the network operators involved had been received.

Special gas network charges

According to section 20(2) sentence 1 GasNEV, in order to avoid the construction of a direct pipeline, in individual cases operators of distribution networks may, in derogation of the provisions of section 18 GasNEV, apply a separate network charge on the basis of the gas services actually provided (special network charge).

The regulatory authorities of the federal states and the Bundesnetzagentur have drawn up joint guidelines on determining special network charges under section 20(2) GasNEV.

The aim of these guidelines is to establish a reliable, uniform Germany-wide approach in connection with the calculation of special network charges. The application of a standard set of rules available to all network operators and network users in these guidelines is intended not only to create transparency and ensure non-discrimination but also to help achieve the objectives of section 20(2) GasNEV in the best possible way.

Proceedings for exemption from regulation for planned LNG terminals

LNG terminal Brunsbüttel (BK7-18-063)

On 25 May 2021, the European Commission issued a decision in line with the statutory participation procedure on the approval of exemption from regulation under section 28a EnWG for the planned LNG terminal in Brunsbüttel issued by Ruling Chamber 7 on 30 November 2020.

In its decision, the Commission confirmed the 25-year exemption period and its scope. It also confirmed the secondary provisions, which in particular guarantee permanent access to the LNG facility for third parties with comprehensive rules and mechanisms for the management and allocation of capacity. At the same time, the Commission required the Bundesnetzagentur to change some points of its decision, including by setting a booking limitation for potentially dominant undertakings and other transparency requirements.

The Bundesnetzagentur revised its decision to take account of the amendments requested by the Commission and issued the final exemption decision on 21 June 2021.

LNG terminal Wilhelmshaven (BK7-19-080)

The proceedings launched in 2019 for exemption from

regulation were discontinued in May 2021 after the application was withdrawn.

LNG terminal Stade (BK7-20-107)

Hanseatic Energy Hub GmbH made an application for exemption from regulation in accordance with section 28a EnWG in conjunction with Article 36 of Directive 2009/73/EC in December 2020. It plans to build and operate an LNG terminal in Stade. The proceedings are still pending.

Status of certification procedure for Nord Stream 2 AG

Nord Stream 2 AG submitted an application for certification as an independent transmission operator (BK7-21-056) to Ruling Chamber 7 on 11 June 2021. Because of the involvement of a third country, Russia, this was a certification procedure in accordance with sections 4a and 4b EnWG, for which the BMWK examines the effects of certification on security of supply. The Polish undertakings PGNiG S.A. and PGNiG Supply & Trading GmbH (PST) were summoned to the proceedings on 21 September 2021. The Ukrainian undertakings Naftogaz and GTSOU (Gas Transmission System Operator of Ukraine LLC) were summoned on 15 November 2021.

The ruling chamber suspended the certification procedure on 16 November 2021. The suspension was caused by a change in legal form at Nord Stream 2 AG. The company decided to found a subsidiary to become the owner and operator of the German part of the Nord Stream 2 pipeline. This subsidiary was founded at the end of January and called Gas for Europe GmbH.

Gas for Europe now has to fulfil the unbundling requirements of an independent transmission operator as set out in sections 10 to 10e EnWG and submit documentation, evidence, etc to the ruling chamber accordingly. The procedure will therefore remain suspended until the main assets and human resources have been transferred to the subsidiary and the ruling chamber has been able to check whether the documentation resubmitted by the subsidiary, as the new applicant, is complete.

The four-month period in which the authority has to draft a decision and transmit it to the European Commission does not continue running while the procedure is suspended.

Regulation of hydrogen networks under the EnWG and the WasserstoffNEV

The amendment to the EnWG of 26 July 2021 brought new provisions on the regulation of hydrogen networks into force. An interim arrangement was made to get the market up and running swiftly and with legal certainty while allowing flexibility in the creation of hydrogen networks.

Cross-subsidisation of hydrogen networks via gas network charges is ruled out. No distinction between TSOs and DSOs is made (yet) and network operators can decide if they want to opt in to regulation or be active on the free market. If they choose to be regulated, operators submit an opt-in declaration to the Bundesnetzagentur. This takes effect when the first positive assessment of demand is complete. The ad hoc demand assessment for planned hydrogen infrastructure of regulated network operators, which is set out in section 28p EnWG, is carried out promptly by the Bundesnetzagentur, which has to make a decision within four months. Once the declaration is effective, the provisions on the regulation of hydrogen networks are applied in full. The declaration is irrevocable and continuing and covers all hydrogen networks and storage facilities of the respective operator. The Bundesnetzagentur publishes the list of regulated operators of hydrogen networks and storage facilities on its website.

In addition to building new hydrogen pipelines, it is also possible to convert existing natural gas pipelines to transport hydrogen. Section 113b EnWG allows TSOs to use the gas network development plan pursuant to section 15a EnWG to indicate gas supply lines that could in future be used for hydrogen. These pipelines, once checked by the Bundesnetzagentur, can then be confirmed quickly for use for hydrogen transportation in the ad hoc demand assessment.

Section 28n EnWG requires infrastructure operators to work together to enable non-discriminatory use of pipelines by third parties by means of negotiated network connection and access.

Pursuant to section 28q EnWG, TSOs and regulated hydrogen network operators have to submit to the Bundesnetzagentur in each even-numbered calendar year (with the first deadline being 1 September 2022) a report on the current status of the hydrogen network and the development of future network planning for hydrogen with the target year 2035.

The Bundesnetzagentur can take the report as a basis on which to make recommendations for the legal implementation of a binding hydrogen network development plan.

Detailed provisions on costs and charges are set out in the Hydrogen Network Charges Ordinance (Wasserstoff-NEV), which was adopted by the cabinet on 22 September 2021 and by the Bundesrat on 5 November 2021. It includes an annual comparison of the projected and actual costs that will lead to faster cost recognition and refinancing of investments, supporting the rapid ramp-up of the market. The rate of return on equity set until the end of 2027 is 9%.

Capex mark-up for electricity

The Bundesnetzagentur introduced the capex mark-up for electricity distribution systems for the first time as from 1 January 2019. DSOs are able to apply for mark-ups on the revenue cap approved by the Bundesnetzagentur to directly take account of network infrastructure investments.

The capex mark-up already includes a pre-financing element as the companies can factor in planned investments.

By the deadline of 30 June 2021, 170 applications for capex mark-up approvals for 2022 had been received (105 under the Bundesnetzagentur's own responsibility and 65 for the regulatory authorities of the federal states of Schleswig-Holstein and Brandenburg).

By 30 June 2021, the Bundesnetzagentur had approved capex mark-ups for distribution network expansion amounting to around €3.3bn for the years 2019 to 2021. This corresponds to past or planned investments totalling some €13bn. Through the capex mark-up, only the annual capital costs of investments, including a return on equity, feed into the revenue caps for a given calendar year.

The approved capex mark-ups relate to past or planned investments from 2017 to 2022. The capex mark-ups approved by the Bundesnetzagentur are supplemented by further investments of the 700 smaller companies under the regulatory responsibility of the federal states.

For the first time, approval of the incentive regulation account balance for 2019 also made it possible to reconcile the forecasted and actual 2019 capex mark-up. The Bundesnetzagentur approved capex mark-ups totalling around €780mn for 2019. The cost

examination of actual expenditure showed that investments made in network infrastructure amounted to around €810mn. Of particular note are the network operators' investments in telecommunications infrastructure, some of which are very high. The acquisition and production costs of this asset class are €147mn.

Setting the quality element

Incentive regulation harbours the risk that operators will make the required cuts in revenue by saving costs through not investing in their networks or not carrying out other necessary measures to maintain or improve quality of supply. This could lead to a poorer quality of supply. The Energy Industry Act (EnWG) and Incentive Regulation Ordinance (ARegV) therefore provide for regulation of supply quality in energy supply networks.

The sixth calculation for a total of 201 electricity DSOs in the standard procedure took place in 2021, making use of the findings from an expert report on the further development of the quality element. The reliability measures System Average Interruption Duration Index (SAIDI) and Average System Interruption Duration Index (ASIDI) were used for the low and medium voltage levels of the relevant network operators. A total of 134 network operators were above average in terms of reliability and thus received mark-ups (bonuses) for their revenue caps in the calendar year 2022. By contrast, 67 network operators with a relatively poor level of quality were given a deduction. The highest mark-up was about €3.68mn and the greatest deduction was about €3.84mn. The system of quality regulation has a neutral effect on revenues, ie the total mark-ups and deductions cancel each other out across all network operators.

Efficiency benchmarking of electricity distribution system operators

The Bundesnetzagentur is preparing the data survey of electricity DSOs that has to be carried out to set the revenue cap for the fourth regulatory period. Network operators using the standard procedure thus had to provide the Bundesnetzagentur with the structural data for the relevant efficiency benchmarking by 30 April 2021. The base year is 2021.

Ahead of the consultations on the data survey launched in autumn, the Bundesnetzagentur organised a "pre-test" process for both the cost examination and the efficiency benchmarking. The pre-test was not a pre-consultation and did not imply that any particular

decision had been made in advance. Rather, it was focused on checking technical functions and, particularly in the pre-test of the structural data survey, tightening up data definitions. The consultations following the pre-test are currently planned to be completed by January/February 2022 at the latest.

Efficiency benchmarking of electricity transmission system operators

The same method is being used to work out the efficiency scores for German TSOs in the fourth regulatory period as in the third one. The necessary preparations for this reference network analysis were made in 2021. A consultant was commissioned to support the project and provide input on the methodology. The structural data that have to be included in the survey were also identified and defined with the help of the consultant. Ahead of the consultation on the structural data survey launched in autumn, the planned details of the analysis and the structural data to be included in the survey were presented to TSOs and discussed with them. The subsequent consultation should be finished in January/February 2022.

Abuse proceedings

The issue of singularly used operating resources (section 19(3) StromNEV) as distinct from the service cable at the low voltage level was the subject of special abuse proceedings pursuant to section 31(1) EnWG. Specifically, the network charges billed by a network operator to the energy service provider of a supermarket were the subject of dispute.

In a decision dated 3 August 2021 (BK8-21-1495-05#1), Ruling Chamber 8 ruled that the energy service provider was not entitled to pay a (lower) network charge for the medium voltage/low voltage transformation level and the charges for the use of the low voltage level had been calculated correctly.

Section 17(1) sentence 2 StromNEV sets out that the network charges are based on the network level to which the withdrawal point is connected. In the view of the ruling chamber, the applicant's withdrawal takes place at the boundary of the property. Between the customer's own service connection box and the

network operator's substation there is a low-voltage cable belonging to the network operator. The withdrawal occurs at the customer's own service connection box, which is at the low voltage level. Any arrangements made in the network connection agreement that deviate from the actual circumstances (regarding, for example, the payment of certain network connection cost contributions) are irrelevant to the calculation of the network charges.

An appeal against the ruling chamber's decision has been submitted to the Higher Regional Court (OLG) of Düsseldorf and is pending.

Decisions on reimbursement of costs for the grid reserve

Before the costs for grid reserve plants can be reimbursed, there first needs to be a decision on whether the plant is important for the system. If the shutdown is temporary, the TSO can make the designation of systemic importance. If the shutdown is permanent, however, approval from the Bundesnetzagentur is also required. Systemically important installations become part of the grid reserve for the duration of the designation period.

Costs arising from the use of a grid reserve plant are reimbursed to the plant operator by the TSO in accordance with the provisions of section 13c EnWG and the Grid Reserve Ordinance (NetzResV). The reimbursement depends on whether the plant will be shut down temporarily or permanently. If the closure is temporary, the plant operator has the right to return it to the market at a later date.

Installation operators and TSOs conclude a grid reserve contract governing the provision and use of the installation. It also covers the remuneration, which is determined in coordination with the TSOs and depends on the cost structure of the installation in question.

There was an additional, special arrangement for 2021. Plant operators that had been successful in the first

tendering procedure under the KVBG in December 2020 were legally required to keep their plants ready for operation for a transition period running until 7 July 2021 (section 52 KVBG). They were entitled to claim appropriate compensation for doing so. The basis of the cost recognition is comparable to that for grid reserve plants under the EnWG. Here, too, the cost reimbursement is agreed with the Bundesnetzagentur and then becomes part of the contract between the TSO and the plant operator.

Ruling Chamber 8 decides on the recognition of costs for the TSOs. The costs incurred by TSOs due to the grid reserve contracts are recognised as regulated costs, provided the TSOs have made a voluntary commitment to maintain the services agreed in the grid reserve contract and thus also the payment of the compensation to plant operators. These regulated costs are classed as permanently non-controllable costs that the TSOs are allowed to pass on to their network customers.

The following determinations on the recognition of costs for the provision and use of domestic power plants in the grid reserve and for the procedure set out in section 52 KVBG were made in 2021 in accordance with section 13c(5) EnWG:

More information on the grid reserve procedures and the costs resulting from section 52 KVBG may be found

Reference	Decision date	Period of designation of systemic importance	TSO	Plant
BK8-18/3005-R	31.08.21	3	TenneT TSO GmbH	Irsching 4
BK8-18/3006-R	02.09.21	3	TenneT TSO GmbH	Irsching 5
BK8-18/3001-R	31.08.21	3	TenneT TSO GmbH	Irsching 3
BK8-17/2009-R	25.10.21	2	Amprion GmbH	GTKW Darmstadt
BK8-18/2005-R	25.10.21	3	TenneT TSO GmbH	GTKW Darmstadt
BK8-19/1001-R	31.08.21	3	50Hertz Transmission GmbH	GTKW Thyrow
BK8-17/2007-R	12.01.21	1	Amprion GmbH	Weiher 3
BK8-17/2008-R	22.02.21	1	Amprion GmbH	Bexbach
BK8-18/4002-R	24.08.21	3	TransnetBW GmbH	Heilbronn Block 5&6
BK8-20/4003-R	24.08.21	4	TransnetBW GmbH	Heilbronn Block 5&6
BK8-20/1101-R	05.05.21	section 52 KVBG	50Hertz Transmission GmbH	HKW Moorburg Block A
BK8-20/1102-R	05.05.21	section 52 KVBG	50Hertz Transmission GmbH	HKW Moorburg Block B
BK8-20/2101-R	05.05.21	section 52 KVBG	Amprion GmbH	Ibbenbüren Block B
BK8-20/2102-R	05.05.21	section 52 KVBG	Amprion GmbH	Westfalen Block E
BK8-20/2103-R	05.05.21	section 52 KVBG	Amprion GmbH	Walsum 9
BK8-20/3101-R	05.05.21	section 52 KVBG	TenneT TSO GmbH	Heyden
BK8-20/3102-R	05.05.21	section 52 KVBG	TenneT TSO GmbH	Bremen-Hafen Block 6

in the Bundesnetzagentur's quarterly reports on security of supply.

As well as the operational readiness set out in the KVBG and mentioned above, the plants Mehrum and Heyden 4 were added to the grid reserve in 2021. They were designated as systemically important and the costs are currently being calculated.

The costs for converting hard coal-fired power plants to rotating phase shifters were also new in 2021. This affects the power plants Heyden 4 and Westfalen Block E. Their operators can claim costs for the conversion and for appropriate repayment of outgoings under section 26 KVBG.

The grid reserve power plant GTKW Thyrow has been contracted as capacity reserve for the first delivery period from 1 October 2020 to 30 September 2022.

EEG and CHP auctions

Auctions under the Renewable Energy Sources Act (EEG)

The determination of the level of payments from auctions for renewable energy installations for solar, onshore wind and biomass as well as from the innovation auction continued in 2021. Auctions for rooftop solar installations and biomethane plants were held this year for the first time.

Solar installations (first segment)

Three solar power auctions were held for the first segment (ground-mounted solar) in March, June and November. All auction rounds carried out in 2021 were significantly oversubscribed. The average volume-weighted award value was 5.03 ct/kWh in the March round and 5.00 ct/kWh in both of the other two.

Solar installations (second segment)

The Bundesnetzagentur held the first auctions exclusively for solar installations to be mounted on buildings or noise barriers (rooftop solar) in 2021. Two rounds were held, one in June and one in December, both of which were oversubscribed. The average volume-weighted award price was 6.88 ct/kWh in the June round and 7.43 ct/kWh in December.

Onshore wind installations

Three rounds of auctions were held for onshore wind energy: in February, May and September. The round held on 1 September was the first to be oversubscribed after a sustained period in which these auctions had been undersubscribed. The average volume-weighted award price across all rounds was 5.88 ct/kWh, only a little below the maximum price of 6.00 ct/kWh.

Biomass plants

The Bundesnetzagentur held two auction rounds for biomass plants in 2021 (March and September). The number of bids continued to increase, reaching three figures for the first time in the September round, yet both rounds were still significantly undersubscribed. For this reason, the volume control introduced in the EEG 2021 for biomass plants was applied in both rounds.

The average volume-weighted award price was 17.02 ct/kWh in the first round and 17.48 ct/kWh in the second (the maximum price was raised in the EEG 2021).

Biomethane plants

The Bundesnetzagentur held its first auction round for biomethane plants in December 2021. It was possible to submit bids for new biomethane plants with an installed capacity of between 151 kW and 20 MW. The round was slightly undersubscribed. The average volume-weighted award price was 17.84 ct/kWh.

Innovation auctions

The Bundesnetzagentur followed the first innovation auction in September 2020 with two further rounds in April and August 2021. In this type of auction, bids are submitted for a fixed market premium that is paid regardless of the profit generated by the electricity. Both rounds were oversubscribed. It was only possible to participate with a combination or grouping of different renewable energy sources, the most common option being solar installations with storage facilities.

The average volume-weighted award price was 4.29 ct/kWh in the first round and 4.55 ct/kWh in the second round.

Auctions for combined heat and power (CHP) installations

In 2021 the Bundesnetzagentur held auctions for CHP installations and innovative CHP systems with two bidding deadlines each. The pay-as-bid auctions determine the amount of the award payment for electricity produced by CHP installations and fed into the public network. Such installations now need to have a capacity of more than 500 kW to participate, as set out in the amended Combined Heat and Power Act (KWKG) 2020. The previous lower limit was 1 MW. The upper limit for innovative CHP systems is now set at 10 MW in the law.

The first auction for CHP plants with a bid deadline in June was significantly oversubscribed. Thirteen of the 16 bids submitted were successful, with the average

volume-weighted price being 5.64 ct/kWh. The round for innovative CHP systems was also oversubscribed and seven of the nine bidders were successful. The average volume-weighted award price was 11.57 ct/kWh. The second round for CHP plants, in December, was oversubscribed again. Three of the 18 bids were successful. The average volume-weighted award price in this round was 6.11 ct/kWh. Although the auction for innovative CHP systems was undersubscribed, only five of the seven bids received were awarded as the other two were not admissible. The average volume-weighted award value was 11.37 ct/kWh in this round.

Determination on the requirements for special solar installations pursuant to section 15 InnAusV

The Bundesnetzagentur determined the specific requirements for special solar installations under the Innovation Auction Ordinance (InnAusV) on 1 October 2021. Special solar installations are photovoltaic installations that are built and operated on water, on parking areas, or on agricultural land that is being used for crops at the same time. The common feature of such installations is that the area they are used on is also being used for another purpose.

The Bundesnetzagentur carried out a consultation as part of the determination procedure and received 34 responses from various sectors.

The determination sets out requirements as to the installation sites, building and operating methods and evidence that has to be provided. Special solar installations must meet these requirements for the entire period in which they receive support. The provisions for floating solar are closely aligned with the Federal Water Act (WHG) and the water categories set out therein. The solar installations on arable or agricultural land have to be built and operated using state-of-the-art technology. This requirement is considered to be met in particular when the solar installations and the cultivation of crops, including permanent or multi-year crops, meet the requirements of the standard DIN SPEC 91434:2021-05 for the entire period in which they receive support. Solar installations on parking areas must not restrict the use of the area for parking too much. Such areas must not be constructed primarily for the purpose of erecting solar installations and the size of the parking area must be in proportion to the need for parking. Public and non-public areas are both covered.

Guidance note 2021/1 on the allocation of renewable energy installations no longer receiving payments

The Bundesnetzagentur published its guidance 2021/1 on 15 February 2021. The payment period regulated in the EEG ended for the first renewable energy installations at the beginning of 2021. Payments for more installations will come to an end at the start of each year from now on. For the various energy-related processes to work, it is necessary to clarify in good time which EEG feed-in is balanced in which balancing group. The guidance note highlights the risk for balancing groups if renewable energy installations that are no longer receiving payments are not re-allocated in time. It also explains the obligation to allocate such installations and describes the special arrangement for their automatic allocation if no other allocation takes place and the resulting legal consequences.

Guidance note 2021/2 on commercial-economic feed-in

The Bundesnetzagentur published its guidance 2021/2 on 31 March 2021. In it, the authority explains that "commercial-economic feed-in" is a general accounting option for the energy sector that may be used regardless of the type of generating installation, the existence of a right to payment or commercial uptake of the electricity pursuant to the EEG or KWKG. With this accounting option, the electricity generated is physically fed into a line that is not an electricity supply network, such as a customer facility. For the purposes of accounting and settlement, the physical volumes fed in and withdrawn are corrected as if the electricity generated had been fed into the network. Proper accounting and settlement are essential for the option to be usable. One-sided optimisations are not permissible. This form of feed-in is very important, especially in the EEG and KWKG, and can make processing much simpler.

Redispatch 2.0 – making network security fit for the future

Network operators have to intervene in generation to maintain security of supply. This process, which is known as "redispatching", involves increasing or reducing generation in a targeted way to, for example, avoid network congestion. Previously, there were different rules for major conventional power plants and for renewable or CHP plants, which employed feed-in management. Lawmakers have simplified these rules with effect from 1 October 2021.

This move to "Redispatch 2.0" is part of the energy transition. The electricity supply used to be based on large power stations that also provided the majority of redispatching potential, with feed-in management only intended as an emergency measure. Now, the number of large conventional power plants is falling, while renewable energy is growing and there is additional need for redispatching. Feed-in management started to be used regularly and was no longer fit for purpose.

Redispatch 2.0 meets this challenge. Renewable energy and CHP plants are taken into account in the network status forecast, the identification of possible congestion and its avoidance from the start. Measures are to be planned and implemented in such a way that the costs incurred are as low as possible. Of course, network operators must observe the priority dispatch for renewable and CHP electricity. At the same time, Redispatch 2.0 is a major step towards greater digitalisation.

The Bundesnetzagentur has issued four determinations on the move to Redispatch 2.0. The determination of minimum criteria specifies the priority dispatch of renewable and CHP electricity (30 November 2020, PGMF-8116-EnWG § 13j). Other determinations govern economic balancing and market communication (6 November 2020, BK6-20-059), coordination between network operators (12 March 2021, BK6-20-060) and the data that have to be reported by plant operators (23 March 2021, BK6-20-061).

Implementation costs incurred by network operators before 1 October 2021 can be included in the incentive regulation account. After 1 October, costs can be included that are necessary for implementation, further development and operation of the necessary equipment to meet the joint cooperation requirement. Costs incurred by network operators due to redispatching can be included in the revenue cap.

A major challenge in 2021 for the affected undertakings – network operators, plant operators, marketers and balance responsible parties – was the practical implementation. The schedule set out by law was ambitious. Unfortunately, the sector did not manage to fully implement Redispatch 2.0 by 1 October 2021. The industry association BDEW therefore developed an interim solution, primarily to avoid undesired effects on system security caused by a disorderly transition. The Bundesnetzagentur has accompanied and supported this process.

Special abuse proceedings

In the special abuse proceedings pursuant to section 31 EnWG (BK6-20-193), Ruling Chamber 6 ordered Energienetze Mittelrhein GmbH in a decision of 1 March 2021 to make the applicant Deutsche Funkturm GmbH an offer to make a network connection on the site of its mobile radio equipment.

Energienetze Mittelrhein has no right to refuse the connection on economic grounds, despite the fact that the system requires comparatively little electricity. It is true that, if the company's submission is accepted, there is a gap between the assumed operating expenses for the approximately 350m line and the expected revenue from network charges. However, ultimately the interests of Deutsche Funkturm in obtaining the network connection win out, particularly given the great interest in rolling out mobile coverage.

Offshore wind auctions in 2021

Following the offshore wind auctions for existing projects in 2017 and 2018, the first of the offshore auctions to be held each year from now on took place on 1 September 2021 in the "central model". The awards include the right to grid connection – financed by electricity consumers through the offshore network surcharge – and the possibility to operate the offshore wind farms for 25 years. The successful bidders also receive the right to apply for planning approval to

construct an offshore wind farm on the site from the Federal Maritime and Hydrographic Agency (BSH).

Three sites with a combined volume of 958 MW that had been subject to a preliminary investigation by the BSH were up for auction. Two of them, known as N-3.7 and N-3.8, are located in the North Sea and the third, O-1.3, is in the Baltic Sea. All three sites have an award value of 0 ct/kWh. The offshore wind farms are expected to go into operation in 2026.

Several bids with a value of 0 ct/kWh were submitted for the N-3.8 and O-1.3 sites. The Bundesnetzagentur therefore drew lots, as foreseen by law, to decide which bidder would be successful. The sites N-3.8 and O-1.3 are both subject to a right of subrogation by the project developers that originally planned offshore wind farms there. The developers exercised their right to subrogate the award in good time.

Designation of site	N-3.7	N-3.8	O-1.3
Volume auctioned (MW)	225	433	300
Award volume (MW)	225	433	300
Highest permissible bid (ct/kWh)	7.30	7.30	7.30
Award price (ct/kWh)	0.00	0.00	0.00
Lots drawn	no	yes	yes
Right of subrogation	no	yes	yes
Offshore transmission link	NOR-3-3	NOR-3-3	OST-1-4

Refining the imbalance price system

Ruling Chamber 6 first issued rules for the calculation of the uniform imbalance price applicable to all German load-frequency control areas in its decision BK6-12-024 of 25 October 2012. The methodology in place since then for calculating the imbalance price is made up of three modules. Module 1 involves calculating the basic imbalance price based on the costs and revenues from using automatic frequency restoration reserves (aFRR) and manual frequency restoration reserves (mFRR) as well as any additional measures that have been used for system balancing. Module 2 is the market-price coupling of the imbalance price as an "incentive component"; and module 3 is the "scarcity component" of the imbalance price in the form of the "80% criterion". The combination of modules 1 to 3 means that the imbalance price for a quarter hour results from the highest price of the three modules in the event of a short German transmission system and from the lowest price of the three modules in the event of a long system.

Amendment to modules 2 and 3

Decision BK6-19-552 of 11 May 2020 adjusted module 2. The aim of amending the market-price coupling of the imbalance price was to prevent arbitrage against the imbalance price and to create an economic incentive for balance responsible parties to compensate for identified imbalances in their balancing groups through electricity trading instead of using balancing energy.

However, market-price coupling alone is not sufficient to create enough incentive for balance responsible parties to balance their groups. At times when there are large imbalances in the system, in particular, the market-price coupling needs to be effectively secured with a scarcity component that causes balance responsible parties to conclude electricity trades for short-term balancing even when these are comparatively expensive. The scarcity component in its original form was not able to do this, so the German TSOs responsible for the load-frequency control areas revised module 3 and submitted it to the ruling chamber for approval. The revised scarcity component concept of the imbalance price basically works as follows:

- it sets a minimum/maximum price for the imbalance price when there are large imbalances in the system – when the imbalance within the national grid control cooperation is at least 80% of the contracted aFRR and mFRR capacity,

- it is designed as a parabola that increases disproportionately as the national grid control cooperation imbalance increases, develops continually without jumps and is open-ended.

The amendment of the scarcity component of the imbalance price was approved in decision BK6-20-345 of 11 May 2021 and has been applied since 1 August 2021.

Amendment to module 1

As the European target model is established and the German TSOs enter the European platforms for the exchange of balancing energy, PICASSO (aFRR) and MARI (mFRR), the calculation of the imbalance price must in future follow European rules. These envisage a "price-based" calculation of the imbalance price based on the cross-border marginal prices formed on the abovementioned platforms for the main activation direction of the respective TSO in the relevant quarter hour. It is also mandatory in the calculation of the imbalance price to take account of minimum and maximum prices and pricing for avoided activation of balancing energy. There are further requirements regarding the financial neutrality of TSOs and the publication of relevant information.

The implementation of the European provisions made it necessary to overhaul the imbalance price calculation rules for module 1 and the related rules for the imbalance price system. An application by the TSOs to this effect is the subject of approval proceedings with the reference BK6-21-192.

Suspected breaches in wholesale energy trading

The Bundesnetzagentur monitors compliance with Regulation (EU) No 1227/2011 on wholesale energy market integrity and transparency (REMIT). It is mostly market monitoring bodies of the energy exchanges that provide indications of breaches of REMIT.

Suspected breaches are broken down into the categories of market manipulation and insider trading. Insider trading often refers to transactions concluded prior to the publication of power plant failures. Market manipulation may include the placing of orders with no intention of executing them or the influencing of closing or reference prices.

Of the total 140 reports of suspected breaches that have been received since 2012, 35 are being dealt with internally. A total of 65 cases were closed. Fines have been imposed in five cases so far. 37 suspected breaches are primarily being dealt with by the energy regulators of other Member States.

In September 2021, fines of €200,000 and €175,000 respectively were imposed on the companies Energi Danmark A/S and Optimax Energy GmbH owing to market manipulation. The background to this was the serious imbalances in the German electricity grid that occurred on three days in June 2019. At that time, full use had to be made of the balancing energy for longer periods and the exchange price was at times considerably higher than the imbalance price. The companies were found to have continued offering and, in some cases, selling electricity at the end of the trading periods at especially high prices, which were higher than the imbalance price, without the electricity actually being available and despite severe shortfalls in the relevant balancing groups. These false signals led other market participants to believe that there were offers in the market at the relevant prices that could still physically be fulfilled. An appeal was filed against the administrative fine imposed on Optimax Energy GmbH. Further background information on these market manipulation proceedings can be found on the Bundesnetzagentur's REMIT information portal at www.remit.BNetzA.de.

Developments at the core energy market data register

Almost all generating installations in Germany are now registered in the core energy market data register (MaStR). The register, which is publicly accessible at www.marktstammdatenregister.de, contained about 2.5mn electricity generating installations at the end of 2021.

The deadline for registering existing installations was 1 October 2021. There was a clear increase in registration numbers and enquiries as the deadline approached. During the busiest period, about 13,000 installations were being registered and around 3,000 phone enquiries being made each day.

A variety of tasks for the Bundesnetzagentur are associated with the MaStR, including software development for the online portal, quality management of the registered data, monitoring based on the Core Market Data Register Ordinance, the service area and administrative tasks.

Evaluation report on bivalent electricity storage facilities

Section 61l(1c) EEG 2017 places upon the Bundesnetzagentur the task of evaluating section 61l(1) to (1b) EEG 2017 for electricity storage facilities whose electricity is neither fed solely into a network nor consumed exclusively by the operator (bivalent operating method). The report was drawn up and sent to the federal government. It was published on the Bundesnetzagentur website on 29 April 2021. The report concludes that the provisions of section 61l EEG 2017 are suitable to avoid bivalent electricity storage facilities being charged the EEG surcharge twice. However, the evaluation also showed there was potential to simplify the legal framework. The simplifications put forward in the report were largely accepted by lawmakers in their amendment of section 61l in the EEG 2021.

Göttingen energy conference

The Bundesnetzagentur and the Energy Research Centre of Lower Saxony (EFZN) hosted the 12th Göttingen energy conference on the latest developments in the energy supply network on 22 and 23 September 2021. The event, which is designed as a workshop, aims to foster multidisciplinary and practice-focused discussions and contributions.

The 2021 edition of the long-standing conference was held under the title "Consumers in the new energy world: action in the market and challenges for the network". It focused on consumer participation issues, which were discussed from the perspectives of different players and with representatives of business, industry associations, authorities and academia. As well as papers on the quality requirements of network services, consumer protection and the role of energy communities, there was a panel discussion on network charges in the new consumer world. The conference was held digitally and not, as usual, in the historic Paulinerkirche in Göttingen owing to the pandemic situation.

International cooperation

A major milestone for European internal electricity market integration is the introduction of a common flow-based capacity calculation and market coupling in the Core region, which covers the bidding zones of Austria, Belgium, Croatia, Czechia, France, Germany, Hungary, Luxembourg, the Netherlands, Poland, Romania, Slovakia and Slovenia.

2021 was full of preparations for the start of the flow-based capacity calculation in the day-ahead time frame. The completion of the Interim Coupling project in June 2021 means that joint market coupling within the region is already largely in place.

Approvals in accordance with European electricity Regulations

The Bundesnetzagentur issued further approvals in accordance with European Regulations in the electricity sector in 2021.

Within the scope of Regulation (EU) 2019/943 on the internal market for electricity, the establishment of regional coordination centres in the Central Europe system operation region (BK6-20-196) and the report of the German TSOs on available capacity across bidding zones for the year 2020 (622-21-007) were approved.

Within the scope of Regulation (EU) 2016/1719 establishing a guideline on forward capacity allocation, the capacity calculation methodology for long-term time frames in the Hansa capacity calculation region was amended (622-21-006).

Pursuant to Regulation (EU) 2017/1485 establishing a guideline on electricity transmission system operation, additional properties of the frequency containment reserves (FCR) for the Continental Europe Synchronous Area were approved (BK6-19-069), as was the methodology for the regional operational security coordination for the Hansa capacity calculation region (BK6-19-586).

Within the scope of Regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management, the redispatching and countertrading cost sharing methodology (622-21-001), the capacity calculation method in the day-ahead and intraday time frames (622-21-004) and the method for coordinated redispatching and countertrading (622-21-005) were amended for the Hansa capacity calculation region. The capacity calculation method in the day-ahead time-frame was amended for the Core capacity calculation region (622-21-002). A decision was further made on the reallocation of voting rights among TSOs with the inclusion of Baltic Cable AB (622-21-010).

Monitoring of minimum trading capacity requirements

The internal electricity market Regulation requires Member States to make at least 70% of their transmission capacity available for cross-zonal electricity trading. The federal government had presented a national action plan in 2020 that will permit the minimum amount to be introduced in stages up to 31 December 2025. The Bundesnetzagentur's role is to monitor compliance with the minimum trading capacity. To this end, it has worked out monitoring criteria together with the TSOs and approved their monitoring report (see section on Approvals in accordance with European Regulations above). The monitoring process identified transmission capacity that was too low at times at the border to Sweden, but this was justified in view of maintaining system security. Countermeasures were subsequently implemented together with the adjacent network operators to prevent it from happening again.

Action against the Agency for the Cooperation of Energy Regulators on the redispatching and countertrading cost sharing methodology

The Bundesnetzagentur has brought an action before the European General Court (EGC) against a Decision of the ACER Board of Appeal of 28 May 2021, in which ACER's Decision of 30 November 2020 on the cost sharing methodology for redispatching and countertrading was confirmed. The main points of criticism of the ACER Decision were the extension of the cost sharing methodology to practically all network elements of the transmission network and the priority penalisation of loop flows over internal flows. This disproportionately burdens network users in the major German bidding zone with costs. The European legal framework does acknowledge that TSOs have to bear the cost burden for disproportionately high loop flows, but it also sees a certain proportion of loop flows as inherent to the system and therefore tolerable. ACER's Decision does not take this into account and is thus in breach of EU law.

Interim Coupling project and Core

A major milestone for European internal market integration is the introduction of a common flow-based capacity calculation and market coupling in the Core region, which covers the bidding zone borders of Austria, Belgium, Croatia, Czechia, France, Germany, Hungary, Luxembourg, the Netherlands, Poland, Romania, Slovakia and Slovenia.

2021 was full of preparations for the start of the flow-based capacity calculation in the day-ahead time frame, planned for the end of February 2022. TSOs and nominated electricity market operators (NEMOs) were busy setting up and thoroughly testing the necessary IT systems. The Bundesnetzagentur and the other regulatory authorities of the region closely monitored this work. The underlying capacity calculation methodology for the day-ahead time frame also had to be amended (see section on Approvals in accordance with European Regulations above).

The completion of the Interim Coupling project in June 2021 means that joint market coupling within the region is already largely in place, strengthening the day-ahead market even before the introduction of the flow-based capacity calculation.

Capacity Allocation and Congestion Management 2.0

The European Commission has started the process of amending Regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management and has asked ACER to draw up proposals. European TSOs, power exchanges and other stakeholders had the opportunity to respond to consultations during this process. The aim of the overhaul is to adjust the Regulation in tune with the latest developments, deal with conflicts that have arisen in the past and implement the new requirements of Regulation (EU) 2019/943 on the internal market for electricity. The changes affect the organisation of market coupling operators, market coupling and in particular market times, capacity calculation and bidding zone configuration. ACER plans to send its reasoned proposal for amendments to the Commission before the end of the year. The Bundesnetzagentur was involved in the revision as part of the ACER bodies and provided valuable input with specific respect to the success of the energy transition and grid expansion.

Methodology developed by ACER on the use of congestion income

On the basis of Regulation (EU) 2019/943, ACER issued a Decision (38/2020 of 23 December 2020) on the methodology for the use of congestion income, which is also addressed to operators of independent cross-border electricity interconnectors. In line with this, the TSOs with responsibility for control areas submitted information on the use of the expected (planned) congestion income for 2022 to the Bundesnetzagentur for the first time on 30 September 2021 in the form of an advance communication. The Bundesnetzagentur is assessing this information using the allocation to the cost categories of the priorities set out in the internal market Regulation.

In March 2021, the Bundesnetzagentur published its annual report on the amount and use of congestion income for 2020 as set out in Article 19(5) sentence 2 of the internal market Regulation and informed ACER accordingly.

www.bundesnetzagentur.de/engpassmanagement

Fines for manipulation of wholesale energy market (5 October)

The Bundesnetzagentur has imposed fines for manipulation of the wholesale electricity market in connection with the system imbalances in June 2019.

The manipulation consisted of placing offers to sell electricity in intraday trading on the EPEX Spot SE energy exchange that gave misleading signals as to the supply of electricity, since the electricity offered or sold was not in fact available, nor was there any intention to procure or generate it.

In addition, the price on the exchange was unusually high, making it possible to predict that it would be higher than the expected imbalance price. This created an economic incentive for the companies to sell expensive electricity and pay for the cheaper balancing energy for the electricity not supplied.

Investigations following the system imbalances in 2019

On three days in June 2019, there were serious imbalances in the German electricity system. On these days, the transmission system operators had to make full use of balancing energy for longer periods and take other measures in order to keep the system stable and maintain the electricity supply in Germany.

The Bundesnetzagentur analysed trading activity during these periods for evidence of breaches of the prohibition on market manipulation. In September 2020, the Bundesnetzagentur opened administrative fines proceedings against three companies.



Shaping digital change

The spread of digital technology and connectivity processes are having a powerful impact on all areas of modern society. These changes are affecting areas of private life as well as leading to significant structural change in the economy. The Bundesnetzagentur is influencing these processes at various levels.

Contents

Market trends	50
Consumer protection and advice	68
Rulings, activities and proceedings	84
International cooperation	104

The technical regulation strategic plan
is available here in German:
www.bundesnetzagentur.de/vorhabenTR





The Bundesnetzagentur carried out more tasks relating to digitalisation in 2021. These included implementing the Gaia-X funding competition, publishing a discussion paper on interoperability between messaging services and drawing up approaches to the regulation of digital platforms.

In the field of spectrum management, the Bundesnetzagentur got further steps underway for the spectrum usage rights due to expire at the end of 2025. The aim is to decide on the provision of available spectrum in good time in order to give the market legal and planning certainty for the further roll-out of mobile networks.

The number of written complaints about cold calling received by the Bundesnetzagentur hit a new high in 2021. In addition, the authority received over 155,000 written complaints and enquiries about number misuse – also significantly more than in the previous year.

Market trends

The number of customers covered or passed by fibre (FTTH/FTTB) increased by about a third in 2021.

Mobile data volumes are still increasing steeply and reached 5,457 million gigabytes by the end of 2021, a 37% rise on the year before.

Telecommunications markets as a whole

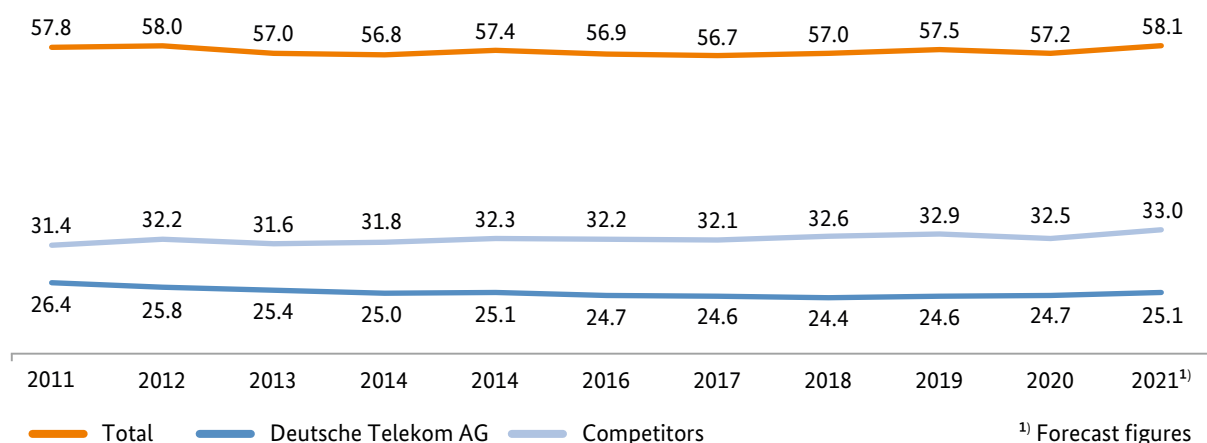
External revenue

According to the Bundesnetzagentur's preliminary calculations, external revenue in the telecommunications market was €58.1bn in 2021, corresponding to a year-on-year increase of nearly 2%.

Both Deutsche Telekom AG and its competitors saw their external revenue rise in 2021, with €33.0bn for the competitors and €25.1bn for Deutsche Telekom AG, each nearly 2% higher than the previous year. The competitors' share was 57% and Deutsche Telekom AG's 43%, proportions that were the same as in the previous years.

A breakdown of external revenue by market segment shows that the largest share is still attributable to mobile services. Accounting for a projected €26.36bn (45%), the market share of mobile services in 2021 was more than that of digital subscriber/fibre (xDSL/FTTx) networks at €24.72bn (43%) and of hybrid fibre coaxial (HFC) networks at €6.05bn (10%).

External revenue in the telecommunications market (€bn)



External revenue by sector

	2019		2020 ¹⁾		2021 ²⁾	
	€bn	%	€bn	%	€bn	%
External revenue on the telecommunications market	57.5		57.2		58.1	
External revenue in xDSL/FTTx networks	21.79	100	24.63	100	24.72	100
Via retail	17.42	80	20.04	81	20.45	83
Via wholesale	4.13	19	4.17	17	4.00	16
Other external revenue	0.24	1	0.42	2	0.27	1
External revenue in HFC networks	5.77	100 ³⁾	5.94	100	6.05	100
Via retail	5.45	94	5.64	95	5.76	95
Via wholesale	0.08	1	0.08	2	0.10	2
Other external revenue	0.24	4	0.22	4	0.19	3
External revenue from mobile services	26.60	100	25.65	100	26.36	100
Via retail	18.29	69	17.47	68	17.99	68
Via wholesale	2.65	10	2.50	10	2.51	10
Via terminal equipment	4.85	18	5.00	19	4.97	19
Other external revenue	0.81	3	0.68	3	0.89	3
Other external revenue	3.33	100	0.97	100	0.99	100

1) The structural shift between individual segments is due to the restructuring of business areas at one company.

2) Forecast figures

3) Totals may deviate from rounded cumulative values.

xDSL/FTTx networks

In the xDSL/FTTx networks segment, external revenue amounted to about €24.72bn in 2021, according to currently available data. This is a similar amount to the year before.

External revenue consists of external revenue from retail and wholesale services and other external revenue. Revenue via retail is generated from services for private, commercial and public sector final consumers. Its share gained two percentage points to 83% in 2021. Wholesale services for fixed-network and mobile operators and service providers outside of the Deutsche Telekom AG group took a share of 16%, down one percentage point. These services include wholesale products for voice traffic and telephony, broadband and internet, and infrastructure services.

HFC networks

The growth in revenue among HFC network operators continued in 2021, with external revenue rising nearly 2% on the previous year to a projected €6.05bn. By far the largest proportion of this, 95%, was for revenue via retail, while the share of external revenue for wholesale was 2%. The limited significance of the wholesale business compared with the xDSL/FTTx segment is largely due to the fact that HFC network operators to date offer virtually no wholesale products that can be used by third parties to provide broadband connections. Vodafone and Tele Columbus have now granted

Telefónica access to their HFC networks; Vodafone on the basis of a commitment in the Vodafone/Certain Liberty Global Assets (Unitymedia) merger control proceedings, and Tele Columbus on a voluntary basis.

Mobile services

External revenue from mobile services amounted to around €26.36bn in 2021, just under 3% below the prior-year figure. This can be broken down into 68% via retail (excluding terminal equipment), 10% via wholesale and 19% via terminal equipment.

The distribution of revenue between network operators and service providers/mobile virtual network operators (MVNOs) shows that the lion's share of this external revenue (over 80%) was attributable to network operators and that the proportions have barely altered. From 2019 to 2021, the share of network operators was 81 or 82% and that of service providers/MVNOs 19 or 18%.

External revenue from mobile services

	2019		2020		2021 ¹⁾	
	€bn	%	€bn	%	€bn	%
Total	26.60	100	25.65	100	26.36	100
Network operators	21.58	81	20.95	82	21.58	82
Service providers/MVNOs	5.02	19	4.70	18	4.78	18

1) Forecast figures

Investments in fixed assets

Investments in fixed assets in the telecommunications market were up again in 2021, according to currently available data. At €11bn, they were nearly 2% (€0.2bn) higher than the previous year. Competitors invested €6.5bn in 2021 compared with €6.2bn in 2020.

Deutsche Telekom AG invested €4.5bn, €0.1bn or 2% lower than in the year before. Deutsche Telekom AG's share of total investments on the telecommunications market in 2021 thus dropped two percentage points to 41%, while the competitors expanded their share to 59%.

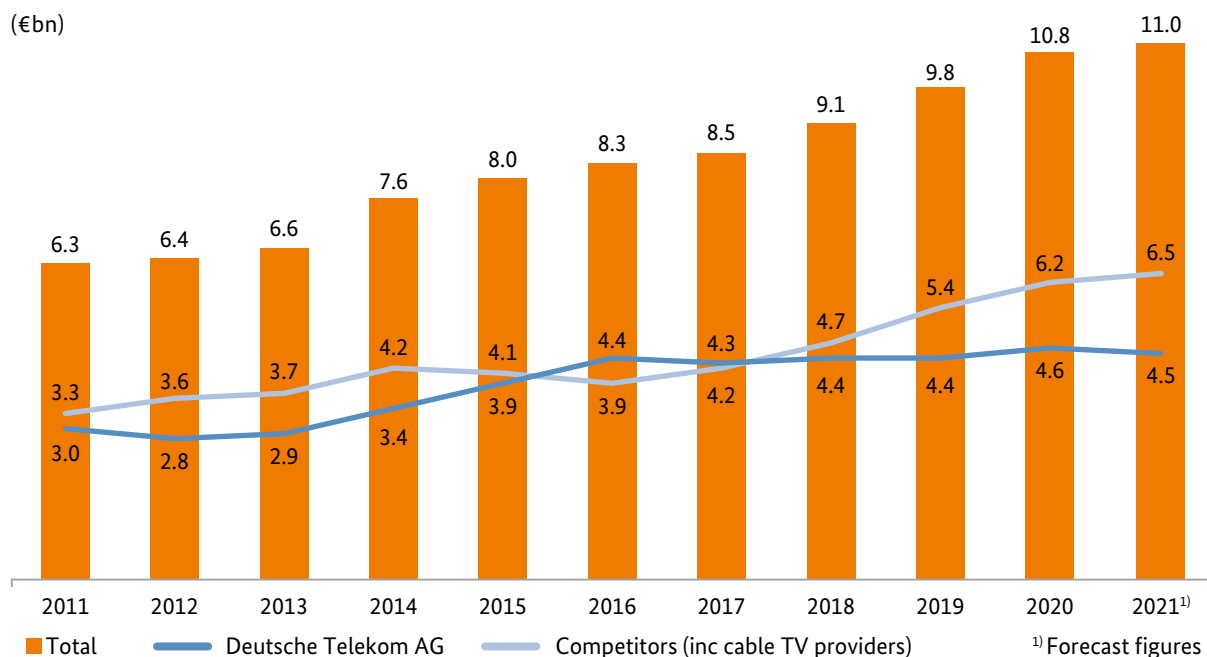
The companies were mostly investing in new broadband network infrastructure. This includes investments to expand coverage and/or upgrade connection performance, which together accounted for around 70% of all investments in 2021. Approximately 13% went towards the maintenance of existing broadband network infrastructure and around 17% was used for other purposes, such as investments in subscriber

terminal equipment, the expansion of data centres and investments in customer support.¹

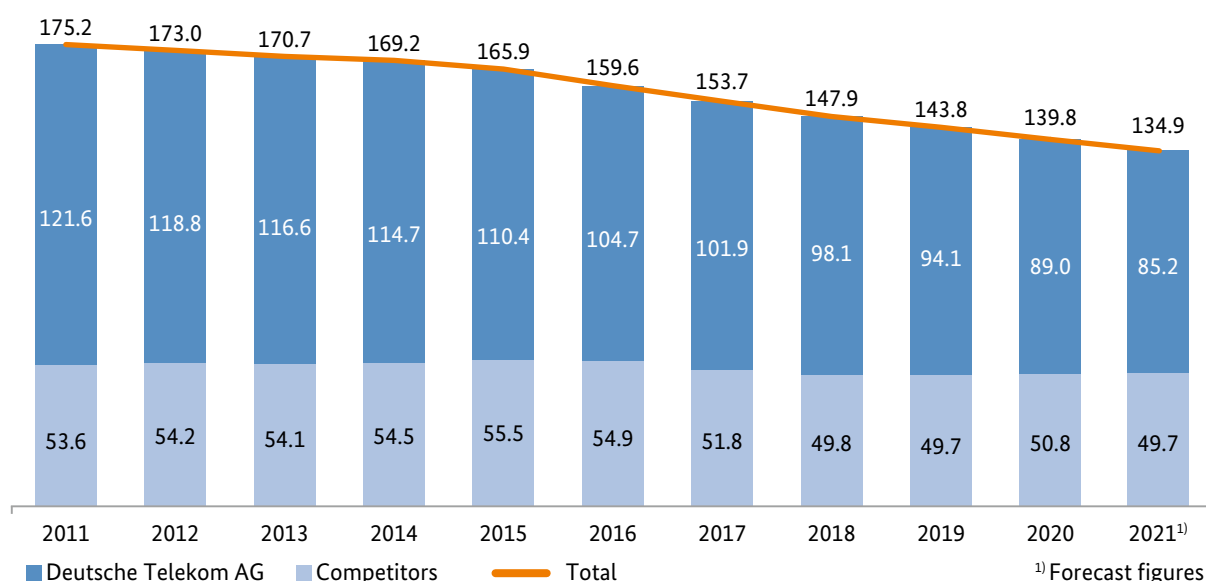
In the fixed-network segment, investments were devoted primarily to rolling out fibre networks and upgrading cable networks for gigabit data transmission rates. In mobile networks, the focus was on rolling out 5G networks.

From the time the market was opened up in 1998 through to the end of 2021, companies invested a total of €185.7bn in fixed assets in the telecommunications market. Of this amount, 53% (€98.3bn) is attributable to competitors and 47% (€87.4bn) to Deutsche Telekom AG.

¹ 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.

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


Employees in the telecommunications market (thousands)



Employees

According to preliminary calculations by the Bundesnetzagentur, approximately 134,900 people were employed by companies in the telecommunications market at the end of 2021, which is 4,900 fewer than at the end of 2020. The decline is partly a result of ongoing workforce reduction activities at Deutsche Telekom AG, where the headcount fell by 3,800 to 85,200. The number of people employed by the competitors, meanwhile, also fell by about 1,100 from the previous year to around 49,700 at the end of 2021.

Fixed network

Broadband connections

The number of contract-based broadband connections² increased to a total of about 36.9mn by the end of 2021, bringing the proportion of households in Germany with broadband access to about 90%.

The majority of broadband connections – about 69% or 25.4mn – continue to be based on various DSL technologies. All other technologies accounted for approximately 11.5mn connections. Most of these were based on HFC networks (around 8.8mn). Approximately 2.6mn were based on fibre-to-the-building (FTTB) or fibre-to-the-home (FTTH). Fewer than 0.1mn connections were broadband wireless access (BWA), fixed connections or satellite connections.

As far as marketing to end-users was concerned, Deutsche Telekom AG's competitors largely maintained their market share of all broadband connections at around 61% at the end of 2021.

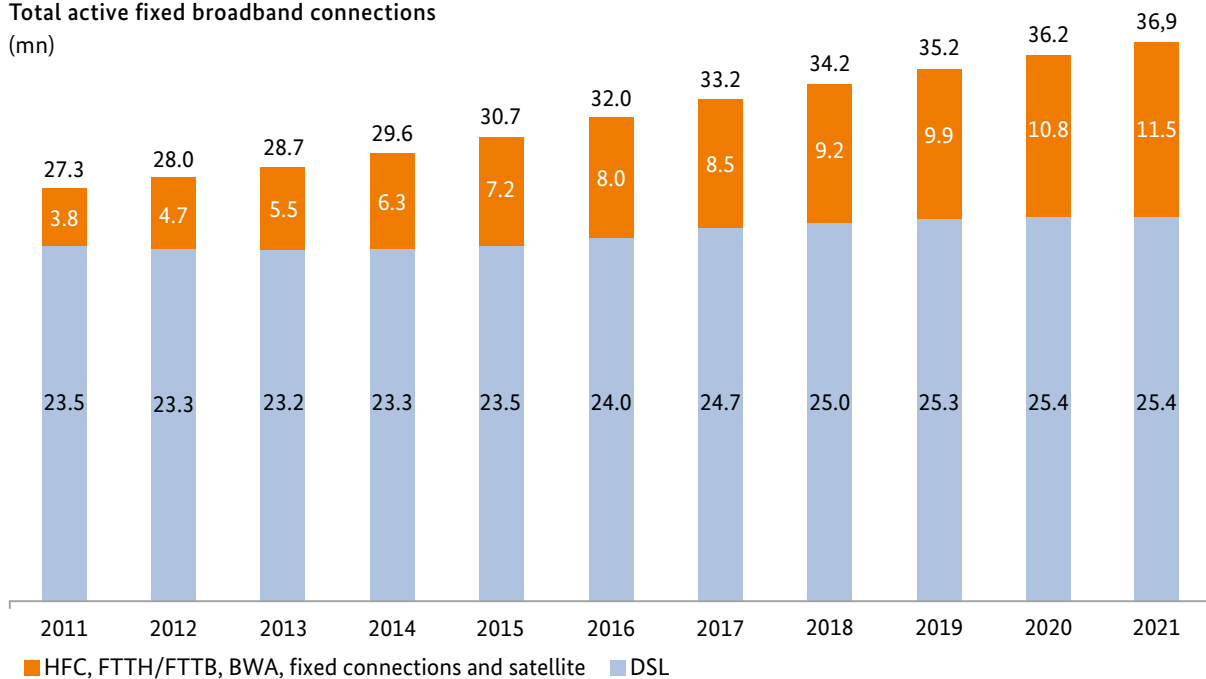
² Broadband connections include all connections with a bandwidth of at least 144 kbps. The Bundesnetzagentur bases this threshold on the requirements defined by the European Commission in its latest broadband report (COCOM).

Transmission rates

In the broadband market, demand for connections with fast nominal transmission speeds continued to increase in 2021, too. Some 14.3mn broadband connections were available with an advertised transmission rate of at least 100 Mbps at the end of 2021. This amounted to about 39% of all broadband connections

sold in fixed networks (36.9mn). Roughly 1.4mn connections had an advertised speed of at least 1 Gbps, while some 2.1mn broadband customers were still using connections with a nominal data rate of under 10 Mbps at the end of 2021.

Total active fixed broadband connections (mn)



DSL connections

At the end of 2021 some 25.4mn DSL connections were operational. Around 13.9mn of these were attributable to direct end-users of Deutsche Telekom AG and around 11.5mn 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 45% by the end of 2021.

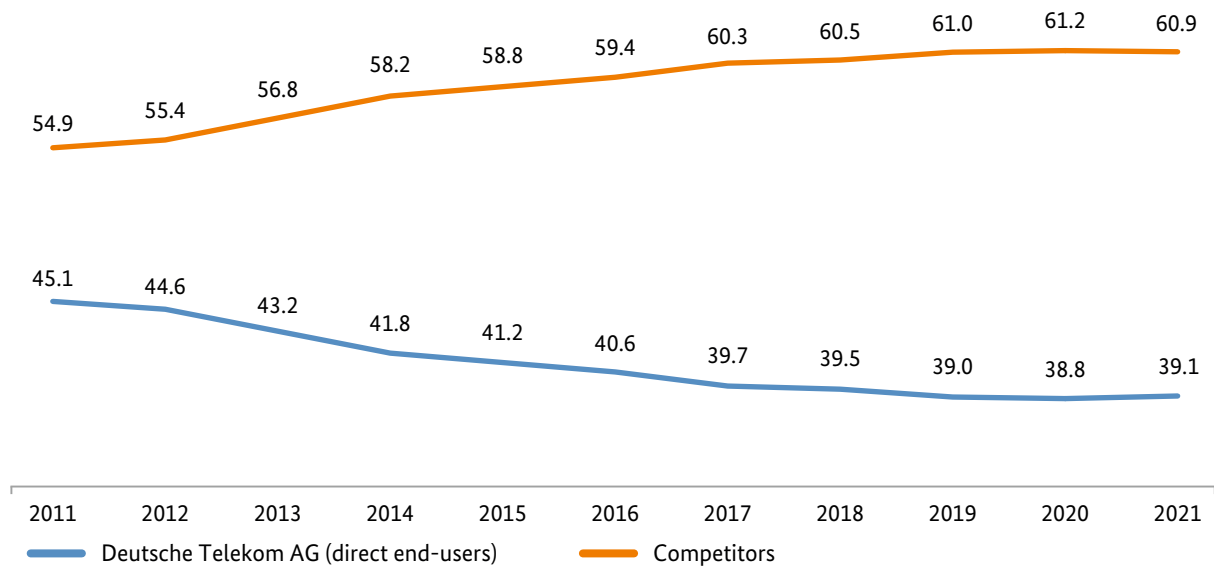
At around 17.9mn connections, VDSL technology accounted for approximately 70% of all DSL connections at the end of 2021. About 8.0mn VDSL connections were provided by the competitors compared to Deutsche Telekom AG's 9.9mn.

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

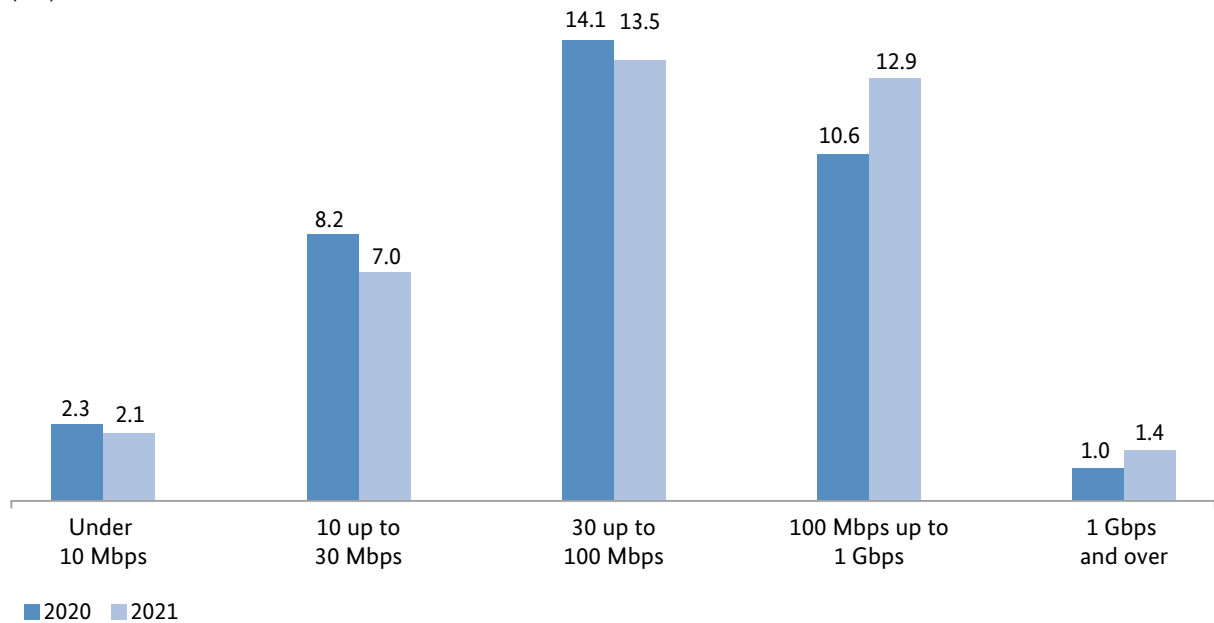
The significance of VDSL was also reflected at the wholesale level. In the last few years it has led to a considerable rise in demand for specific VDSL wholesale products from Deutsche Telekom AG, with bitstream wholesale products seeing particularly strong growth. Deutsche Telekom AG's layer 2 bitstream 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.

The number of bitstream wholesale products increased by about 5% year-on-year in 2021, whereas the number of resale wholesale products remained more or less the same.

Share of fixed broadband
(%)



Advertised speed of contract-based fixed broadband connections
(mn)



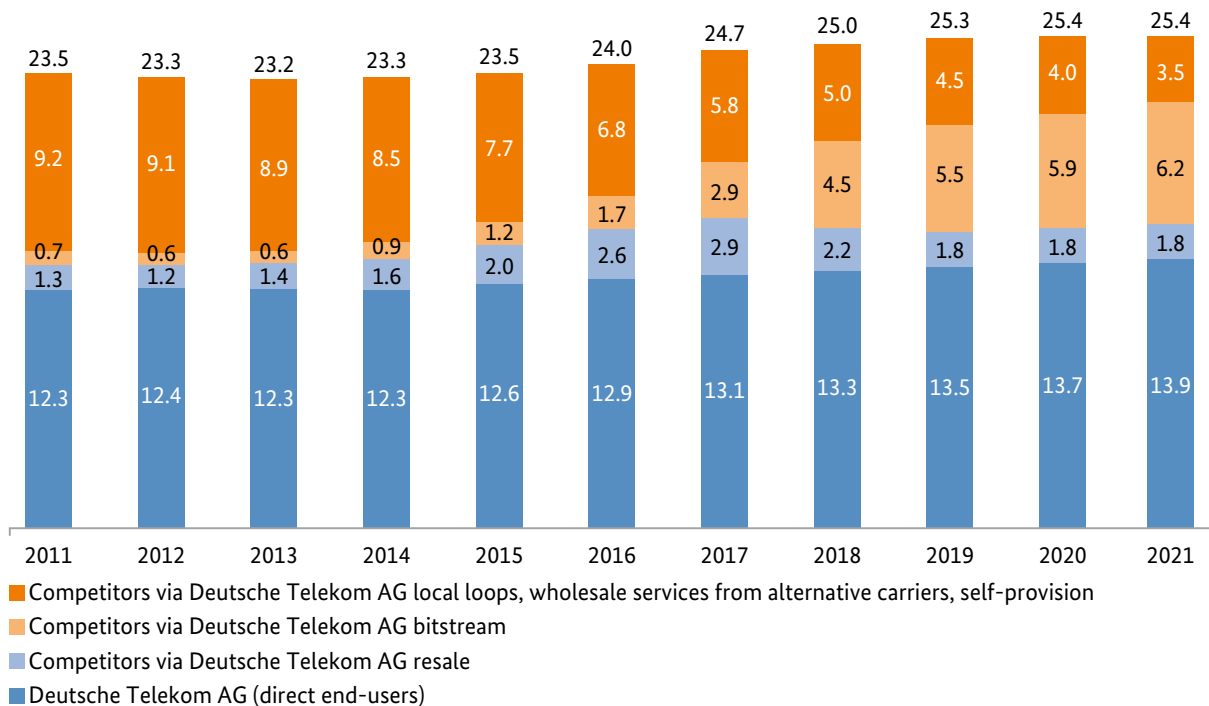
By contrast, for the number of competitor-operated connections based on Deutsche Telekom AG's high-bit-rate, unbundled local loops (about 3.5mn) fell again, this time by about 0.5mn, perhaps due to their limited usage possibilities amidst the ongoing rollout of vectoring technology.

Broadband connections via HFC networks

As more and more HFC networks are upgraded with the latest DOCSIS 3.1 transmission standard and investments in fibre components continue, these networks can now increasingly offer download speeds of up to 1 Gbps. At the end of 2021 there were around 8.8mn connections via HFC infrastructure, of which

nearly 5.6mn (64%) had delivering speeds of at least 100 Mbps. The ongoing growth eased off considerably to 100,000 new connections in 2021.

Active DSL connections (mn)



Broadband connections via FTTH/FTTB

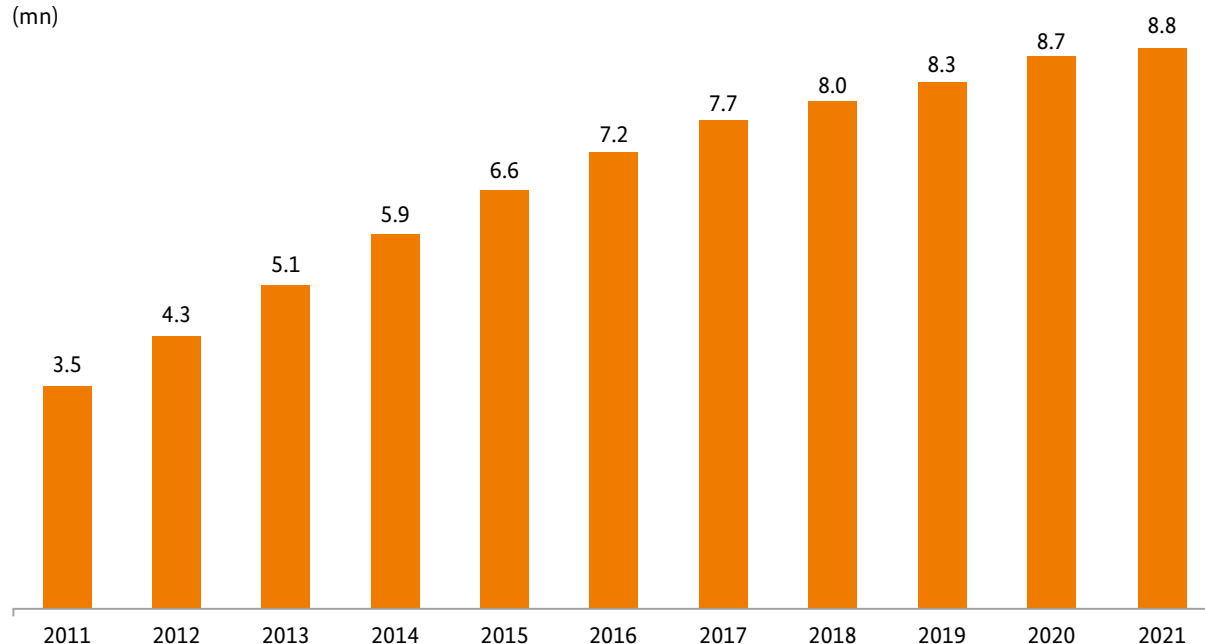
Thanks to their outstanding technical properties and almost unlimited transmission rates, optical fibres are considered to be the perfect medium for transporting data. The number of active fibre connections with FTTH or FTTB for private, commercial and public sector end-users expanded to a projected 2.6mn at the end of 2021, around 600,000 more than at the end of the previous year. These were split between about 1.7mn FTTH connections (65%) and about 0.9mn FTTB connections (35%). The share of FTTH connections has been greater than that of FTTB connections since 2019.

According to the Bundesnetzagentur's preliminary calculations, the number of customers covered or passed by FTTH/FTTB grew to 8.9mn in 2021, an increase of 2.2mn against 2020 (6.7mn). As well as active connections, these figures 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. Fibre infrastructure already reaches these customers, ie an FTTH/FTTB-dedicated optical fibre cable or bundle directly passes their property (at a maximum distance of 20 metres). Further investment is required to complete the connection to these end-users.

The growth in demand drove up the share of active broadband connections in fixed networks accounted for by active FTTH/FTTB connections from 5.5% in 2020 to 7.1% by the end of 2021. 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, partly on the back of rising private-sector investments in fibre and supporting funding initiatives at national, state and local level.

Active broadband connections via HFC networks
(mn)

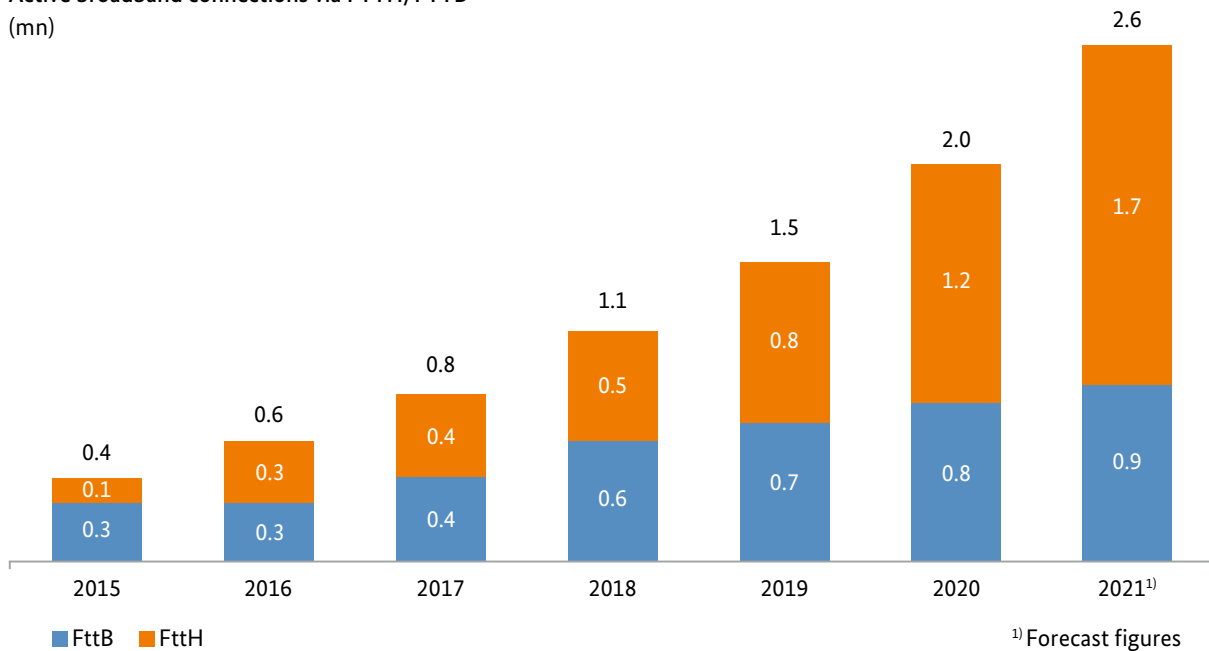


The take-up rate, which is the proportion of customers covered or passed by fibre who have active fibre connections, was about 29% at the end of 2021.

Satellite broadband connections

Nearly 25,000 customers were using satellite internet access from virtually any location at the end of 2021. Demand remained low due to the availability of more cost-effective alternative access options, often with higher maximum transmission speeds. Satellite internet connections can, however, help to provide full broadband coverage in regions where other technologies are not, or not sufficiently, available.

Active broadband connections via FTTH/FTTB (mn)



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

	2019	2020	2021 ¹⁾
Number of end-users covered or passed by FTTH/FTTB	5.3 Mio.	6.7 Mio.	8.9 Mio.
Active broadband connections via FTTH/FTTB	1.5 Mio.	2.0 Mio.	2.6 Mio.
Take-up rate	28 %	30 %	29 %

¹⁾ Forecast figures

Data volume

There was further strong annual growth in the data volume per fixed-network broadband connection.³ Consumers used a total volume of roughly 81bn GB by the end of 2020, or about 186 GB per connection per month.

Shifts in consumer behaviour during the Covid-19 pandemic led, among other things, to another rise in the total fixed-network volume to an estimated 100bn GB in 2021. This corresponds to an average of approximately 226 GB per fixed-network broadband customer per month.

Bundled products

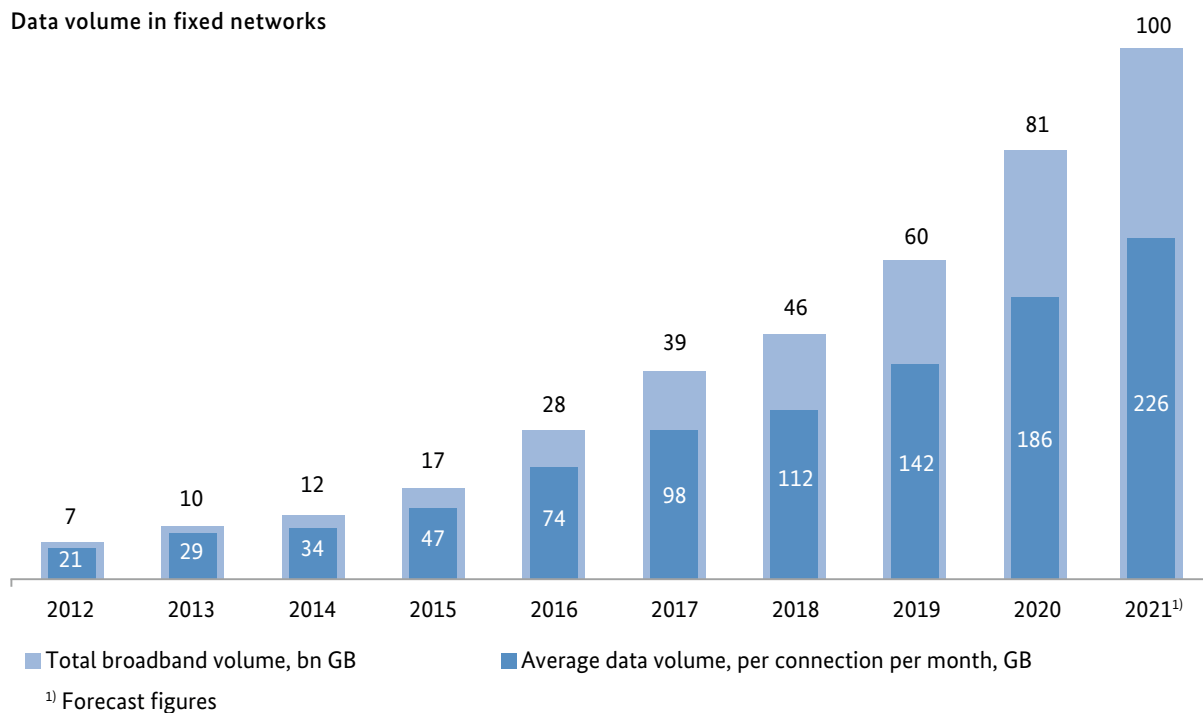
Bundled products that, in addition to a broadband connection, include at least one other telecommunications service (fixed-network telephony, TV or mobile services) in a single contract are offered as standard by companies in their marketing to end-users. In some cases, it is no longer financially expedient to purchase these services separately.

In addition, consumers who have already entered into a fixed-network and mobile contract with a provider can increasingly 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.

At the end of the first half of 2021, Deutsche Telekom AG and its competitors had around 35.1mn contracts

³ The traffic volumes shown do not include data volumes from Deutsche Telekom AG's IPTV (internet-based TV) service.

Data volume in fixed networks



with bundle tariffs and advantage programmes. Bundled products with two services were still by far the most common of these, accounting for approximately 21.5mn customers. The majority of these dual-play bundles consist of an IP-based telephone service in addition to a broadband connection.

Around 12.1mn customers had triple-play bundles at the end of the first half of 2021. Approximately 63% of these consisted of a broadband connection including a telephone service and an additional TV service, whilst roughly 37% 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.

Telephone connections

The number of voice communication connections in the fixed networks has been relatively stable in recent years. The total number of telephone connections in 2020 was 38.4mn, which rose slightly to about 38.6mn in 2021, according to preliminary calculations by the Bundesnetzagentur. Conventional fixed-network telephony using analogue and ISDN⁴ connections has now moved almost completely to Voice over Internet Protocol (VoIP).

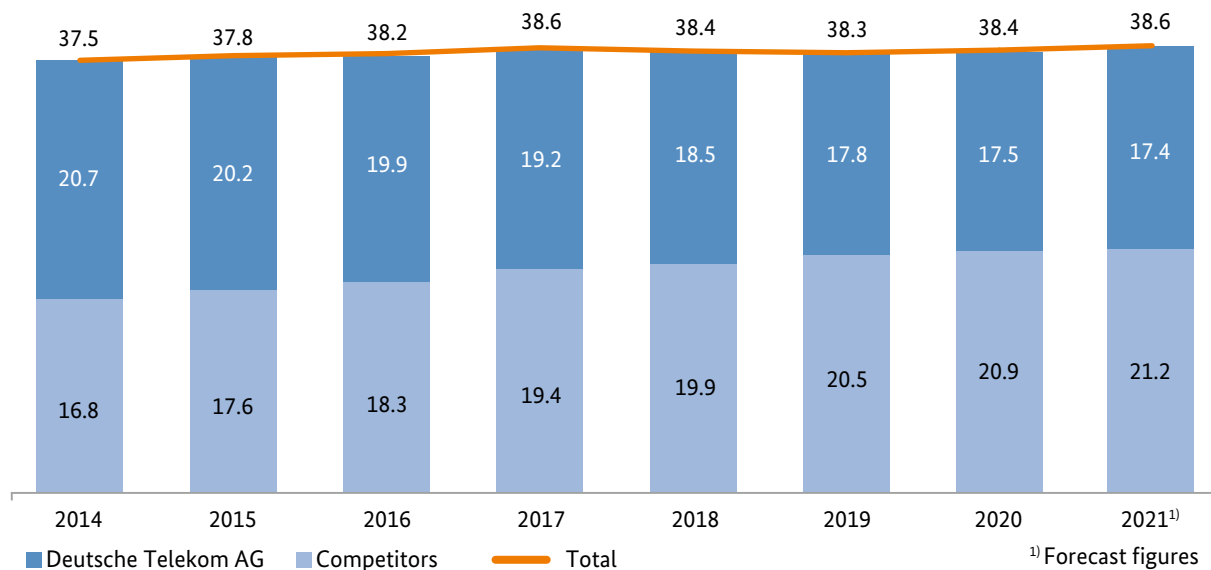
⁴ Integrated Services Digital Network

Since the telecommunications market was opened up, the competitors of Deutsche Telekom AG have expanded their share of the total number of all telephone connections every year, although this growth has slowed in recent years. The Bundesnetzagentur estimates that for 2021 about 55% (21.2mn) of the total

can be attributed to the competitors and about 45% (17.4mn) to Deutsche Telekom AG.

The Bundesnetzagentur estimates that at the end of 2021 in the Deutsche Telekom AG and competitor fixed networks there were around 27.6mn VoIP via DSL lines

Telephone connections (mn)



and analogue/ISDN connections that had been migrated to IP technology. The number of HFC connections used for telephony increased to approximately 8.4mn, according to initial calculations. By the end of 2021, the number of voice lines in fibre networks (FTTH/FTTB) had also risen to approximately 2.5mn. At the same time, the number of analogue/ISDN connections in the conventional fixed-line network fell to an estimated only 0.1mn.

At Deutsche Telekom AG, DSL lines used for VoIP and analogue/ISDN lines migrated to IP technology accounted for 97% of telephone connections at the end of 2021, with a further 3% or so coming from VoIP lines in fibre networks, according to an estimate of the Bundesnetzagentur. In the fixed networks of the competitors, at the end of 2021 the share of DSL lines for VoIP (an estimated 51%) was higher than the share of voice lines in HFC and fibre networks, which together accounted for around 49%. Fibre connections have become increasingly important for both the competitors and Deutsche Telekom AG in the last few years, a trend which is expected to continue.

Call minutes in fixed networks

Up until 2019, the volume of call minutes from the fixed network to fixed networks within Germany, to German mobile networks and to international fixed and mobile networks was in decline. In 2020, the first year affected by the coronavirus pandemic, call minutes rose to about 104bn. The Bundesnetzagentur estimates that they totalled about 102bn in 2021, the second year of the pandemic, making them still higher than in 2019.

Preliminary calculations indicate that about 52bn of the call minutes in 2021 (approximately 51%) can be attributed to Deutsche Telekom AG, which is a drop of an estimated about 2% from the around 53bn minutes the year before. The Bundesnetzagentur estimates that the competitors handled about 50bn minutes in 2021, which is also lower than the around 51bn minutes in 2020. As in previous years, direct traffic accounted for the majority of these minutes – around 48bn (96%) in 2021. Based on initial forecasts, indirect access and carrier pre-selection calls accounted for a total of nearly

Telephone connections and competitors' shares

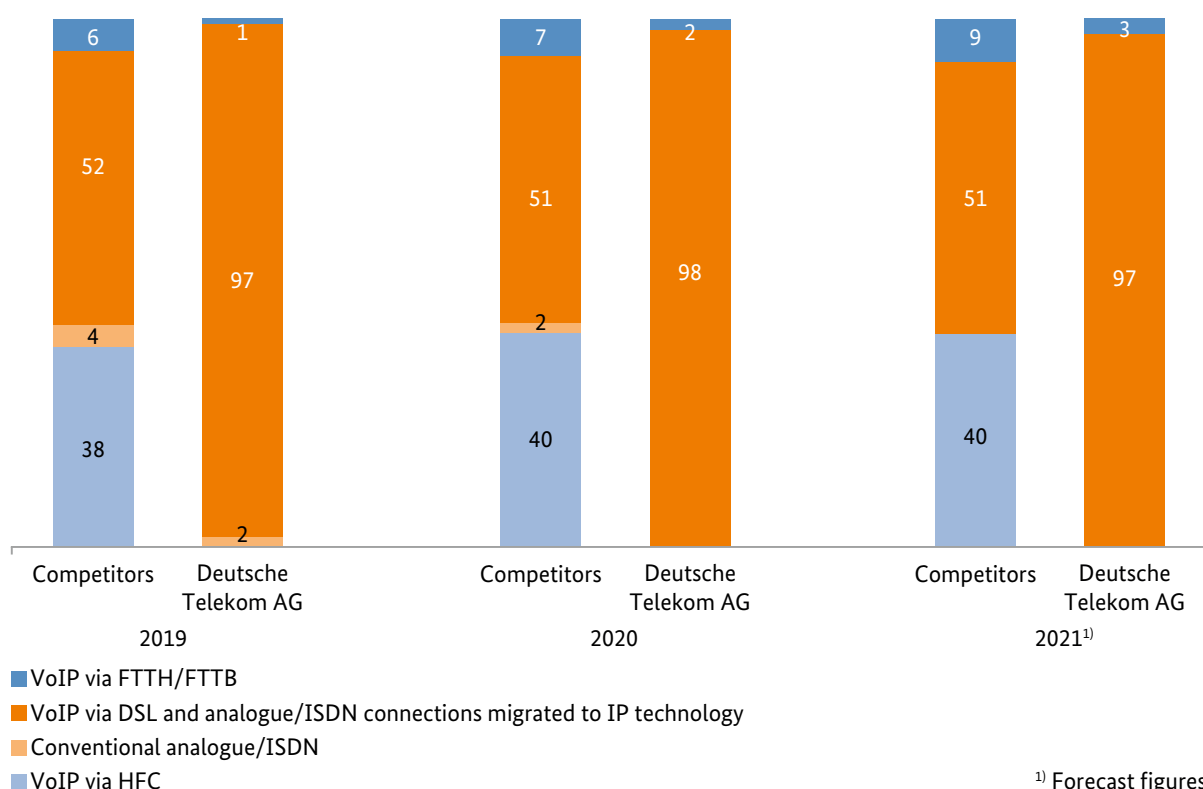
	2019		2020		2021 ¹⁾		
	Total	Competitors' share	Total	Competitors' share	Total	Competitors' share	
	mn	%	mn	%	mn	mn	%
VoIP via DSL ²⁾	27.79	38	27.85	39	27.60	10.70	39
VoIP via HFC	7.81	100	8.22	100	8.43	8.40	100
VoIP via FttH/FttB	1.49	84	1.87	81	2.49	1.98	80
Analogue/ISDN connections ³⁾	1.18	76	0.44	97	0.10	0.10	100
Total	38.27	54	38.38	54	38.62	21.18	55

1) Forecast figures

2) Including analogue/ISDN connections migrated to IP technology

3) Conventional telephone lines

Telephone connections from Deutsche Telekom AG and its competitors by technology (%)



¹⁾ Forecast figures

2bn minutes – or almost 4% – of all calls handled by competitors in 2021 (around 2% of total calls). A decrease in pre-selection in the Deutsche Telekom AG network led to indirect access exceeding pre-selection call volumes for the first time in 2021, the Bundesnetzagentur estimates.

Of the total 102bn minutes of calls made in 2021, preliminary calculations indicate that around 86bn of them were within the national fixed network. About 12bn minutes were made to the national mobile networks and an estimated 4bn to foreign fixed and mobile networks. According to initial forecasts, the competitors had a share of about 49% of these national fixed-network minutes, 49% in national mobile networks and 57% of the international minutes.

In general it should be noted when interpreting these call minutes that certain traffic volumes are not currently included in the Bundesnetzagentur's database. These primarily include voice transmission by over-the-top (OTT) providers that do not operate their own fixed-network lines or telecommunications networks and that offer internet-based services.

Mobile services

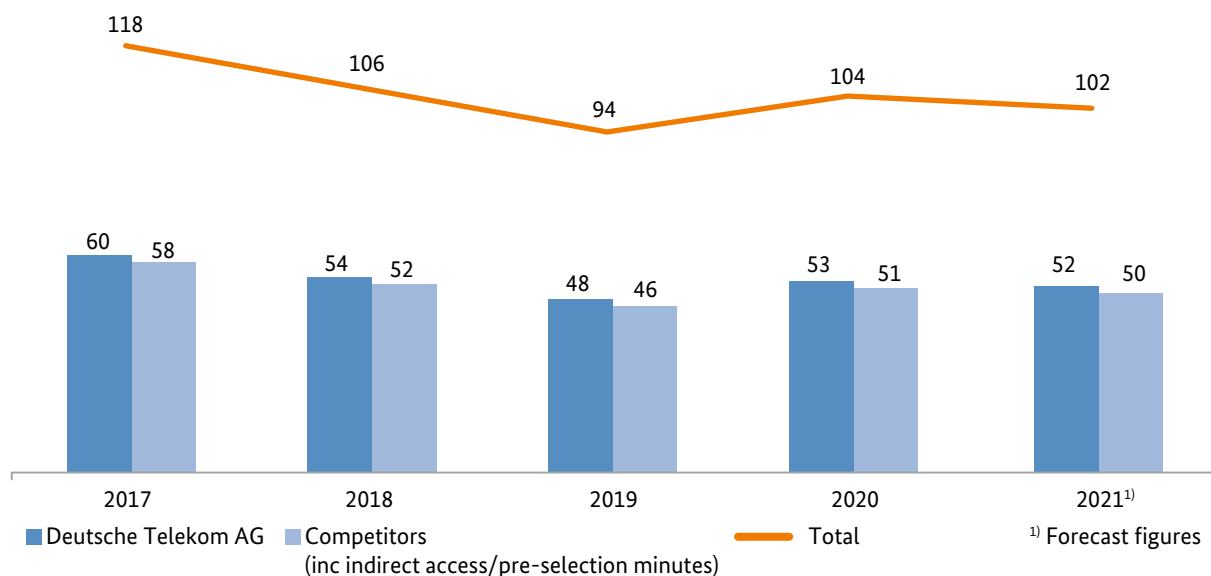
Subscribers

Actively used SIM cards

Data collected by the Bundesnetzagentur suggest that there were 106.4mn active SIM cards at the end of 2021. This does not include cards for machine-to-machine (M2M) data communications. Statistically speaking, each inhabitant has around 1.3 SIM cards. SIM cards 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 card in this period.

There was a slight shift in the shares of SIM cards from those attributable to service providers and MVNOs to those attributable to network operators. At the end of 2021 the network operators accounted for 77% (81.5mn) of SIM cards, up from 75% (80.2mn) the year before. In contracts, too, there was a small change of one percentage point from postpaid to prepaid cards. At the end of 2021, 66% (70.7mn) of SIM cards were on postpaid contracts and 34% (35.7mn) on prepaid contracts.

Outgoing call minutes in fixed networks (bn)



Some 45.6mn SIM cards were being used for M2M at the end of 2021 (2020: 36mn). This increase of nearly 27% is a result of sustained growth in demand for smart home and Internet of Things (IoT) applications.

The number of LTE SIM cards in active use was 71.2mn at the end of 2021, up by almost 12% year on year.

Voice communication is increasingly being made using the internet-based service Voice over LTE (VoLTE) which, in future, will be joined by Voice over New Radio (VoNR). These are IP-based and offer 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 45.7mn at the end of 2020 to 56.4mn at the end of 2021.

About 1.1mn SIM cards were being used at a fixed location or as a hybrid solution at the end of 2021. Mobile connections at a fixed location are used to establish internet access over a mobile connection via a special LTE or 5G router. These connections are predominantly offered as a fixed-network substitute in regions lacking powerful fixed-network infrastructure. Alternatively, SIM cards used at a fixed location can also be used as a hybrid solution in which, where

necessary, the router establishes parallel internet connection paths via the mobile and fixed networks and bundles the capabilities of both.

Registered SIM cards

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

At the end of 2021 the mobile network operators reported a total of 161.3mn registered SIM cards.⁵ This is an increase of around 11.3mn cards compared with 2020.

⁵ No standard definition applies to the total number of SIM cards specified in the publications of network operators. Each company decides for itself how to count SIM cards and when adjustments are required.

Use and distribution of active SIM cards

		2019		2020		2021	
		mn	%	mn	%	mn	%
Total excluding M2M cards¹⁾		107.2		107.4		106.4	
Penetration (SIM cards/inhabitant)		–	129	–	129	–	128
Business:	Network operators	79.8	74	80.2	75	81.5	77
	Service providers/MVNOs	27.3	26	27.2	25	24.9	23
Contract type:	Postpaid	70.9	66	72.4	67	70.7	66
	Prepaid	36.3	34	35.0	33	35.7	34
M2M cards		27.7	–	36.0	–	45.6	–
LTE subscribers (excluding M2M cards)		60.1	–	63.6	–	71.2	–
VoLTE users		32.2	–	45.7	–	56.4	–
Use at a fixed location/hybrid use		1.2	–	1.2	–	1.1	–

1) The drop in active SIM cards in 2021 is due to an adjustment to exclude inactive cards.

Total volumes

Mobile broadband

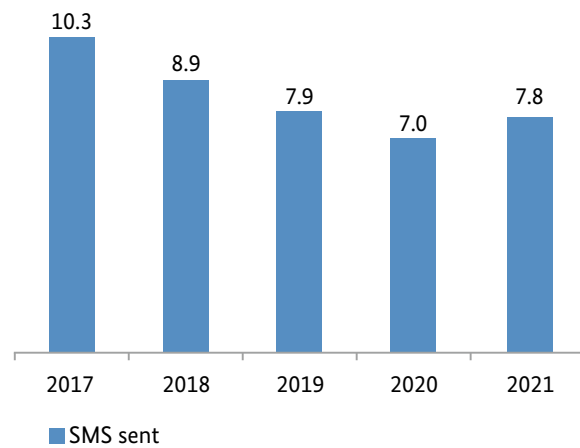
Mobile data volumes are continuing to increase steeply. Current data collected by the Bundesnetzagentur suggest that 5,457mn GB of data were transmitted in 2021, up from 3,972mn GB in 2020. This corresponds to an increase of 37%. The absolute increase of 1,485mn GB is the highest ever observed by the Bundesnetzagentur. The great majority (95%) of data traffic took place via LTE.

The average data volume used per active SIM card, per month, rose by about 39% year-on-year in 2021 to 4.3 GB.

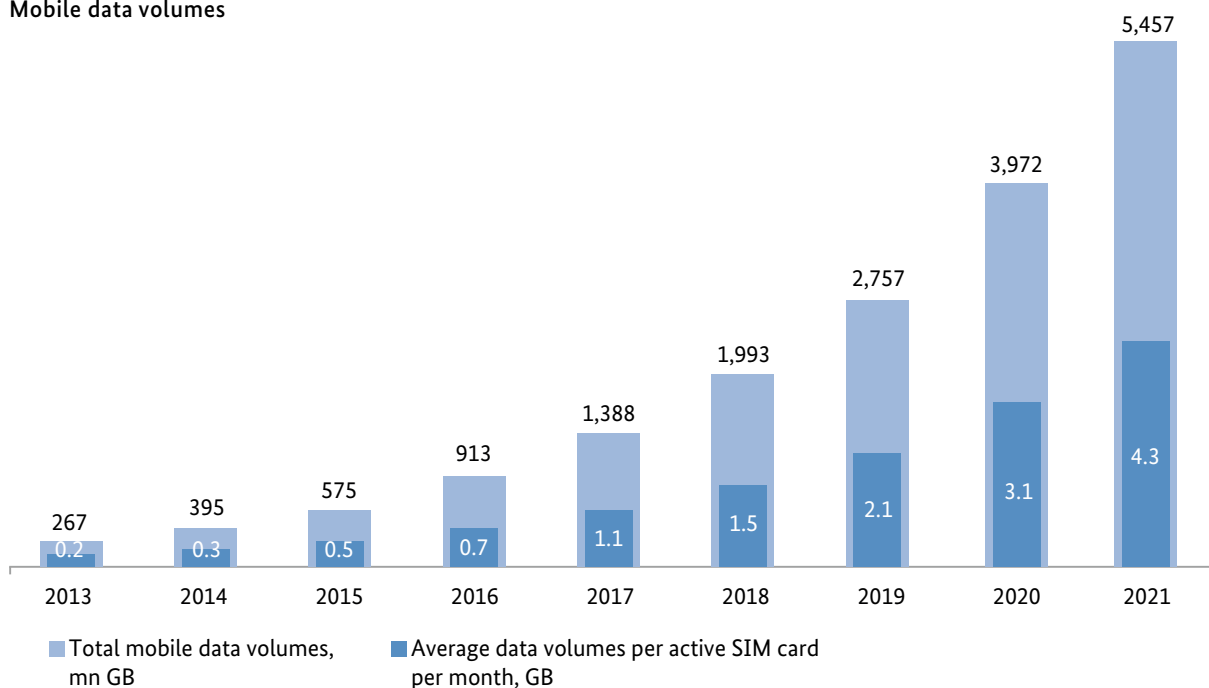
SMS messages

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. The number of SMS messages sent rose again for the first time in 2021 to 7.8bn. Each active SIM card sent an average of about six messages a month, up from around five the previous year. The slight rise could be due to pandemic-related use of SMS or two-factor authentication for payment services.

Mobile data volumes (bn)



Mobile data volumes



Call minutes

Nearly 163bn minutes of outgoing calls were made via German mobile networks in 2021. In other words, about 127 minutes of calls a month were made with each active SIM card. Mobile call volumes now significantly exceed the volume of calls in the fixed networks (102bn minutes).

The year-on-year growth rate in mobile telephony in 2021 was nearly 5%. In 2020, there had been growth of 22% caused by the pandemic, which led to an increase in mobile voice calls.

The breakdown of mobile call traffic has altered only marginally in recent years. Around 41% of call minutes in 2021 (2020: 40%) were within the same operator network (on net), whilst approximately 34% (2020: 33%) were calls to other national mobile networks (off net).

The number of inbound call minutes terminated within mobile networks in 2021 increased by nearly 7% to around 140bn minutes. Roughly 47% of the call minutes were from the same operator network and 40% from other national mobile networks.

International roaming

Since the introduction of "roam like at home", which essentially allows consumers to use their domestic mobile plan on equal terms in other countries of Europe, the use of mobile data and voice services had been increasing. The Covid-19 pandemic led to a reversal of this trend in 2020, but there was significant recovery in 2021. The volume of data generated abroad rose by 69% from 88.3mn GB in 2020 to 149.3mn GB in 2021. This large increase is presumably due not only to the spread of online communications services but also to heavier use of OTT content services, such as streaming services. The number of outgoing call minutes abroad was up 10% from 2,887mn in 2020 to 3,183mn in 2021. The number of SMS messages sent abroad was up 38% by the end of 2021 to 152mn from 110mn the year before.

Outbound and inbound mobile voice minutes

	2019	2020	2021
	Minutes (bn)	Minutes (bn)	Minutes (bn)
Outgoing traffic from mobile networks	126.88	155.28	162.58
To German fixed networks	30.22	37.60	36.90
To the same mobile operator network	51.98	62.62	66.53
To other mobile operator networks	40.50	50.67	54.75
To foreign networks (fixed/mobile)	2.67	2.76	2.38
Other traffic	1.51	1.63	2.02
Incoming traffic to mobile networks	104.36	130.92	139.80
From German fixed networks	9.78	13.99	14.31
From the same mobile operator network	50.26	61.62	66.27
From other mobile operator networks	41.47	52.42	56.30
From foreign networks (fixed/mobile)	2.59	2.58	2.49
Other traffic	0.26	0.31	0.43

Infrastructure

The expansion of the mobile communication networks relies heavily on the installation of additional radio base stations. These interfaces between the wireless and wire-based network fell by 17% in 2021 to 187,443, owing to the switch-off of the 3G network. The number of LTE base stations in operation increased 9% to 82,479. The number of 5G base stations grew sharply, by 54% from 19,510 at the end of 2020 to 29,959 at the end of 2021. In addition, the first small cells were

reported. 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).

The majority of the base stations mentioned here use Dynamic Spectrum Sharing, which allows the existing 4G use to be switched to 5G as required. The full

International roaming

	2019	2020	2021
Volume of data generated abroad (mn GB)	98.7	88.3	149.3
Outgoing call minutes abroad (mn)	3,812	2,887	3,183
SMS sent abroad (mn)	223	110	152

potential of 5G, including particularly high data speeds or low latency, is not always reached.

year. A small number of sites are still connected via copper-based transmission paths.

In practice, a physical antenna site usually contains radio base stations of different mobile communication standards. The number of antenna sites (85,861 at the end of 2021) is therefore lower than the number of radio base stations (187,443 at the end of 2021). 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 fixed links or fibre. At the end of 2021, about 51% of the sites were connected via fixed links and about 46% via fibre. The number of fibre-connected sites was up 12% year-on-

Radio base stations

	2019		2020		2021	
		%		%		%
Total	190,595	100	224,554	100	187,443	100
5G	139	0	19,510	9	29,959	16
LTE/4G	62,567	33	75,901	34	82,479	44
UMTS/3G	57,457	30	56,934	25	652	0
GSM/2G	70,432	37	72,209	32	74,353	40

Key figures and competitors' shares

The following table summarises selected key figures and competitors' shares in the telecommunications market for the period from 2019 to 2021.

Key figures and competitors' shares in the telecommunications market

Key figures	2019	2020	2021
External revenue (€bn)	57.5	57.2	58.1 ¹⁾
Investments (€bn)	9.8	10.8	11.0 ¹⁾
Employees	143,800	139,800	134,900 ¹⁾
Total active fixed broadband connections (mn)	35.2	36.2	36.9
- DSL	25.3	25.4	25.4
- HFC	8.3	8.7	8.8
- FttH/FttB	1.5	2.0	2.6 ¹⁾
- Other	< 0.1	< 0.1	< 0.1
Broadband penetration rate (active connections/household) (%) ²⁾	86	88	90
Total telephone connections in fixed networks (mn)	38.3	38.4	38.6 ¹⁾
- VoIP via DSL and analogue/ISDN connections migrated to IP	27.8	27.9	27.6 ¹⁾
- VoIP via HFC	7.8	8.2	8.4 ¹⁾
- VoIP via FttH/FttB	1.5	1.9	2.5 ¹⁾
- Conventional analogue/ISDN	1.2	0.4	0.1 ¹⁾
Active SIM cards (mn)	107.2	107.4	106.4
Mobile penetration rate (active SIM cards/inhabitant) (%) ³⁾	128.8	129.2	127.9
Competitors' shares (%)	2019	2020	2021
External revenue	57	57	57 ¹⁾
Investments in fixed assets	55	57	59 ¹⁾
Fixed broadband connections	61	61	61
DSL	47	46	45
Telephone connections in fixed networks	54	54	55 ¹⁾

¹⁾ Forecast figures

²⁾ Number of households according to Eurostat

³⁾ Number of inhabitants according to Federal Statistical Office

Consumer protection and advice

The number of written complaints about cold calling received by the Bundesnetzagentur hit a new high of over 79,000 in 2021, surpassing the previous year's figure by 26%.

In addition, the authority received over 155,000 written complaints and enquiries about number misuse during the year – also significantly more than in the year before.

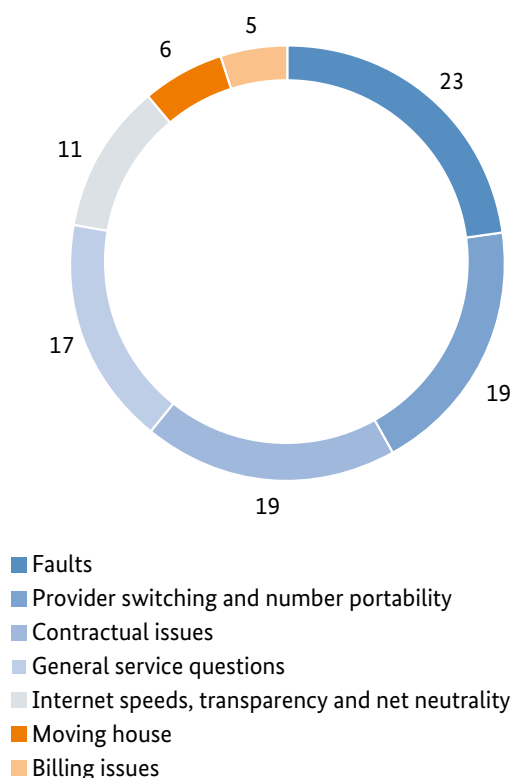
Overview of enquiries and complaints

Customers of telecommunications service providers tend to approach the Bundesnetzagentur for help when they have not managed to satisfactorily resolve their issue with their provider directly. Provided the customers are not applying for dispute resolution, their messages – the great majority of which are received via the online contact form on the Bundesnetzagentur's consumer portal – are handled as enquiries or complaints. The Bundesnetzagentur breaks down the messages received by the number of subject areas of concern. A total of about 18,500 such areas were recorded in 2021.

As before, these were primarily focused on the connections and services needed at a fixed location and associated contractual issues. The latter may relate to any contractual stage: can a sufficient range of telecommunications services be provided at a specific site in an appropriate time, for example for a newly constructed building? How quickly does a provider have to resolve faults? What rights do customers have when they move house or switch provider? Do the agreed contractual durations and cancellation periods conform with the law? Are the bills correct?

The areas of concern for 2021 were distributed as follows: about 23% dealt with faults, or their removal, in telecommunications services, around 19% were related to provider switching and number portability, around 6% were about moving house and around 11% about internet speeds. Approximately 17% were general service questions, eg about the scope of basic coverage or house connections. About 5% were billing issues, while about 19% were other contractual issues such as questions about contract durations or cancellation periods.

Breakdown of customer protection concerns in 2021 (%)



Under its regulatory powers, the Bundesnetzagentur can use the specific messages received to consider whether, and to what extent, providers might be breaching their obligations under telecommunications legislation. If the specific concerns raised are well-founded, the Bundesnetzagentur asks the providers concerned in the interest of the individual end-users to look at them again and, where possible, to resolve them. The Bundesnetzagentur does not decide on the merits of the case if these are in dispute – for example, whether a fault exists at all or if a cancellation is valid, as it is up to the civil courts to do that. The same goes for assessing and enforcing special termination rights, reduction rights, or monetary claims such as compensation, etc. It is possible to apply for dispute resolution at the Bundesnetzagentur with the aim of reaching an amicable agreement and avoiding a court dispute.

Service

About three quarter of concerns raised in 2021 related to provision with telecommunications services. Provision deadlines and the installation costs for establishing a connection played a role in the general service issues. End-users also wanted to know about the network roll-out planned for their region.

One of the main activities of the Bundesnetzagentur is to support end-users in the general interest so that providers resolve unplanned supply interruptions as quickly as possible. Particularly important topics in this context are provider switching, number porting, moving house, fault clearance and internet speeds.

The Bundesnetzagentur continues to place great emphasis on ensuring that the provider switching process runs smoothly, including the right for customers to take their number with them (portability), also in the interest of effective competition. A determination on provider switching from 2012 requires providers to clear up complaints made to the Bundesnetzagentur about interruptions to service lasting more than a day promptly under the "escalation procedure". The primary goal of this special complaints procedure is to ensure that end-users are provided with telecommunications services again as quickly as possible. Cooperation between the agency and companies on this issue has been good. The number of escalation procedures reached a high of 5,300 in 2015, falling to 756 by 2021. The Bundesnetzagentur has not had to issue orders or impose penalties or fines in this regard since 2015. In the past, many of the issues around moving home were about connections at the new place of residence that were "blocked" by the previous tenant or user. The providers made improvements to their coordination in this area in 2021. The Bundesnetzagentur will continue to monitor whether providers actually supply consumers with the service set out in the contract from the specific, agreed date in the new place of residence.

The area of fault clearance was previously largely left to providers' freedom of contract. As far-reaching new legislation entered into force on 1 December 2021, the Bundesnetzagentur is likely to focus on helping consumers to get faults resolved as quickly as possible. The previous determination on the special complaints procedures for provider switching may be replaced by a new determination based on the processes agreed with the provider working party on interfaces and processes. The existing scope of the escalation procedure is to be expanded to include moving home and fault clearance. The Bundesnetzagentur launched a consultation on this matter at the end of November 2021.

Dispute resolution

End-users wishing to settle a dispute with their telecommunications provider or a network operator out of court can turn to the Bundesnetzagentur's telecommunications dispute resolution panel. The dispute resolution procedure is free of charge. The objective is to reach a speedy and satisfactory resolution for both sides and thus avoid lengthy and costly court proceedings.

Telecoms companies showed themselves increasingly willing to participate in procedures before the dispute resolution panel in 2021. They took the opportunity to show their interest in resolving conflicts and thus improve customer service. Participation in procedures is voluntary for both parties.

Up until 30 November 2021, the telecommunications dispute resolution panel mediated disputes relating to certain consumer-protection provisions of the Telecommunications Act (TKG) in force at that time (section 47a TKG).

Contractual disputes once again accounted for the lion's share of the cases in 2021. Most customer grievances related to the failure of companies to provide the contractually agreed services. Billing, contract terminations and disagreements on the contract duration were further common sources of dispute.

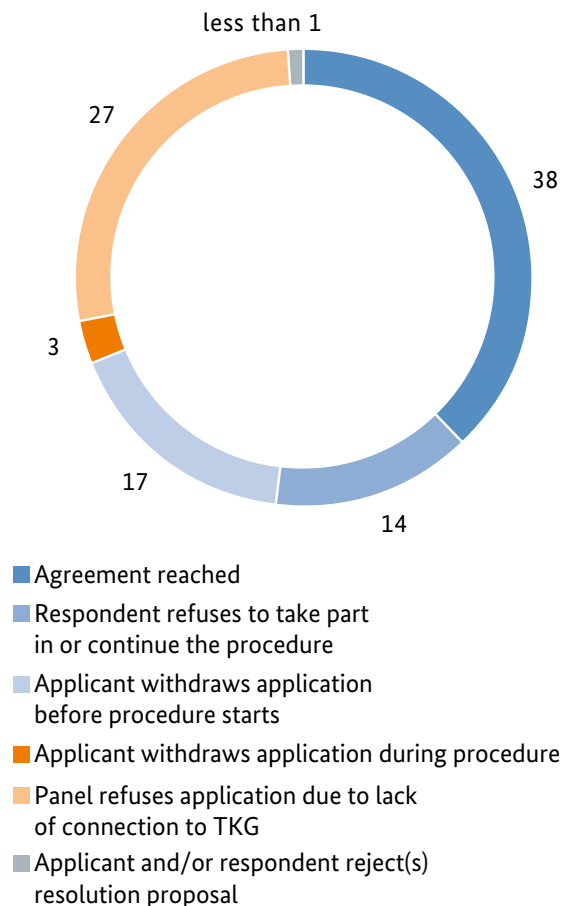
In 2021 the telecommunications dispute resolution panel received 1,622 applications for dispute resolution. In addition, the panel received 830 enquiries and requests for assistance, mostly relating to whether the facts presented in particular cases could be resolved through dispute resolution.

The dispute resolution panel handled and closed 1,632 cases in 2021. In 38% of closed cases, the parties reached an agreement, usually before a resolution proposal was made. Frequently, companies will offer their customers a resolution once the procedure is underway.

In 14% of cases, the telecommunications companies implicated in the dispute resolution procedure refused to take part or to continue the procedures and offered no solution to the issue in hand. In 17% of cases, the applicants withdrew their applications, for example because the matter had suddenly been resolved.

In 27% of the cases closed in 2021, the dispute resolution panel dismissed the application for dispute resolution on the basis that the prerequisites for initiating a procedure were not met – in particular the absence of a violation of customer protection rights under the TKG.

Dispute resolution results 2021 (%)



With the entry into force of the new TKG on 1 December 2021, the name of the dispute resolution panel was changed to remove the reference to "consumers" and make clear that dispute resolution is in principle open to all end-users. However, restrictions may arise from some provisions of telecommunications legislation.

The change to the law also expanded the dispute resolution panel's area of responsibility to cover new subject areas. Moreover, since 1 December 2021 it has been possible to open a dispute resolution procedure over a dispute relating to the provisions set out in section 68 TKG. It is no longer essential for there to have been a specific breach of rights. The dispute resolution panel revised its dispute resolution rules on the basis of the amended law and they also came into effect on 1 December 2021.

In accordance with the Act on Alternative Dispute Resolution in Consumer Matters (VSBG), additional information is published in the dispute resolution panel's annual activity report, which can be found on the Bundesnetzagentur's website.

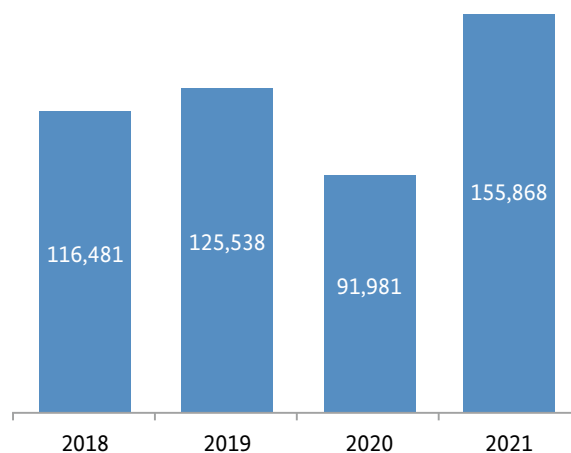
Combating number misuse

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 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 authority received over 155,868 written complaints and enquiries about number misuse during the year – significantly more than in the year before. In addition to the written complaints, the Bundesnetzagentur received 20,264 telephone enquiries and complaints about number misuse and unsolicited marketing calls.

The Bundesnetzagentur works to protect consumers from unsolicited advertising and nuisance calls, fee-based call queuing, the unauthorised billing of third-party services and subscriptions, and many other breaches. It opened administrative proceedings to investigate the breaches in 1,609 cases, resulting in orders to disconnect 861 phone numbers. Bans on billing and collection were issued with regard to 10,052 numbers, 4,791 of which were also issued with payment bans.

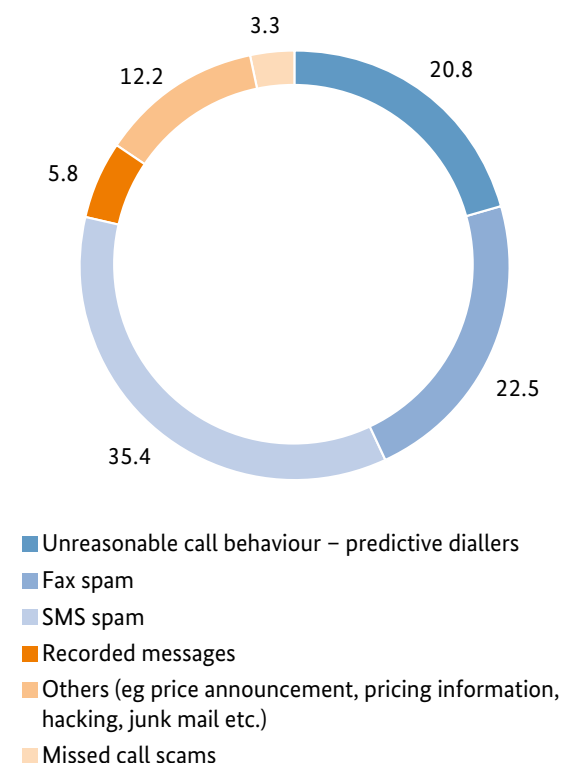
Written complaints and enquiries



All actions are published (in German) online in a continually updated list at:

www.bundesnetzagentur.de/Massnahmenliste

Share of complaints by subject (%)



Missed call from foreign number scams

The number of complaints about missed call scams, which try to entice people to call back numbers that will incur charges, fell again to 5,200 in 2021 from 6,987 in 2020. The Bundesnetzagentur's order requiring the activation of a price indication service in mobile communication networks to provide no-cost information on the charges associated with specific country codes had to be applied again in 2020. This safeguard prevents people from incurring costs as they have the chance to end the call before they are charged. In cases where this protective measure was not directly effective, bans on billing and collection were issued again. These ensure that consumers can neither be billed for the costs of calls to such numbers nor pursued for recovery of the debt.

Telephone system and router hacking/malware

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 affected end-users. It is now rather the exception than the rule that end-users themselves report the cases to the Bundesnetzagentur. Rather, the authority's consistent intervention has led to a situation in which the majority of measures are taken in response to requests from telecommunication service providers whose end-users are affected. The providers prevent their end-users from incurring losses and act quickly to stop payments being made. The Bundesnetzagentur's payment bans enable providers to permanently prevent payouts.

Since mid-2021, the Bundesnetzagentur has also been receiving complaints about international calls, mainly to Morocco, on mobile bills. The findings to date suggest that these connections were made without the knowledge of the affected parties. The Bundesnetzagentur has issued bans on billing and collection for such cases, too.

Third-party providers

The Bundesnetzagentur has determined that third-party services may only be invoiced via mobile 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). A comparatively low number of complaints, 388, were received on this issue. The Bundesnetzagentur examines such complaints and contacts the respective mobile providers on these issues.

Nuisance calls

Complaints about nuisance calls remained high during the reporting period. The Bundesnetzagentur received a total of 32,402 complaints concerning unreasonable calling behaviour by call centres. This is where repeated call attempts are made at inopportune times or multiple times a day without leading to an actual telephone conversation. They are usually generated by the software used in call centres to manage calls. There are no specific legal provisions governing the use and configuration of such software or the calling behaviour of call centres itself. Depending on the software configuration, call recipients can be subjected to considerable harassment in violation of section 7(1) UWG. The Bundesnetzagentur decides on the unreasonableness of the nuisance calls on a case-by-case basis, taking into account the viewpoint of the average market participant in its assessments. In such cases, the Bundesnetzagentur can take measures pursuant to section 123(1) 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. These complaints are considered alongside complaints received about cold calling, which are actioned separately.

In 2021, 55 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.

SMS and messaging spam

The Bundesnetzagentur received 55,138 complaints from consumers about SMS and messaging spam in 2021. As well as advertisements for expensive, premium-rate numbers, hyperlinks are still being sent asking consumers to visit websites that request personal details, as well as containing advertising. There has also been an increase in SMS spam with purely advertising content in recent years, in particular ads for travel services.

The Bundesnetzagentur saw a particularly high number of complaints about messages using various ploys – such as claiming a package is awaiting delivery or a voice mail message has been received – to get consumers to click on a link that leads to malware being downloaded. In many cases, this malware caused the affected device to send, at great expense, large numbers of SMS messages with malware links to other numbers. As part of its engagement with the public, the Bundesnetzagentur acted quickly, putting notices on its website and using Twitter to warn consumers not to open such links. It also talked to mobile network operators and service providers so that either affected consumers were exempted from the costs incurred or the share they had to pay was considerably reduced. In many instances, the Bundesnetzagentur intervened at the network operator responsible on behalf of the affected end-users and pushed for consumer-friendly solutions.

The sending of unsolicited promotional SMS messages breaches provisions of the UWG. In some cases, it may also violate provisions of the TKG, such as the price indication requirement of section 109. The Bundesnetzagentur regularly orders the sending numbers and, where necessary, the contact numbers advertised to be disconnected. This measure ensures that the unlawfully advertised service can no longer be reached and no more SMS messages can be sent using the sender number. In 2021, the Bundesnetzagentur disconnected numerous mobile and geographic numbers as well as freephone numbers.

Fax spam

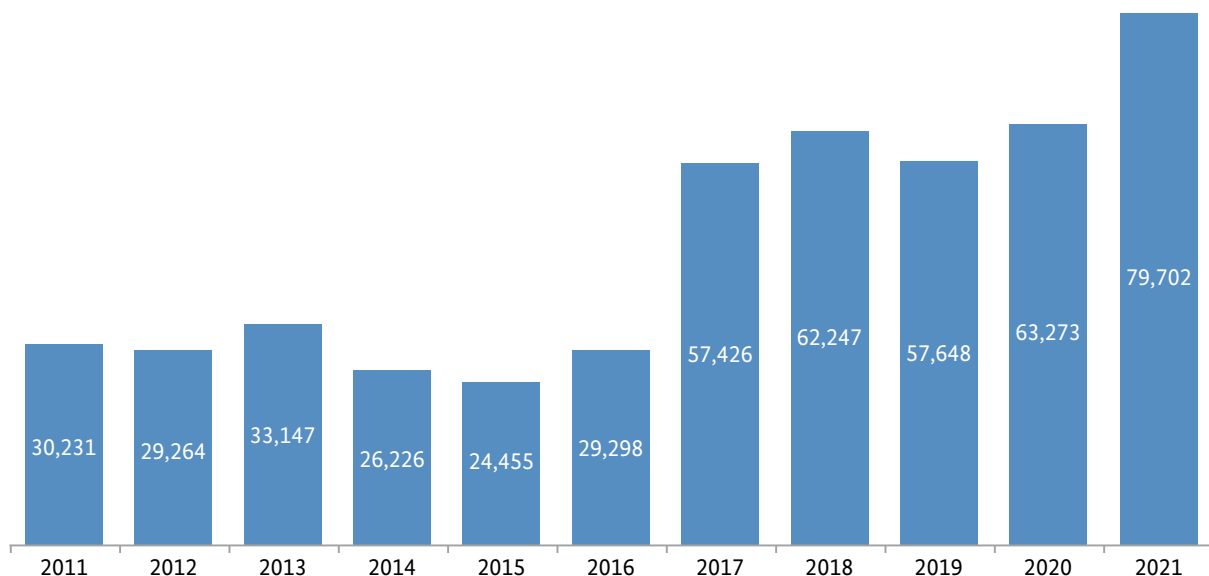
The Bundesnetzagentur received 35,072 complaints about fax spam in 2021 (2020: 26,268). Over 19,000 of them were related to unsolicited fax advertising for Covid tests and masks as the pandemic continued. Despite orders of the Bundesnetzagentur to disconnect numbers, some of the advertising companies continued to send unsolicited fax advertisements. The Bundesnetzagentur therefore also had numbers disconnected that had not yet been used unlawfully, to prevent the unlawful behaviour from being continued on those numbers. In parallel, it imposed prohibition orders with penalties. In this context, (00)800 numbers for international freephone services were also disconnected for the first time.

Pop-up error messages

The Bundesnetzagentur disconnected numerous numbers featured in misleading pop-up error messages. This scam uses pop-up fake messages, some purporting to be from Microsoft, that claim to warn of computer viruses or software problems. A telephone number in the pop-up promises assistance free of charge when in fact, there is no technical problem. The aim of the scam is to use remote diagnostics to pressure users into expensive, unnecessary repair contracts or gather personal details. A new aspect is that if someone calls the number shown in the pop-up, initially no one answers but immediately afterwards they are called back. The callback usually shows a foreign or fake number or a withheld number. It is striking that the numbers shown on the PC are often registered using fake details. In some cases, the data of consumers that previously had contact with the supposed technical

support staff are misused for this purpose. The Bundesnetzagentur regularly issues warnings to people not to call numbers on pop-ups. Official error messages from the Microsoft Corporation never contain telephone numbers.

Written complaints about unsolicited marketing calls



Combating unsolicited marketing calls

Cold calls, that is marketing calls made without the express, prior consent of the consumer, are prohibited by law but nevertheless widespread in practice. Those targeted run the risk of being caught out by pushy sales tactics or unfair tricks on the phone, like being manipulated into entering a contract.

This danger is reflected in the number of written complaints received by the Bundesnetzagentur. In 2021, it leaped from an already high level to a new high of 79,702, up 26% year-on-year.

The Bundesnetzagentur combats unfair business practices by consistently taking action against regulatory offences and imposing severe fines. The size of individual fines depends on the findings made in each case, with any special features indicating a degree of wrongdoing going beyond the mere nuisance calls being included in the assessment. In its investigations, the Bundesnetzagentur focuses deliberately on particular areas.

Of the many administrative fines proceedings launched by the authority in the reporting year, 14 major ones, some of them targeting well-known companies and sanctioning a very large number of cold calls, were concluded with orders imposing fines. The amount of fines imposed totalled €1.435mn, the highest ever sum. However, as some of the orders were appealed, those proceedings are not yet final.

The largest share of complaints – more than a quarter – related to the energy supply sector. Financial and insurance products were also a notable group. There was a slight increase in percentage terms from 2020 in complaints about prize draws and a near doubling in percentage terms year-on-year of complaints about services. It is striking that, particularly in the areas of energy supply and prize draws, many of the complainants said they had been unknowingly signed up to contracts supposedly entered into on the telephone.

Aside from its enforcement activities, the Bundesnetzagentur played a key role in discussions about the improvement of the legislative framework for unsolicited marketing calls, in particular the amendment of the UWG by the Fair Consumer Contracts Act. Since 1 October 2021, companies have been obliged to document consumers' consent to advertising appropriately and to keep it for at least five years after it was given and after each use. Advertising companies must provide the Bundesnetzagentur with proof of consent upon request and without delay. Breaches of the

requirement to document, retain and submit the documentation may incur fines of up to €50,000 from the Bundesnetzagentur.

The Bundesnetzagentur intends to draw up and publish a guide to the interpretation of section 7a UWG, as specifically mentioned in the explanatory notes to the Fair Consumer Contracts Act. The guide should help market participants to inform themselves about section 7a UWG and how the authorities will act in future on the basis of the new legislation. The Bundesnetzagentur put a draft of the guide to interpretation out for public consultation on 19 October 2021 to enable it to take account of the experiences and needs of those practically involved as far as possible. It had received 15 responses by 30 November 2021, which it has published on its website. In the next step, the Bundesnetzagentur will formulate and publish a final version of the guide to interpretation on the basis of the consultation results.

As well as imposing fines, the Bundesnetzagentur also took preventive action against the spread of cold calling in 2021 by raising awareness among consumers of the risks in its public relations activities. To this end, it sent out press releases about various cases, including the names of the fined parties where this was considered necessary to warn consumers.

However, the agency's efforts have been curbed by a court ruling of the Higher Administrative Court for North-Rhine Westphalia (OVG NRW) regarding the permissibility of official notices on administrative fines proceedings (ruling of 17 May 2021, ref no 13 B 331/21). In summary proceedings brought by the one of the addressees of the administrative order imposing a fine following its issue, the Cologne Administrative Court (VG Köln) had initially ruled the press release naming the addressee to be lawful (ref no 1 L 166/21). The OVG, however, subsequently imposed a provisional ban on the Bundesnetzagentur from disseminating it, pointing to the protection of occupational freedom under Article 12 of the Basic Law (GG). The OVG ruled that the reporting on the administrative fine proceedings was not covered by the power to publish set out in section 45n TKG, which the authority was basing its information on. The proceedings on the main issue following this interim injunction are still pending. If the initial ruling by the OVG in the summary proceedings were to be confirmed, there would be hugely negative consequences going far beyond this individual case. It would be much more difficult to issue targeted warnings to consumers that enable them to recognise current risks posed by unsolicited telephone marketing and to combat them effectively and confidently. The public awareness work that the Bundesnetzagentur has carried out up to now to

protect consumers from cold calls would fundamentally suffer. There might be a need for legislative clarification so that consumers could in future be warned about cold calling and helped to deal with unlawful calling behaviour confidently and efficiently.

Broadband speed checker

In mid-April 2021 the Bundesnetzagentur published detailed findings from the broadband speed checker – Breitbandmessung – for the fifth time (<https://breitbandmessung.de/ergebnisse>). The tests covered in the annual report were carried out in the period from 1 October 2019 to 30 September 2020 (fifth operational year of the broadband speed checker). The report covers a total of 949,414 valid tests on fixed broadband connections and 448,058 valid tests on mobile broadband connections (2018/2019: 829,426 fixed and 527,558 mobile broadband tests).

The proportion of users across all bandwidth categories and providers whose fixed broadband connection had a download speed at least half their contractually agreed maximum speed was 73.6% (2018-2019: 70.8%); the proportion of users whose connection had a speed equivalent to or higher than their contractually agreed maximum speed was 24.0% (2018/2019: 16.4%). As in the previous period, in 2019/2020 end-users frequently did not receive their contractually agreed maximum speeds. There was, however, a noticeable improvement compared to the previous 12-month period.

The ratio of actual to agreed estimated maximum data transfer rates for mobile broadband connections was once again well below that for fixed broadband connections. The proportion of users across all bandwidth categories and providers whose connection had a download speed at least half their contractually agreed estimated maximum speed was 17.4% (2018/2019: 14.9%); the proportion of users whose connection had a speed equivalent to or higher than their contractually agreed estimated maximum speed was 2.1% (2018/2019: 1.5%). These shares in the mobile sector were both slightly higher than in the previous period.

The test results depend on the tariffs 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.

The desktop app, which already enabled end-users to use the test results as proof that the speeds they were receiving were not in compliance with their contracts, was expanded on 1 February 2021 to enable end-users to make individual tests to check their contractually agreed speeds. Since then, it has been possible to check connections with low speeds right up to those with gigabit speeds. The previous browser-based test was streamlined and can now be used by end-users to test performance when surfing the internet.

Broadband speeds

The new TKG gives consumers the right, in the event of substantial, continuous or regularly repeated deviations in speed between the actual performance of the internet access services and the service cited by the provider, to reduce the contractually agreed fee or to terminate the contract extraordinarily without compliance with a period of notice.

In a general administrative order, the Bundesnetzagentur has defined exactly when such a deviation in the fixed network is present. The general administrative order on the new reduction rules for fixed-network internet access was published on 8 December 2021. Its aim is to create a reliable framework for consumers to exercise their new rights. The provisions went into effect on 13 December 2021. The Bundesnetzagentur has also provided a guide with specific requirements for the proof of performance procedure.

At the same time that the general administrative order went into effect, the Bundesnetzagentur released a revised version of its measuring tool (the desktop broadband speed checker app) as a monitoring mechanism. Consumers can use the new app to demonstrate to their provider their entitlement to a reduction of their monthly payment or their right to extraordinary termination of contract under the new legal provisions.

For a deviation to be accepted as warranting reduction, it suffices when the minimum speed is not reached at least once on two of the three measurement days. Reduced performance of the maximum speed is present when 90% of the maximum speed is not reached at least once on two out of the three measuring days. Deviation is present when the speed normally available is not attained in at least 90% of the total of 30 measurements.

In September 2021 the Bundesnetzagentur presented drafts of the general administrative order and the guide for consultation. Various responses to both drafts were received, including joint statements from the telecommunications associations, a response from the Federation of German Consumer Organisations (Verbraucherzentrale Bundesverband e. V. – vzbv) and responses from individual companies.

The general administrative order and the guide are available in German on the Bundesnetzagentur website at www.bundesnetzagentur.de/breitbandgeschwindigkeit-en. The responses to the consultation have been published there too.

International roaming

The Bundesnetzagentur is responsible for compliance with the Roaming Regulation in Germany and thus also compliance with the "roam like at home" (RLAH) principle. In the interests of consumers, the Bundesnetzagentur continually monitors the market and tariff situation to identify breaches and enforce the rules. In particular at the start of and during the pandemic, the Bundesnetzagentur received greater numbers of complaints about high additional roaming charges for people using value-added services in other EU countries. The Bundesnetzagentur stepped in early, contacting providers based in Germany to find a solution to such cases. It also investigated cases of limits on fair use in business tariffs that were not in compliance with the Regulation and ensured that these were amended appropriately.

In the preliminary ruling proceedings of the Cologne Administrative Court (VG Köln) on the add-on option "Vodafone Pass", the European Court of Justice ruled on 2 September 2021 that a limitation on use when roaming based on the activation of a "zero tariff" option was not compatible with the principle of equal treatment of all data traffic since the underlying zero-rating option was itself in breach of the principle of equal treatment. Further explanation may be found on page 86.

The reference for a preliminary ruling was based on an order by the Bundesnetzagentur from 2018 that had imposed changes with regard to the RLAH principle. The background to the case was the fact that, with the "Vodafone Pass", the data volume used by certain apps was not included in the data of the basic tariff, but only when used in Germany. The Bundesnetzagentur considered this a breach of the Roaming Regulation because the underlying tariffs for which the "Vodafone Pass" can be booked are open for EU roaming. Following the ruling in the summary proceedings, Vodafone opened up the use of "Vodafone Pass" abroad by introducing a fair use policy.

Good progress in mobile coverage on main transport routes

The Bundesnetzagentur completed its review of the coverage obligations attached to the spectrum auctioned in 2015. All three mobile network operators have met their obligations.

The coverage obligations for households had been met in the previous year already. A total of 97% of households in each federal state and 98% in the country as a whole had to be supplied with mobile broadband by each of the three mobile network operators. The main transport routes are now fully covered by LTE as well.

2019 coverage obligations

Now the coverage obligations for the spectrum assigned in 2015 have been met, the obligations from 2019 need to be implemented. By the end of 2022, the successful bidders from the 2019 spectrum auction must each provide coverage of at least 100 Mbps for 98% of households in each federal state and for all motorways as well as the most important federal roads and rail routes. All other federal roads must have coverage with at least 100 Mbps by the end of 2024, while state roads, seaports and major waterways as well as all other rail routes must have coverage with at least 50 Mbps.



Intra-EU communications

Caps on costs for voice calls (€0.19/minute net) and SMS messages (€0.06/SMS net) from the home country (Germany) to another EU Member State and accompanying rules for regulated intra-EU communications were introduced by EU Regulation on 15 May 2019. The Bundesnetzagentur continually monitors the products offered on the market by mobile and fixed network providers offering intra-EU communications and takes action if it encounters infringements.

This regular monitoring uncovered breaches of the applicable price caps to certain destinations by various indirect access providers and regional city carriers. Once proceedings had been launched, the companies in question were told to resolve the identified breaches. The providers complied with the Bundesnetzagentur's instructions within the time specified and amended their tariffs to comply with the regulation on the applicable price caps.

Geo-blocking

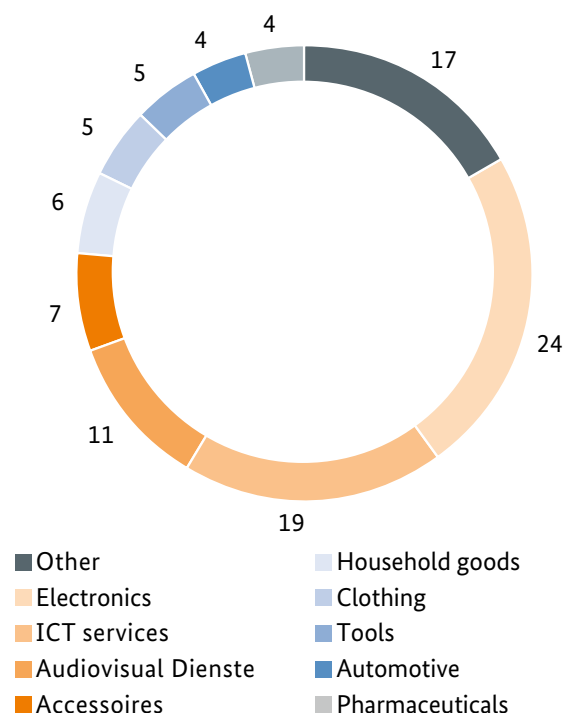
The Geo-blocking Regulation (EU 2018/302), which came into force in 2018, is part of the European Commission's strategy to create a digital single market. In Germany, the responsibility for enforcing the Regulation falls to the Bundesnetzagentur. The Regulation addresses unjustified discrimination against customers in the EU based on their nationality, residence or place of establishment. It removes barriers to cross-border business between providers and customers for the sale of goods and provision of services ("shop like a local" principle).

The Geo-blocking Regulation applies to both online and brick-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, health, financial, telecommunications and transport services. 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, is not covered either. 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 easily online using the consumer portal. 80 cases were reported in 2021. Most related to orders for electronic equipment, media content and clothing. For the first time, there were examples in

which companies refused to allow orders from abroad, in particular of high-value electronics, on the basis of possible fraud.

Enquiries and complaints about geo-blocking (%)



Again, all cases in 2021 were resolved in the consultation stage without the need for further action. It was possible to find a rapid solution in the interest of the consumers. As the competent national authority in the European Consumer Protection Cooperation (CPC) network, the Bundesnetzagentur requested other EU geo-blocking authorities to take measures against providers in other EU countries. The Bundesnetzagentur also continued to work closely with the European Consumer Centre (ECC) Germany to resolve consumer complaints.

Harmonisation of fixed network and mobile prices for (0)180 and (0)137 numbers

Retail prices for (0)180 medium rate services and (0)137 mass calling services used to be much higher when used from mobile networks as opposed to fixed networks. When advertising medium rate services, the maximum mobile rate had to be indicated in addition to the fixed network rate. For mass calling services, there was no maximum mobile rate, so the information that calls from mobile networks were much more expensive had to be provided alongside the fixed network rate.

Following a public consultation in summer 2021, an administrative order of 8 December 2021 determined that the retail prices already laid down by the Bundesnetzagentur for the fixed network sector for medium rate services would also apply to mobile networks as of 1 December 2021. There was no real retroactive effect, since the determination had been announced in summer 2021. It was not possible for legal reasons to issue the order earlier, because the Bundesnetzagentur was only conferred the pricing competence as of 1 December 2021. It was, however, important to issue a determination with effect from 1 December 2021 because on that date a new statutory maximum mobile rate came into force and users of medium rate services would otherwise have had to change their pricing information twice within a short amount of time.

This issue did not apply to mass calling services, so in that case the harmonisation of prices was determined for 1 April 2022 in the interests of staggering the necessary IT measures.

The price determinations led to a significant drop in prices. Calling a (0)180-1 number had previously cost 3.9 cents per minute and from mobile networks usually 42 cents. The change also makes it possible to provide pricing information that is short yet complete.

Revocation of decisions on the ex-post rates regulation of porting fees for retail customers in the mobile sector

In a decision of 25 November 2021 with effect from 1 December 2021 pursuant to section 49 of the Administrative Procedure Act (VwVfG), the Bundesnetzagentur revoked points 1 and 2 of four proceedings on the ex-post regulation of porting fees for retail customers in the mobile sector, specifically in the decisions BK2d-20/002, BK2d-20/007, BK2d-20/008 and BK2d-20/010, all of 17 April 2020. This was necessary owing to the entry into force of the new TKG, which sets out in section 59(7) sentence 4 that the Bundesnetzagentur must ensure that end-users are not charged any direct fees for the porting of their telephone number. The earlier decisions had ordered a fee for porting and given the parties concerned the option of charging less.

Revocation of decisions on the ex-post rates regulation of porting fees for retail customers in the fixed network sector

In a decision of 25 November 2021 with effect from 1 December 2021 pursuant to section 49 VwVfG, the Bundesnetzagentur revoked points 1 and 2 of one set of proceedings on the ex-post regulation of porting fees for retail customers in the fixed network sector, specifically in the decision BK2d-18/002 of 16 July 2018. This was necessary owing to the entry into force of the new TKG, which sets out in section 59(7) sentence 4 that the Bundesnetzagentur must ensure that end-users are not charged any direct fees for the porting of their telephone number. The earlier decision had ordered a fee for porting and given the parties concerned the option of charging less.

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 interpreter will then call the desired person and pass on the message received in spoken language. Conversely, the recipient's message is translated into sign language or written language. The text and video relay service enables people who are deaf or hard of hearing to make phone calls.

There was another large increase in use of the service in 2021. The Bundesnetzagentur therefore redetermined the need for the text and video relay service for 2022.

The Bundesnetzagentur once again took appropriate measures in 2021 to ensure the financing of the service. In particular, it determined the proportionate costs to be paid by providers of publicly available telephone services.

Investigating interference – the radio monitoring and inspection service

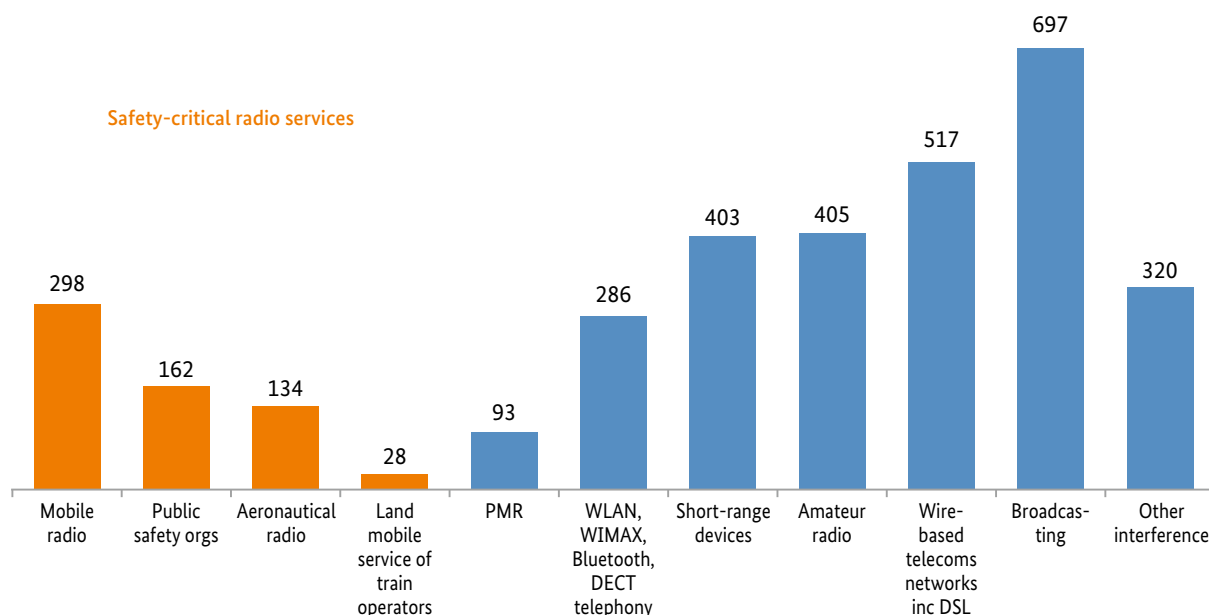
The Bundesnetzagentur makes an important contribution to consumer protection by dealing with radio interference through its radio monitoring and inspection service.

In 2021, despite the ongoing pandemic, the radio monitoring and inspection service resolved over 3,300 cases of radio and electromagnetic interference on site and guided operators through the fault clearance process. One in five of these reports of interference affected safety-critical radio services, including the aeronautical radio service, the radio services of public protection and disaster relief agencies, or maritime and inland waterways services, or had a large-scale impact on mobile communications services.

Given the material risks to which safety-critical radio and telecommunications services potentially expose objects of legal protection (especially life and limb) and the fact that they are part of critical infrastructure, the radio monitoring and inspection service had to ensure the uninterrupted operation of these services even throughout the hard lockdown phases.

Hygiene precautions and social distancing measures were put in place for the protection of the employees in this service, enabling them to continue rectifying faults on site throughout the country, processing fault reports and conducting site inspections seven days a week, round the clock.

Interference volumes by type of service in 2021



By dealing with radio interference, the radio monitoring and inspection service plays an important role in the efficient, interference-free use of spectrum and the maintenance of critical infrastructure.

This service remains available free of charge to institutions, business and consumers, including the parties that caused the interference, provided it was not their fault.

Market surveillance

Market surveillance in Germany is carried out on the basis of the Electromagnetic Compatibility of Equipment Act (EMVG) and the Radio Equipment Act (FUAG). In addition, the Act relating to market surveillance and ensuring compliance of products (Market Surveillance Act – MüG) and the new EU Regulation on market surveillance and compliance of products (Market Surveillance Regulation) came into force on 16 July 2021.

The Office of the German Market Surveillance Forum (GS-DMÜF), based at the Bundesnetzagentur, was notified to the European Commission as the single liaison office to be established in each Member State in accordance with the EU Regulation. It supported the Federal Economics Ministry in preparing and holding the German Market Surveillance Conference (DMÜK) on 22 and 23 September 2021.

Under the new rules, electrical and radio equipment does not only have to bear a CE marking but must also clearly show an economic operator that is located in the EU. This also applies to shipments made directly to the consumer from retailers in third countries.

The Bundesnetzagentur conducts checks of electronic and radio equipment from both online and brick-and-mortar retailers and was able to use suitable measures to protect consumers and ensure fair competition.

It also stepped up its cooperation with the customs and security authorities in order to halt products not in compliance with the regulations at the border to the single market.

Promoting competition and protecting consumers – interoperability of audiovisual media

For some years now, there has been a move towards consuming TV content via the internet as well as with traditional broadcasting technologies. The variety of new media offers has led to changes in the features of TV sets, media players and apps. As a result, the Bundesnetzagentur has focused more closely on this issue with a view to competition, interoperability and consumer protection.

A market consultation held in 2021 on standardisation in this sector and regular dialogue with market participants brought important findings for the standardisation work and work in international bodies.

Misuse of telecommunications systems

In 2021 the Bundesnetzagentur again took action to combat the use of a variety of transmission-capable cameras and microphones concealed in everyday objects. As well as the usual banned telecommunications systems such as fake smoke detectors and GPS trackers, checks focused on multifunctional telecommunications systems like robot vacuums with surveillance functions.

As in the previous year, the Bundesnetzagentur successfully worked with the manufacturers without having to impose a ban on sales to ensure the products were reconfigured to legal telecommunications systems.

Current cases from 2021

Offers deleted from internet platforms: 4,573. Investigations opened against sellers/manufacturers: 1,742.

Since the end of 2021, the misuse of telecommunications systems has been regulated in section 8 of the Telecommunications Telemedia Data Protection Act (TTDSG).

Gaia-X: winning consortia in funding competition

The Bundesnetzagentur announced the winning consortia in the Gaia-X funding competition organised on behalf of the German Federal Economics Ministry.

The Gaia-X project aims to set up a competitive and trustworthy digital data infrastructure. The goal is to create an open and transparent digital ecosystem in which data and services can be made available, collated and shared in an environment of trust.

The projects successfully demonstrate the economic viability and usability of digital Gaia-X technologies and applications. The Federal Ministry for Economic Affairs and Climate Action (BMWK) awarded a total of €117.4mn in the first round of funding. This sum is sufficient to fund 11 of the 16 winning project abstracts.

"All of the project abstracts selected are innovative and of convincing quality," said Jochen Homann, Bundesnetzagentur President. "There are many businesses and research institutions that are willing and have the potential to implement Gaia-X quickly across the country."

The ideas selected cover the fields of health, law, education, finance, mobility, geo-information, energy, aerospace, agriculture, construction and the public sector.



Rulings, activities and proceedings

The Bundesnetzagentur carried out more tasks relating to digitalisation in 2021. It implemented the Gaia-X funding competition, examined the use of artificial intelligence in the network sectors and launched an information portal about blockchain technology. The Bundesnetzagentur also published a discussion paper on interoperability between messaging services and drew up approaches to the regulation of digital platforms.

In the field of spectrum management, the Bundesnetzagentur got further steps underway for the spectrum usage rights due to expire at the end of 2025. The aim is to decide on the provision of available spectrum in good time in order to give the market legal and planning certainty for the further roll-out of mobile networks.

Digital transformation

Net neutrality

ECJ judgments of 2 September 2021

The European Court of Justice (ECJ) ruled that the zero-rating options "StreamOn" and "Vodafone Pass" were not compatible with the principle of equal treatment for all traffic within the meaning of Article 3(3) of Regulation (EU) 2015/2120 (case numbers C-854/19, C-5/20, C-34/20). The ECJ's judgments must be taken into account by national courts in proceedings on the admissibility of individual usage conditions for zero-rating options. Telekom and Vodafone have now withdrawn the actions they filed with the administrative court, while the civil court proceedings at the Higher Regional Court (OLG) in Düsseldorf for the action brought by the Federation of German Consumer Organisations (vzbv) are still ongoing.

Independent of the national proceedings on the individual usage conditions, the operative provisions and the reasoning in the ECJ judgments are binding for the Bundesnetzagentur. The Bundesnetzagentur also needs to take "utmost account" of the Body of European Regulators for Electronic Communications (BEREC) guidelines on net neutrality, which are under revision until June 2022 in light of the ECJ judgments.

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 2020 to April 2021. The report covers the Bundesnetzagentur's key activities relating to an education flat rate, domain name system (DNS) blocking, transparency measures, including handling consumer complaints about low data transmission rates, and the operation of a quality monitoring mechanism.

Mobile flat rates

Several providers' mobile flat rates currently include clauses prohibiting the use of fixed LTE routers even though it is possible to use SIM cards in this type of equipment. The Bundesnetzagentur issued notices to the providers prohibiting them from applying the clauses, which are a violation of the end-users' right to use terminal equipment of their choice. The Bundesnetzagentur concluded from its investigations that the purpose of the clauses is to limit the volume of data used with flat rates. The point of a flat rate, however, is to have unlimited data usage.

DNS blocking and cooperation with the Online Copyright Clearance System

The Online Copyright Clearance System (CUII) was established in January 2021 as a joint initiative between rights holders from the cultural and creative industry and four major internet access providers. The aim is to enable DNS blocks to be implemented in an out-of-court procedure by all internet access providers involved for websites that structurally infringe copyright.

Rights holders can make a blocking request to the clearance system; an examination body comprising former Federal Court of Justice (BGH) judges examines the request to determine whether the requirements enabling a block to be put in place are met. Rights holders are able by virtue of section 7(4) of the German Telemedia Act (TMG) to request internet access providers to block sites if there is no other way of resolving the infringement and if the block is reasonable and proportionate. The CUII forwards the results of its examination in the form of a non-binding recommendation to the Bundesnetzagentur. The Bundesnetzagentur examines whether the prerequisites of Article 3(3) point (a) of Regulation (EU) 2015/2120 are met, that is whether the DNS block is necessary to implement national or European legislation and is therefore justified. The internet access providers can only set up a DNS block if there are no net neutrality concerns.

Six DNS blocks were put in place for websites that were structurally infringing copyright by offering films and series for streaming and music and computer games for downloading.

Geo-blocking

The increasing spread of digital technology also plays an important role within the context of purchasing goods and services online. The rights of consumers and companies acting as consumers making cross-border purchases within the EU were strengthened in 2018 by the rules of the Geo-blocking Regulation. More

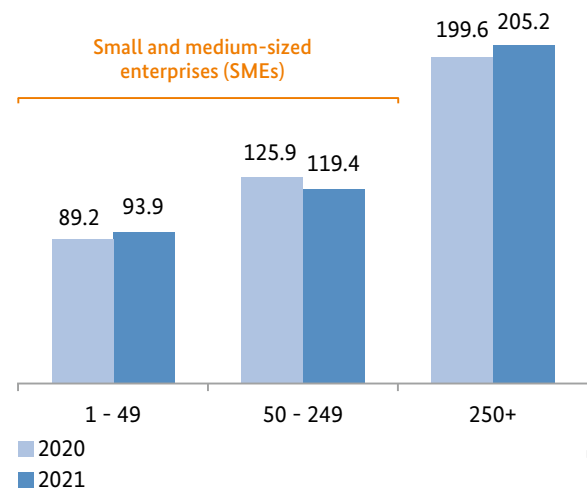
detailed information about this can be found on page 81 under Consumer protection and advice.

Digital transformation among SMEs

The status of digitalisation in Germany's industry is a regular focus of studies and surveys, which frequently find that smaller companies in particular have not yet adequately recognised and realised the potential associated with using digital technologies. The digitalisation index published by the Federal Ministry for Economic Affairs and Climate Action (BMWK) for 2020 and 2021 shows just how far behind small and medium-sized businesses are. The index for companies with more than 250 employees is twice that for small companies (with up to 49 employees).

Digitalisation index by company size

Index in points. Weighted average 2020 = 100



With 99.2% of companies classed as small and medium-sized enterprises (SMEs), the digital transformation in industry cannot be a success without the systematic spread of digital technology among SMEs⁶.

The situation prompted the Bundesnetzagentur to place a new focus on digitalisation among Germany's SMEs – the "Mittelstand". The first step the Bundesnetzagentur took was to enter into dialogue with a large number of players actively supporting the digital transformation process among SMEs. As well as general fact-finding about the range of support measures offered and the challenges for SMEs in connection with the transformation process, the focus of the dialogue was on identifying any other possible accompanying measures to support SMEs in the process.

⁶ Definition in accordance with Commission Recommendation 2003/361/EC (<http://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:32003H0361&from=EN>)

The Bundesnetzagentur placed the focus of its 2021 research programme on taking stock of the situation with the aim of identifying the SMEs' current challenges and needs. As well as taking a 360-degree look at the current state of digitalisation and existing obstacles, the Bundesnetzagentur examined the importance of different technologies and applications such as blockchain, B2B platforms, the Internet of Things (IoT) and artificial intelligence (AI) from the SMEs' perspective and investigated the existence of incentive schemes for sustainable digital change among SMEs. All the findings have been published on the Bundesnetzagentur's website.

The Bundesnetzagentur has also launched a project to create a comprehensive data basis that will help to improve the understanding of developments in the digitalisation process among SMEs and make measures and decisions more evidence-based. The Bundesnetzagentur will contribute to the dialogue on digitalisation among SMEs by collecting and evaluating primary data on a regular basis and publishing its findings.

The Bundesnetzagentur will also provide a comprehensive range of information for SMEs on its website, including details of different digitalisation projects among SMEs as an incentive for other companies.

Gaia-X funding competition – digital transformation among SMEs

At the beginning of 2021 the Federal Ministry for Economic Affairs and Climate Action (BMWK) appointed the Bundesnetzagentur to organise the funding competition for innovative and practical applications and data spaces in the Gaia-X ecosystem, details of which were published in the Federal Gazette on 15 March 2021. The competition was only open to joint projects with at least three partners, including at least one small/medium-sized enterprise (SME) or start-up. The aim of the competition is to provide a total of around €176mn in funding over a period of three years specifically at the user level.

The funding competition runs alongside the French-German initiative creating the Gaia-X European data infrastructure project, with players from business, science and the public sector working together towards the common goal of developing a digital ecosystem based on European values (including European data protection, digital sovereignty and trust) with support from politics and in cooperation with other European partners.

In 2021, 131 consortia with a total of 1,004 partners responded to the funding competition announcement.

The project abstracts covered ten fields (Industry 4.0/SMEs, health, finance, public sector, geo-information, smart living, energy, mobility, agriculture and education), with 30 abstracts relating to more than one field. The 16 most promising proposals were selected and divided into two groups, with the partners in the first group being asked to submit their applications.

The Bundesnetzagentur awarded funding to an initial group of 11 joint projects comprising 114 individual applications, all of which were able to be launched by 1 January 2022.

The application process for the remaining five joint projects in the second group is due to start in the second quarter of 2022. It is expected that the applications will be examined and funding awarded by the end of 2022. The second group of projects covers the construction industry, public safety/security, forestry, law and energy supply.

Artificial intelligence

Since 2021, against the backdrop of the German government's Artificial Intelligence (AI) Strategy, the Bundesnetzagentur has been looking more closely at AI and its use in the network sectors. The aim is to identify the challenges of successfully using AI and how they can be overcome.

One step in the Bundesnetzagentur's dialogue with the market was a consultation on the use of AI in the network sectors in March 2021. The consultation confirmed that AI has huge potential for adding value in the regulated network sectors and showed that AI is already being used in many areas, including for network planning, network expansion/roll-out, predictive maintenance and repair, and improving generation and consumption forecasting. It also revealed, however, that small and medium-sized enterprises (SMEs) in the network sectors still currently use AI to a considerably lesser degree than larger companies. The most significant challenge in using AI was seen to be the skills gap and the complexity of AI. No or inadequate legal framework conditions, security and reliability were identified as further obstacles to using AI. The huge importance of data as an input factor for AI applications also became clear.

The results of the consultation were presented at a virtual workshop involving representatives from industry, associations and institutions. The second focus of the workshop was the European Commission's proposal for a future European legal framework for AI. Companies from the network sectors also presented use cases and the associated challenges. Finally, there

were discussions on the use of AI in the context of sustainability, standardisation and SMEs. The results of the market consultation and the workshop recordings (in German) are available to view on the Bundesnetzagentur's website at www.bundesnetzagentur.de/KI.

Blockchains

The Bundesnetzagentur launched an information portal about blockchain technology (in German – (www.bundesnetzagentur.de/blockchain) on its website in September 2021. In addition to explanations about how blockchain technology works, the portal also provides an overview of blockchain applications in the regulated network sectors, the potential for implementing blockchains in public administration and the challenges and opportunities blockchain technology presents for small and medium-sized businesses. The portal also provides information on supplementary publications and innovative projects such as the European Blockchain Partnership as well as points to consider to help identify when the use of blockchain technology in a specific, planned application can offer added value. The information portal is updated on a regular basis to accommodate new issues and developments in the field of blockchain technology. The Bundesnetzagentur has been operating a blockchain node for the European Blockchain Partnership at its computer centre in Mainz since 2020. This blockchain infrastructure was expanded in 2021 and could be made available for use by other authorities in future if needed. The Bundesnetzagentur held talks with various authorities about such possible use in 2021.

Consumer survey on the use of online communications services

In mid-2021 the Bundesnetzagentur conducted a comprehensive, representative survey on the ways in which and the degree to which online communications services are used in Germany.⁷ The survey followed on from the one carried out in 2019 and was performed in cooperation with INFO GmbH, a Berlin-based market and opinion research institute.⁸ A mixed mode approach with a combination of online and telephone data collection was chosen for the survey; the consumers surveyed were German residents aged 16 and over. A total of 2,141 consumers across Germany took part in the survey.

The aim of the survey was to obtain comprehensive empirical information about actual use of online communications services in Germany. Information was gathered about the distribution and use of online communications services in Germany, in particular the frequency of use, the functions and mobile devices used, and the reasons for using or not using online communications services. Video calling and email services were included in the survey for the first time. A closer examination of the competitive relationship between online communications services and traditional telecommunications services was also conducted. One focus of the survey was on changes in communication patterns, especially with regard to how much online communications services are used, the trend in communications volume and the effects of the Covid-19 pandemic. A full report presenting the findings was published in the first quarter of 2022. www.bundesnetzagentur.de/online-kommunikation

Classification of NI-ICS in the new regulatory framework for telecommunications

The extensive revision of the German Telecommunications Act (TKG) to transpose the European Electronic Communications Code (EECC) involved adapting the regulatory framework to developments in the market and in competition. One key change to the telecommunications regulatory framework as a result of the EECC and the new TKG transposing the EECC with effect from 1 December 2021 is that the scope now also specifically covers online communications services. These services are provided exclusively via the open internet and include email and messaging services.

Online communications services are now covered by some of the regulations (most importantly those relating to customer protection and public safety/security) as "number-independent interpersonal telecommunications services" (NI-ICS) alongside traditional telecommunications services. The new definition of telecommunications services based on the EECC takes account of the further development of the services for communications purposes.

Interoperability between messaging services

Users of different number-independent interpersonal telecommunications services, in particular messaging services such as WhatsApp and Signal, are currently unable to communicate with each other because it is mostly not possible on a technical level. This lack of interoperability frequently prompts the suggestion in discussions about the role of dominant internet platforms and communications services that providers of messaging services should be required to open up their communications services to enable users of

⁷ These include messaging, internet telephony and video telephony services, which – unlike traditional telecommunications services such as telephony and short messaging (SMS) – are provided via the internet, or "over-the-top" (OTT).

⁸ See Bundesnetzagentur (2020): "Nutzung von OTT-Kommunikationsdiensten in Deutschland – Bericht 2020".

different providers to communicate with each other. The aim of regulation would be to break the market power of dominant providers and reduce dependence on them. In light of this, the Bundesnetzagentur published a discussion paper on interoperability between messaging services in December 2021 with a detailed analysis of the issue (www.bnetza.de/Interop-Messenger).

Interoperability obligations could encourage competition. However, depending on the type of obligations, they could also pose challenges, for example in the field of data protection and data security. A possible impact on the further development of services and desirable innovation would also have to be taken into account.

The Bundesnetzagentur's discussion paper provides an overview of different technical interoperability approaches for messaging services and analyses the need for interoperability. It also looks at the various effects of possible interoperability obligations and provides an overview of the present legal framework.

Consultation on digital platforms

The Bundesnetzagentur launched a consultation in March 2020 to learn about business customers' experiences of marketing and sales activities via digital platforms in Germany. It published an interim report in 2021 on the responses up to the end of May 2021, by which time nearly 320 responses had been received. The respondents were mostly smaller businesses from the commercial sector.

The majority of the respondents said they consider both marketing and sales activities via digital platforms to be important or very important. Just over half of the businesses thought they would not be able to exist in the market without digital platforms. Around 20% saw themselves having considerable difficulties competing successfully in the German market without the use of digital platforms. Respondents reported difficulties above all with "big", internationally active e-commerce platforms. The difficulties reported include problems in the areas of complaints management, dealing with customer and product ratings, commissions and other fees, and the ranking and findability of the respondents' own products. The consultation on digital platforms will continue into 2022. The findings will continue to be used to see how to remedy the business customers' difficulties swiftly and effectively.

Suitable approaches to platform regulation

The information gathered by the Bundesnetzagentur on digital platforms has already been used to work out suitable approaches to regulating these platforms. The Bundesnetzagentur devoted much time to the European legislative proposals regulating digital platforms – the Digital Markets Act (DMA) and the Digital Services Act (DSA) – and played an active role in developing the responses from the Body of European Regulators for Electronic Communications (BEREC) to the proposals.

The key finding made is that the application of existing competition policy-based ex post analysis and enforcement instruments to the digital platform economy is an inadequate solution. At present, intervention requires anti-competitive behaviour on the part of a platform operator to have occurred in the form of a violation of the ban on restrictive agreements or abusive practices. Moreover, the current drawn-out proceedings are not an efficient enough match for the fast-moving digital platform economy to prevent damage to competition or consumers in the meantime. The Bundesnetzagentur therefore favours a new ex ante regulatory approach to deal with the structural problems identified as well as potential anti-competitive behaviour on the part of digital platforms at an early stage before damage occurs.

Digital business models and sustainability

The digital structural change is transforming nearly all areas of society and the economy. It also provides an opportunity in the regulated network sectors to make the changes triggered by the digital transformation process sustainable. For instance, Big Data, internet platforms, artificial intelligence (AI) the Internet of Things (IoT) and industry 4.0 make it possible to manage resources in many different ways, more efficiently and more economically.

More and more issues arise that make it necessary to assess digital business models in the network sectors from the viewpoint of sustainability as well. The Bundesnetzagentur identified a need for more research in this area and commissioned two research projects in mid-2021: a study on digital business models and sustainability, and a study on incentive schemes for digital change among small and medium-sized businesses. One of the goals is to develop an analytical solution for assessing sustainability in the network sectors in order to be able to make a sound assessment of digital business models taking account of sustainability factors.

The studies' findings were presented at the end of 2021 or are due to be presented at the beginning of 2022. The

aim is to use the findings to assess the sustainability potential of digital infrastructure and applications based on this infrastructure, for instance to drive forward the energy transition, sustainable mobility solutions and resource-saving production, service and administrative activities.

Data Usage Act

One step in the implementation of the Data Strategy of the Federal German Government was the entry into force of the Data Usage Act (DNG) on 16 July 2021, which assigned a new task to the Bundesnetzagentur. The DNG transposes the recast Directive (EU) 2019/1024 on open data and the re-use of public sector information and replaces Germany's Re-Use of Public Sector Information Act (IWG). Public sector bodies, public undertakings in the transport and water/energy supply sectors, and certain research organisations falling within the scope of the DNG should as far as possible produce data in accordance with the principle of "open by design and by default". The data must be able to be used for any commercial or non-commercial purpose free of charge. Public sector bodies that rely on costs being reimbursed to generate sufficient revenue can apply to the Bundesnetzagentur for an exemption from the requirement to make the data available free of charge. The Bundesnetzagentur will check whether an exemption is possible and will publish a list of exempt public service bodies.

Infrastructure atlas

The Bundesnetzagentur's infrastructure atlas (ISA) is an online map of infrastructure available for shared use for the purpose of expanding broadband networks. The data are supplied to the Bundesnetzagentur by the infrastructure owners or operators and are usually updated once a year. Local authorities and companies promoting or rolling out broadband can apply to access the information for their projects. The data include information on construction work, which makes it possible to coordinate construction activities and share physical infrastructure and fibre optic cables.

A campaign launched in 2020 focuses on collecting data for broadband roll-out from local authorities and made good progress in 2021 as well. As a result, 3,233 new data providers (as at 17 December 2021) have supplied data and the pool of data for infrastructure owned by local authorities has increased significantly.

The number of data providers has increased since December 2020 by about 20% to over 4,450. Most of the new data providers are local authorities. They now account for the majority of data providers and for the largest increase at 35%. The number of data providers

from the wastewater sector also rose by nearly 13%; the number from the telecommunications and energy sectors increased by only just over 2% as the ISA has covered these sectors for longer and already includes most of the infrastructure in these sectors.

The increase in the number of data providers has also led to an increase in the number of infrastructures included. The ISA now covers more than 496,000 kilometres of fibre optic cables and 770,000 kilometres of ducts (an increase of about 7% in each case compared with December 2020). The largest increase has been in infrastructure owned by local authorities, as a result of the campaign. For example, the length of the wastewater pipelines included increased by 175% in 2021 to about 255,000 kilometres. The ISA now also includes nearly 50,000 traffic lights (up 187%), 66,000 building structures (up 109%) and more than 4 million lamp-posts (up 69%).

There was a huge increase in access requests in 2020, which was above all due to the dialogue with local authorities and the introduction of the online application form for these authorities. The number of access requests tripled shortly after the campaign had begun. The total number of requests in 2021 was down about 18% on 2020 at 1,473 (as at 20 December 2021). The local authorities account for a particularly large share of this decrease, down by 57%. The number of access requests was at a normal level again in contrast with the large increase the previous year. While there was a fairly large increase in requests from federal states of 47% to 142, the number of requests from network operators and rural districts was relatively stable at 789 (up 2%) and 84 (down 3%) respectively.

The growth in the number of data providers, infrastructures recorded and access users places greater requirements on the current technology. These requirements are accommodated by continually adding to the functionalities and improving the software.

For example, a web map service (WMS) was introduced on 1 May 2021 that allows users to use the data stored in the ISA planning tool in their own planning software. This makes data analysis and subsequent planning processes easier. The interface used guarantees the confidentiality of the data displayed and protects the data against unauthorised access.

Further sub-areas are currently being digitalised and merged for access in one single portal to make accessing and providing data easier. The portal will allow

access users to make access requests and manage their key personal data online.

Data providers will also have access to the portal and will be able to work through the whole process via the portal, from the electronic questionnaire, clarifying whether a potential provider has relevant data for the ISA, the administrative procedure for obligations through to uploading the geo-data.

The database for information on construction work is continuously expanding, mainly because of cooperation arrangements and the incorporation of existing information sources. As of October 2021, for example, the ISA includes selected planning/construction requests from the BIL eG national information system for pipeline enquiries, which enables access users to coordinate construction work and share infrastructure. The requests from the BIL eG system are incorporated into the ISA's web geographic information system (GIS) on a daily basis.

The new Telecommunications Act (TKG) that entered into force on 1 December 2021 introduced several changes for the ISA. The German Federal Ministry for Digital and Transport (BMDV) became the single information point but officially transferred the responsibility for the ISA and for collecting information on construction work to the Bundesnetzagentur on 18 November 2021. The new TKG also changed the scope of the data provided as well as the options for accessing the data. It places focus on infrastructure suitable for constructing small-area wireless access points. These additions require technical changes to the ISA, new data provision and access conditions and changes to the obligations basis and were therefore already a focus of work in 2021.

Electronic trust services

The coronavirus pandemic has made clear the importance of the spread of digital technology across many different areas of society. The Regulation on electronic identification and trust services for electronic transactions in the internal market (eIDAS Regulation) establishes the necessary regulatory framework and strengthens trust in electronic transactions as one of the building blocks of the EU's Digital Agenda for Europe. The electronic trust services under the eIDAS Regulation enable the digitalisation of analogue processes.

The technical and legal regulatory framework is currently being revised based on the experience made over the past five years so as to accommodate the

digital transformation process. Through its involvement in reworking the eIDAS Regulation, the Bundesnetzagentur has a significant influence on how electronic trust services are developed as a basis for the digitalisation process.

The Bundesnetzagentur, together with the Federal Office for Information Security and in consultation with stakeholders, has paved the way for the use of automated video identification methods by German providers. These methods guide consumers through the identification process for a trust service using artificial intelligence (AI).

The Bundesnetzagentur has also recognised identification using mobile terminal equipment to which an electronic identity has been transferred as an innovative method for trust services for the next two years.

This means providers and consumers have a range of convenient identification options to choose from, depending on the target group and application. This extended range of digital identification methods is an important step towards strengthening German trust services in the international competitive environment.

Spectrum management

Provision of additional spectrum for mobile broadband

Mobile voice and data traffic volumes are continuing to rise rapidly. The pandemic has shown just how essential well-functioning and stable broadband communications are in light of the huge increase in working from home and home schooling as well as online shopping and entertainment. High-speed mobile networks are needed to accommodate this unrelenting growth. Suitable spectrum is a fundamental resource for these mobile networks. The Bundesnetzagentur's aim is to decide on the provision of available spectrum in good time in order to give the market legal and planning certainty for the further roll-out of high-speed telecommunications networks.

The spectrum usage rights in the bands relevant to mobile communications at 800 MHz and 2.6 GHz and some of the rights in the band at 1 800 MHz will be expiring at the end of 2025.

The spectrum below 1 GHz plays a particularly important role in delivering broadband to rural communities. The spectrum at 800 MHz is therefore a key element in rolling out mobile broadband, especially in rural areas. New mobile spectrum – in particular the UHF band above 470 MHz – may become available as a result of discussions at international level. Deci-

sions therefore need to be taken at an early stage as to which spectrum should be included in the future award proceedings and which conditions should be attached to the spectrum usage rights.

The Bundesnetzagentur evaluated the responses to the consultation on its "Spectrum compass 2020" and then published its "Principles and scenarios for the provision of the 800 MHz, 1 800 MHz and 2.6 GHz spectrum" in June 2021.

The scenario paper presented five scenarios – spectrum auction, extension of spectrum usage rights, combination of an auction and an extension, one-operator model, and tendering – for public consultation. Particular focus was placed on how broadband coverage – especially in rural areas – could be improved. The paper therefore also considered a "negative/white spots auction" as an option. In such an auction, the successful bidder would be the one needing the least funding for rolling out mobile coverage to areas that are not financially lucrative. A negative/white spots auction should be considered in context with – and if appropriate could be combined with – other forms of funding.

The choice of scenario for providing the spectrum and how the process will be shaped are closely linked to market developments and market players' individual business models. The Bundesnetzagentur's objective is to improve broadband coverage, especially for communities in rural areas. Particular account will be taken of this objective when making the spectrum available again from 2026. At the same time the aim will be to promote sustainable competition in infrastructure and services.

The Bundesnetzagentur evaluated the consultation responses and published them on its website. The further course of action for the provision of the spectrum will be developed on the basis of the responses received.

It is planned to publish points of orientation and launch a demand survey in the first quarter of 2022.

Further information (in German) is available online at: www.bnetza.de/mobilesbreitband

Implementation of President's Chamber decisions

Spectrum assignment

Mobile network expansion in Germany is making rapid progress. One of the reasons for this is the coverage obligations from past spectrum auctions. The spectrum assignments for the three established mobile network operators Telekom, Telefónica and Vodafone are attached to extensive obligations aimed at driving forward network roll-out and expansion in Germany. The assignments for the newer entrant 1&1 (formerly Drillisch) are also attached to coverage obligations. The obligations were laid down by the Bundesnetzagentur in the President's Chamber decisions (BK1-17/001) for the auction held in 2019. Both consumers and the economy in Germany will benefit from better coverage with high-performance mobile communications. As well as this, the new 5G mobile communication standard will drive the development of innovative applications from many different areas including Industry 4.0, the Internet of Things (IoT), automated and connected driving, telemedicine, and smart farming agricultural applications. The established network operators work together to implement the coverage obligations. The basis for their cooperation arrangements was created with the negotiation requirement laid down by the Bundesnetzagentur in the President's Chamber decisions (BK1-17/001).

Cooperation in grey spots

The Bundesnetzagentur and the Bundeskartellamt followed the negotiations between the three established mobile network operators on coverage in "grey spots". Grey spots, in contrast to white spots, are areas where mobile broadband coverage is provided by (only) one operator. The Bundesnetzagentur's objective was to enable cooperation between network operators as a way to contribute to cost-effective network expansion and an improvement in mobile broadband coverage. At the same time the regulatory objective of fair competition had to be taken into account. Initially only Telekom and Vodafone had any intention of cooperating in grey spots. Following intervention by the Bundesnetzagentur and the Bundeskartellamt, cooperation arrangements for coverage in grey spots were also agreed with Telefónica.

Cooperation in white spots

The three network operators also started negotiations in 2019 on physical infrastructure sharing for coverage in white spots (areas where no mobile broadband coverage is provided by any operator). These negotiations were successfully completed in mid-2021 with the support of the Bundesnetzagentur and the Bundeskartellamt. Physical infrastructure sharing enables mobile broadband to be rolled out to unserved rural areas and along road, rail and water transport routes. The three established mobile network operators intend to set up and operate up to 6,000 new mobile sites by sharing physical infrastructure. Each network operator has committed to set up its share of physical infrastructure that can then be used by the other network operators with their own network technology. This will allow the network operators to save cost and time in rolling out networks in unserved areas.

The fourth mobile network operator 1&1 also has the option of joining the cooperation arrangements.

National roaming

1&1 (formerly Drillisch) won usage rights at 2 GHz (usable from 2026) and 3.6 GHz in the 2019 spectrum auction and was assigned the spectrum at the beginning of the year. Telefónica is also leasing spectrum at 2.6 GHz to 1&1.

1&1 had called for a national roaming agreement to be able to offer services throughout Germany immediately. The Bundesnetzagentur had imposed a negotiation requirement on the three established network operators in the spectrum auction, obliging them to enter into negotiations on national roaming with the new entrant 1&1.

In February 2021, 1&1 accepted a national roaming offer from Telefónica. The two operators then finalised a roaming agreement based on this offer in May 2021.

The agreement on national roaming deepens the existing cooperation between Telefónica and 1&1. 1&1 already sells mobile services based on Telefónica's network. 1&1 will be able to use Telefónica's network wherever it does not yet have its own mobile network. The roaming agreement gives 1&1 the planning certainty it had called for.

1&1 must meet the following coverage obligations:

- 1,000 base stations for 5G applications by the end of 2022;
- coverage for 25% of households nationwide by the end of 2025;

- coverage for 50% of households nationwide by the end of 2030.

1&1 is also required to change its business model, from its current role as service provider/mobile virtual network operator (MVNO) to network operator. The President's Chamber decision for the 2019 spectrum auction lays down the principle of competitive independence, stating that the operator cannot keep this dual role indefinitely. The Bundesnetzagentur consulted the market again in 2021 about the new situation and will decide next about 1&1 ending its dual role.

Arbitration for national roaming

The established network operators – Telekom and Vodafone as well as Telefónica – are all subject to the negotiation requirement imposed in the 2019 spectrum auction obliging them to enter into negotiations on national roaming with the new entrant.

In September 2020 1&1 called on the Bundesnetzagentur to act as an arbitrator vis-à-vis Telekom and Vodafone in order to enforce the negotiation requirement for national roaming laid down in the President's Chamber decision of 26 November 2018 (BK1-17/001). The Bundesnetzagentur, as arbitrator, consulted the parties concerned on several occasions to facilitate constructive negotiations on national roaming.

1&1 and Telefónica concluded their national roaming agreement in May 2021, which meant that the regulatory aim of the negotiation requirement for national roaming had been met. The nationwide roaming arrangements using Telefónica's network enable 1&1 to offer mobile services across the country while it is still gradually rolling out its own network. The Bundesnetzagentur ended its arbitration activities involving Telekom and Vodafone in July 2021.

Requirements for negotiations with service providers

The mobile network operators are subject to a requirement imposed in the above-mentioned President's Chamber decision (BK1-17/001) obliging them to enter into negotiations on sharing wireless capacity with suitable service providers. Negotiations should be non-discriminatory and the capacities to be provided should not be restricted to certain services, radio technologies or applications. The aim of the negotiation requirement is to encourage constructive negotiations between mobile network operators and suitable service providers. There is no compulsion to enter into or conclude a contract or agreement.

The Bundesnetzagentur has so far acted as arbitrator in two cases connected with service provider arrangements and more specifically with the question of access for mobile virtual network operators (MVNOs). MVNOs, in contrast to service providers, have their own infrastructure elements. One case was transferred in July 2021 from the arbitration proceedings to ruling chamber proceedings under section 133 of the 2004 Telecommunications Act (TKG). The Bundesnetzagentur is still acting as arbitrator in the other case to facilitate constructive negotiations between the parties concerned.

Fulfilment of the mobile broadband coverage obligations

The Bundesnetzagentur has overseen the expansion of mobile broadband coverage from the outset.

The spectrum at 700 MHz, 900 MHz, 1 800 MHz and 1 500 MHz auctioned in 2015 was assigned in combination with a coverage obligation that requires every mobile network operator, using mobile transmission technologies, to provide broadband coverage to the population with rates of at least 50 Mbps per sector. Each mobile network operator must provide coverage for 97% of households in each federal state and for 98% of households nationwide. Full coverage must also be achieved along major transport routes, where technically feasible and actually possible.

The Bundesnetzagentur completed its review of the coverage obligations attached to the spectrum auctioned in 2015. All three mobile network operators have met their obligations.

The operators had not fully met their obligations by the initial deadline of 31 December 2019. The Bundesnetzagentur then gave the operators until the end of 2020 as a new deadline, together with a warning that penalties could be imposed.

The coverage obligations for households were met before the new deadline. The review of coverage along major transport routes has shown that they now also have full LTE coverage.

All three mobile network operators are actively driving forward network expansion and roll-out. Some of the 3G networks have already been upgraded to provide the better 4G/5G coverage. The spectrum assigned in the 2019 auction is gradually being used to accommodate the growing demand for mobile broadband services.

Now the coverage obligations for the spectrum assigned in 2015 have been met, the obligations from 2019 need to be implemented. The mobile network

operators must each provide coverage with at least 100 Mbps for 98% of households in each federal state and for all motorways as well as for the main federal roads and rail routes. All other federal roads must have coverage with at least 100 Mbps by the end of 2024, while state roads, seaports and major waterways as well as all other rail routes must have coverage with at least 50 Mbps.

Rail operators' contribution to mobile coverage (master plan)

The Bundesnetzagentur attached obligations to the spectrum awarded in 2019 requiring the mobile network operators to provide coverage along rail routes. Heavily used rail routes with over 2,000 passengers per day must have coverage with 100 Mbps by 2022. By 2024 all rail routes must have coverage with 50 Mbps. These coverage obligations aim to accommodate the rising demand for access by consumers to mobile broadband.

The obligations pose major challenges for the mobile communications companies striving to roll out broadband. Not only must they consider the sheer number of kilometres to be covered, but also the high travelling speeds involved, the shielding of mobile signals caused by the physical characteristics of the trains, and compatibility with the train radio network. To safeguard the proportionality of the obligations, the Bundesnetzagentur foresees the rail operators' active involvement in attaining coverage for rail routes. The mobile network operators and rail operators are working with the Bundesnetzagentur on a concept for how the rail operators can contribute to broadband expansion. This will provide a basis for identifying and removing the obstacles to rolling out mobile coverage along rail routes.

Award of 450 MHz spectrum

The Bundesnetzagentur has assigned the 450 MHz spectrum for use primarily for critical infrastructure applications. This has paved the way for the digitalisation of the energy and transport sectors and contributes towards achieving the climate targets.

The spectrum assignment was based on the Bundesnetzagentur's decision of 16 November 2020 to award the 450 MHz spectrum primarily for critical infrastructure applications in tendering proceedings (available at www.bundesnetzagentur.de/450MHz). The 450 MHz spectrum has good propagation characteristics that make it particularly suited to establishing a functional and resilient wireless network for critical infrastructure in sectors including electricity, gas, wastewater, water and district heating in a cost-effective way.

Degradation or failure of this infrastructure together with supply shortages can bring society to a standstill, endanger public safety and order and even put lives at risk, as last seen with the disastrous flooding in North-Rhine Westphalia and Rhineland-Palatinate. The Bundesnetzagentur also gave consideration to safety and security-related concerns when making its decision on the award. The decision on awarding the spectrum primarily for critical infrastructure applications took account as far as possible of the needs of the authorities and organisations concerned with public safety as well as the federal armed forces. The 450 MHz assignment allows for shared use of the resulting wireless network by public safety authorities and organisations and the federal armed forces.

The Bundesnetzagentur evaluated the applications in the tendering proceedings and considered the application from 450connect GmbH to be the best. 450connect GmbH was subsequently assigned the spectrum usage rights up to 31 December 2040 on the basis of the above-mentioned award decision.

450connect GmbH combines a group of partners: Alliander AG, a consortium of regional energy suppliers, E.ON, and Versorger-Allianz 450MHz, which represents several municipal utilities and energy and water companies. The company's aim is to roll out a high-performance nationwide wireless network serving the digitalisation of Germany's energy and water industry and other critical infrastructures.

Further information (in German) is available online at: www.bundesnetzagentur.de/450MHz

Short-term assignments

The Bundesnetzagentur issues short-term assignments for spectrum to be used at sporting, cultural and other media events as well as 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 period of 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.

One such event in 2021 was the UEFA European Football Championship EURO 2020, which was postponed because of the pandemic. Munich hosted four of the matches. The Bundesnetzagentur dealt with a large number of requests for spectrum from users in

and outside Germany, and a team was ready at the venue for a quick response to any technical problems.

Satellite communications

The advantage of satellite communications is that near-global coverage can be achieved using signals from geostationary and, more and more, non-geostationary satellites. Not only do satellite communications support key scientific, social and governmental activities, they are also increasingly important in terms of the economy. Another advantage of satellite connectivity is its instant availability, which makes it suitable to supplement terrestrial multimedia, communications and internet technologies. Satellite communications play an increasingly important logistical role in peacekeeping missions, safeguarding domestic and international security and in crisis situations such as natural disasters. They also provide data and communication links in situations where terrestrial infrastructure either does not exist or has been destroyed. Satellite communications most recently provided valuable services to both rescue workers and the general public during the disastrous flooding in North-Rhine Westphalia and Rhineland-Palatinate in summer 2021.

In 2021 the Bundesnetzagentur submitted filings for 49 new satellite systems to the ITU. German satellite operators submitted a total of 2,900 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

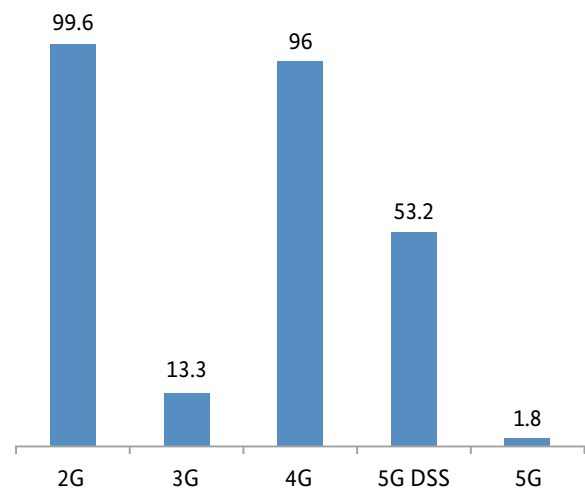
In October 2020 the Bundesnetzagentur launched its first interactive online map showing up-to-date mobile network coverage from the users' perspective at www.breitband-monitor.de (in German). The mobile communications monitoring creates transparency about each provider's actual mobile coverage throughout the country and provides anyone interested with tailor-made information on mobile availability. Work on expanding and developing the online portal continued throughout 2021. One of the new features was the addition of 5G to the coverage map and a new download area for statistical analyses and maps.

The Bundesnetzagentur collects the necessary data from the network operators based on uniform rules once a quarter. The data collected at the end of October 2021 shows that over 53% of the country already has coverage with the latest mobile communications standard, 5G. The network operators Telekom and

Vodafone, in particular, use Dynamic Spectrum Sharing (DSS). DSS enables the existing 4G infrastructure to be used for 5G as well, with the mobile spectrum being shared between the two technologies according to demand. In addition to 5G DSS, the network operators use the 3.6 GHz band for 5G, especially in rural areas. The 3.6 GHz band was auctioned off in 2019 and can be used to achieve particularly high data speeds. It accounts for 1.8% of coverage across the country

3G network coverage hardly plays a role now. The 3G network is due to be switched off at the end of 2021. The spectrum freed up will be used by the network operators for the higher-performance 4G and 5G networks. Turning off the 3G network has not had a negative effect on the coverage situation so far. The proportion of the country affected by white⁹ and grey¹⁰ spots has fallen to 3.9% for white and 6.8% for grey spots. The share of dead spots, where there is no mobile coverage at all, has also fallen slightly to 0.36%. Around 96% of the country now has 4G network coverage.

Nationwide coverage by technology
(%) (As at: October 2021)



Complete revision and publication of the spectrum plan

The spectrum plan provides an overview of all spectrum allocations from 8.3 kHz to 3 000 GHz within the Federal Republic of Germany. Under section 89 of the 2004 Telecommunications Act (TKG) the Bundesnetzagentur is responsible for drawing up the spectrum plan. Work started in 2021 on revising the whole spectrum plan in order to transpose the results of the World Radiocommunication Conference 2019 into national law. The work involves the affected federal and state authorities, the affected groups and the public.

Numerous changes also need to be made to the spectrum plan in order to implement the provisions of EU implementing decisions, which are legally binding and need to be transposed into national law.

Further changes initiated by international bodies (European Commission, CEPT etc) or arising from national requirements are also being implemented and editorial amendments made.

A notice announcing the completion of the work on revising the spectrum plan is due to be published in the Bundesnetzagentur's official gazette and online in February 2022.

⁹ White spots are places where there is no mobile broadband (at least 3G) available.

¹⁰ In grey spots, only one network operator offers mobile broadband.

Bundesnetzagentur's role following flooding

In July 2021 there was disastrous flooding in parts of western and central Europe, including flash floods and flooding affecting areas in Germany near rivers, streams and lakes. Lives were put at risk and considerable damage was caused to buildings, roads and infrastructure as a whole. There was an urgent need to restore the telecommunications networks in the areas affected by the disaster for both the rescue workers and the people living there.

The Bundesnetzagentur played a direct part in restoring the networks affected as part of its statutory tasks. Its work included spectrum management tasks to enable the mobile networks, the networks used by the authorities and organisations concerned with public safety and rail applications to be operated again once the network operators had repaired the damage. Another task was to make additional spectrum resources available. The Bundesnetzagentur acted swiftly to coordinate spectrum and provide additional satellite communication capacity for the teams of the public safety authorities and organisations. Spectrum designated for digital TV (DVB-T II) was also made available for use by the federal armed forces' disaster relief teams working in the areas affected. The Bundesnetzagentur was in constant contact with the network operators and provided support beyond its statutory duties in an advisory capacity, for instance with technical spectrum calculations.

The Bundesnetzagentur will continue its efforts in improving the resilience of telecommunications networks in the event of disasters; it plans to start a dialogue with spectrum assignment holders and operators of networks classed as essential for the system and develop suitable action scenarios.

Market regulation

Regulatory order for market 1

On 27 May 2019 the competent ruling chamber published the President's Chamber's consultation draft of the review of Market 3(a) as defined in Commission Recommendation 2014/710/EU on relevant markets and at the same time opened the proceedings for the routine review of the obligations imposed for local loop access (most recently in regulatory order BK3g-15/004) and layer 2 bitstream access (most recently in regulatory order BK3h-14-114); on 12 July 2019 the ruling chamber conducted a key elements discussion as the first public hearing. The proceedings were put on hold, among other things because of the negotiations and contractual arrangements made by the market players in 2020 and 2021 to safeguard the long-term stability of the copper and fibre wholesale charges (for layer 2 bitstream access) and because of the revision of the Telecommunications Act (TKG), and were resumed in spring 2021.

On 11 October 2021 the ruling chamber published its draft of a regulatory order based on the President's Chamber's most recent market determination for national consultation until 22 November 2021. All stakeholders also had the opportunity to state their views in a public hearing. The updated draft is due to be submitted for the EU consolidation procedure in spring 2022 following evaluation of the responses to the consultation.

A decision needs to be taken on the basis of the President's Chamber's updated market definition and market analysis on whether and how to retain, revise, withdraw or add to the obligations already imposed on Telekom.

The published draft places a particular focus on regulating access to fibre-based wholesale products and on formulating the non-discrimination obligations needed in this context. These obligations will be in line with the stricter equivalence of inputs (EoI) criteria. In return, flexibility will be created by not regulating charges, with the aim of promoting current fibre roll-out. Other key aspects of the future regulatory framework include extended access to ducts and future rates regulation for layer 2 bitstream.

Regulatory order for Market 3(b)

The regulatory order of 28 October 2015 (BK3h-14/114) also needs to be reviewed on the basis of the new market determinations. The obligations relating to layer 2 bitstream access are being reviewed in the BK3i-19/020 proceedings because layer 2 bitstream access has now been classed as part of Market 3(a) as defined in the 2014 Recommendation on relevant markets (Market 1 of the 2020 Recommendation).

The review proceedings for the regulatory order on layer 3 bitstream access have been opened. One particular issue is deregulating the market comprising municipalities with more than 60,000 inhabitants, which according to the President's Chamber's determination no longer require regulation. Another issue in these proceedings is the question of how to regulate fibre-based wholesale products in future.

Telekom's reference offer for NGN interconnection

On 9 July 2021 Telekom Deutschland GmbH submitted its 2021 reference offer for next generation network interconnection (NGN IC) in accordance with the obligation in point 7 of the regulatory order of 26 February 2021 (BK3d-20/30), the revised version of the regulatory order that originally took effect on 19 December 2016 (BK3d-16/005). The new reference offer will fully replace the current NGN reference offer (examined in the second partial decision of 17 December 2015 in the BK3d-13/033 proceedings).

Telekom Deutschland GmbH's main aims behind the new reference offer are to reflect the deregulation of call origination services, allow different pricing for calls originating within and outside the EU, remove 155 Mbps NGN interconnection accesses (NICAs) and the obligation for duplication for NICAs, and make a number of changes in light of the new Telecommunications Act (TKG), which came into force on 1 December 2021.

A first partial decision was made on 13 December 2021 requiring Telekom to submit a revised reference offer within one month.

Telekom's reference offer for mobile termination

On 23 August 2021 Telekom Deutschland GmbH submitted a reference offer (for internet protocol (IP) interconnection) for termination in the Telekom Deutschland GmbH network in accordance with the obligation in point 6 of the revised regulatory order (BK3d-20/096) that took effect on 26 February 2021. The new reference offer will fully replace the current reference offer of 31 October 2007 examined in the BK3a-06/040 proceedings.

The new reference offer aims to accommodate technical developments as well as changes to the legal framework. Telekom Deutschland GmbH has previously provided interconnection using circuit-switched technology and the public switched telephone network (PSTN), but the technical components required are no longer being fully supported. In future, interconnection will only be provided using packet-switched technology and an IP interface.

For the sake of simplicity, the reference offer is based on Telefónica Germany GmbH & Co. OHG's reference offer already examined in the BK3g-17/068 proceedings, but with the addition of different pricing for origination within and outside the EU.

A first partial decision was made on 21 December 2021 requiring Telekom to submit a revised reference offer within one month.

Approval of leasing charges for alternative sub-loop access and handover ports

On 27 October 2021 the ruling chamber set an imputed rate of return of 3.12% (real) for rates approvals between 1 July 2021 and 30 June 2022 in conjunction with its approval of the leasing charges for alternative sub-loop access and handover ports. It was the first time the ruling chamber had set the imputed rate of return on the basis of the Commission Notice on the calculation of the cost of capital for legacy infrastructure in the context of the Commission's review of national notifications in the EU electronic communications sector (2019/C375/01) ("WACC Notice").

The issue of setting the rate of return was very controversial. While the parties summoned called for the full application of the WACC Notice, which would have resulted in a decrease in the rate of return by more than a third, Telekom was in favour of keeping the rate of return as stable as possible and adapting the methodology set out in the WACC Notice.

The ruling chamber weighed up both the regulatory framework's objective of a harmonised internal market

and the legislators' call for a stable economic framework.

From now on, the Bundesnetzagentur will follow the methodology described in the WACC Notice when setting the rate of return and therefore make a key step in harmonising the internal market. However, there is one parameter – namely the risk-free interest rate – which the Bundesnetzagentur will not bring into line with the methodology set out in the WACC Notice immediately but gradually following a glide path ending in 2024 at the latest. Bringing this parameter into line immediately would have resulted in such a large decrease in the rate that it would have sent out negative signals for the necessary investment in telecommunications infrastructure in Germany. By contrast, the aim of setting a glide path is to reflect general developments in the financial markets, and in particular the development of the federal bonds relevant to the risk-free interest rate, and to adjust the interest rate gradually in appropriate steps down to the level in the WACC Notice.

In its response to the ruling chamber's notification draft, the European Commission recognised the need for an orderly transition but called on the Bundesnetzagentur to consider, while following the glide path, whether it would be feasible to bring forward the end date.

Revocation of wholesale fixed and mobile termination services

The ruling chamber issued several decisions amending the regulatory obligations for termination services imposed on Telekom Deutschland GmbH, 65 alternative fixed network operators and eight (virtual) mobile network operators.

The decisions were prompted by the entry into force on 1 July 2021 of maximum Union-wide fixed and mobile termination rates set by the European Commission in its delegated regulation of 18 December 2020 pursuant to Article 75 of the European Electronic Communications Code (EECC). The rates approval requirements were revoked and application of the delegated regulation was ordered to avoid a conflict between the regulatory orders and the termination rates set in EU legislation. In addition, the interconnection obligations for calls originating outside the EU were limited to cases in which the maximum set in the delegated regulation comes into play.

Approval of rates for electricity, air conditioning/ventilation and other collocation services

On 30 November 2021 the ruling chamber approved the rates for collocation electricity, annual and monthly electricity meter reading and other services connected with collocation for one year (decision BK3a-21/009). The new approved rate of €0.2394 per kilowatt hour for an individual customer's electricity consumption is 16.5% higher than the old approved rate of €0.2055/kWh. The increase in costs is due in particular to the higher electricity purchase costs, which are in turn the result of current developments in electricity prices especially on the European Energy Exchange (EEX).

First review of the reference offer for Ethernet 2.0 carrier leased lines

On 21 October 2020, and in a first partial decision of 23 November 2021, the Bundesnetzagentur required Telekom to submit a revised reference offer meeting the requirements of the first partial decision by 7 December 2021. On 2 December 2021 Telekom presented a revised reference offer on the basis of the Bundesnetzagentur's first partial decision. The Bundesnetzagentur is examining whether the revised reference offer meets the requirements of the first partial decision as well as the criteria of equal opportunities, fairness and timeliness and is sufficiently comprehensive for individual access seekers to be able to accept it without the need for negotiations. The aspects covered by the Bundesnetzagentur's decision include monitoring arrangements, provisioning processes, provisioning deadlines, contractual penalties for delays in provisioning, and technical quality-of-service parameters.

Reference offer proceedings for an agreement supplementing standard contracts due to deactivation of the SDH network, including the 1850 SDH platform

In November 2020 Telekom informed the ruling chamber and market players of its plans to switch off its synchronous digital hierarchy (SDH) network. Given the large number of questions arising regarding the migration process and availability of equivalent successor products, the Bundesnetzagentur opened reference offer proceedings on 4 December 2020 and asked Telekom to submit a corresponding draft contract. On 2 February 2021 Telekom submitted a draft standard contract setting out the framework conditions for product transformation in connection with the legacy products being discontinued. On 9 March 2021 Telekom was given one month to submit a supplement to the reference offer with the arrangements for the operative transformation process.

On 20 April 2021 Telekom submitted a revised agreement supplementing the standard contracts due to the deactivation of the SDH network, including the 1850 SDH platform. The ruling chamber is currently examining the supplementary agreement submitted.

Approvals for charges for provisioning, express fault repair and additional services for SDH and Ethernet over SDH carrier leased lines

On 22 January 2021 Telekom submitted applications for approval of its charges from 1 July 2021 for provisioning, express fault repair and additional services for synchronous digital hierarchy (SDH) and Ethernet over SDH carrier leased lines because the last approvals were due to expire. On 29 June 2021 notices were issued approving the charges with effect until 30 June 2024 (BK2a-21/001 and BK2a-21/002).

Approvals for leasing charges for SDH and Ethernet over SDH carrier leased lines

On 30 June 2021 Telekom submitted an application for approval of new leasing charges with effect from 1 January 2022 until 31 December 2023 for traditional SDH and Ethernet over SDH carrier leased lines because the last approvals were due to expire on 31 December 2021. On 22 December 2021 notices were issued approving the charges with effect until 31 December 2023 (BK2a-21/006 and BK2a-21/007). Overall, the new charges are lower than those last approved in 2019.

Approvals for leasing charges for Ethernet 2.0 carrier leased lines

On 1 October 2021 Telekom applied for approval of its monthly leasing charges with effect from 2 March 2022 for Ethernet 2.0 carrier leased lines because the last approvals were due to expire. Telekom applied for approval of different charges for its fibre, very high data rate digital subscriber line (VDSL) and symmetric digital subscriber line (SDSL) variants. It applied for approval of a total of 80 different prices: 64 for lines and 16 for connections. The consultation was opened on 10 January 2022.

Notification procedure for wholesale Ethernet VPN 2.0

On 29 January 2021 Telekom notified the Bundesnetzagentur of its new charges for wholesale Ethernet virtual private network (VPN) 2.0. The Bundesnetzagentur examined the charges for indications of anti-competitiveness and had no objections. There were no clear indications either to assume obvious anti-competitive pricing in charges for wholesale products or of a margin squeeze as referred to in section 28(2) para 2 of the 2004 Telecommunications

Act (TKG) or any other anti-competitive pricing behaviour.

The prices notified by Telekom did not include any charges for "NNI 10G Customer Sited" services or for "standard" connections. The Bundesnetzagentur drew attention to the fact that notification of these charges was still outstanding, and Telekom stated that in its view the charges were not covered by the notification requirement. Following a second unsuccessful request, the Bundesnetzagentur stated in writing on 13 July 2021 that Telekom had failed to meet its notification requirement with respect to these services and requested Telekom to comment on the matter and submit notification. Telekom legally challenged the Bundesnetzagentur's move and applied for interim relief. Cologne Administrative Court held a hearing on 26 January 2022. Following the oral hearing, Telekom withdrew its application and legal action.

Anti-competitive proceedings for cancellation of SDH-based transmission paths

On 16 December 2020 the Bundesnetzagentur opened ex officio anti-competitive proceedings against Telekom pursuant to section 42 of the 2004 Telecommunications Act (TKG). The move was prompted by Telekom's announcement that it would be discontinuing its individual services for competitors for transmission paths based on its synchronous digital hierarchy (SDH) platform with effect from 30 September 2022 or 31 March 2023.

On 16 April 2021 the Bundesnetzagentur issued a notice declaring that cancellation of the services in the regulated sector from 2 Mbps to 155 Mbps was invalid. In addition, Telekom was prohibited from cancelling SDH-based transmission path services because of migration unless the regulatory order and approved reference offer valid when Telekom announced its cancellation provided for other arrangements. Telekom was also prohibited from cancelling services provided to its competitors but not to its own end-users unless the regulatory order and approved reference offer valid when Telekom announced its cancellation provided for other arrangements.

Dispute resolution on account of violation of the President's Chamber decision BK1-17/001 vis-à-vis Telefónica Germany GmbH

The French company Transatel SAS requested the Bundesnetzagentur on 14 June 2021 to open a dispute resolution procedure pursuant to section 133 of the 2004 Telecommunications Act (TKG) vis-à-vis Telefónica Germany GmbH. Transatel SAS asked for a dispute resolution procedure to be conducted in order to call

on Telefónica Germany GmbH to enter into negotiations with Transatel SAS in accordance with point III.4.15 of the President's Chamber decision of 26 November 2018 (BK1-17/001) on the conclusion of a mobile virtual network operator (MVNO) access contract.

The ruling chamber issued a decision on 14 October 2021 (BK2b-21/005) requiring Telefónica Germany GmbH to enter into such negotiations. In this context, it was made clear that MVNOs may invoke the service provider arrangements in the assignment notices in connection with the 2019 spectrum auction. Mobile providers are thus required to negotiate with these companies with the aim of concluding an agreement on MVNO access. This access can also be implemented on the basis of the technical platform for international roaming.

Technical regulation

Radio equipment/EMF protection

Rolling out 5G mobile networks throughout Germany is only possible if the electromagnetic field (EMF) exposure limits are met.

The Bundesnetzagentur's site certification procedure ensures that radio equipment can only be operated if there is proof that the EMF levels at the whole of the site are within the limits.

In 2021 the Bundesnetzagentur issued a total of 19,834 site certificates.

Further information about the site certification procedure and the Bundesnetzagentur's measurements can be found in the EMF section of the Bundesnetzagentur website (in German – www.bundesnetzagentur.de/emf).

Nationwide migration of all active emergency call lines from ISDN to IP technology complete

The operative phase of the migration of more than 800 emergency call lines across Germany to internet protocol (IP) technology was successfully completed in 2021 with the Bundesnetzagentur's help. The migration of the emergency call lines that had been based solely on integrated services digital network (ISDN) technology was a key prerequisite for the public switched telephone network (PSTN)/ISDN platform in Deutsche Telekom's network to be switched off.

The Bundesnetzagentur's intensive efforts meant that it was possible to overcome all potential obstacles for the migration to IP technology and pragmatically mediate between all those involved in the complex migration process. One particular challenge was to continually and extensively adapt the database for emergency call routing without endangering its stability.

All emergency call lines have since been put into operation without any degradation to existing emergency connections; the lines, which are essential for general interest services, will now also be available in all-IP based networks.

Standardisation of 5G/5G dialogue platform

The 3rd Generation Partnership Project (3GPP) is the major driver behind 5G standardisation. Work on Release 17 continued in 2021 under pandemic restrictions and is due to be completed in 2022. The work plan covers various topics including integrating satellites into 5G, reducing mobile phone energy consumption

and expanding the Internet of Things (IoT) for industrial applications.

The areas for inclusion in Release 18 have already been identified and include new work on the use of artificial intelligence (AI) and machine learning in 5G networks and improvements in edge computing. The Bundesnetzagentur is an active partner of 3GPP. The Bundesnetzagentur also moderates a 5G dialogue platform (AP5G) to give 5G user businesses and industries in Germany a direct channel to 3GPP to voice their standardisation needs.

Artificial intelligence (AI)

Artificial intelligence (AI) is a key technology of the future and has vast potential for the economy in various fields of application. AI has already revolutionised business sectors and helped to save costs and optimise products and services.

At the same time, this development creates a number of both regulatory and technological challenges. For instance, not only are the security of the data and the reliability, transparency and explicability of the algorithms used of essential importance, they also contribute towards broad acceptance. In this context, the workshop held by the Bundesnetzagentur in November 2021 on AI in the network sectors made it clear that small and medium-sized businesses, in particular, still have reservations about using AI, their reasons being economic and operational risks and insufficient standards.

The Bundesnetzagentur is building on this with its participation in national and international standardising bodies and its contributions in specialist literature. It is active in developing global standards for uniform application as an aid in the field of AI with the aim of enabling the secure introduction of this technology of the future across the country and in winning support for its approach with numerous presentations at national and international events.

In light of the technical expertise gained from its activities, the Bundesnetzagentur also prepares analyses and draws up recommendations for action for the Federal Economics Ministry.

Standardisation in the field of EMC and radio equipment

The standardisation activities and work within the bodies were continued in 2021 with some new points of focus.

One point particularly worth mentioning in the field of electromagnetic compatibility (EMC) in 2021 is the incorporation of the results of a study initiated by the Bundesnetzagentur on basic issues in the 6-40 GHz band into international standardisation activities, in particular relating to the generic EMC standards. These standards play a pilot role and contribute to achieving comprehensive radio protection for 5G applications with product and product family standards.

In 2021 the ongoing expansion of the EMC standards resulted in introducing requirements for all EMC-relevant accesses and extending the frequency band for industrial, scientific and medical (ISM) equipment (CISPR 11) to 6 GHz, which is due for international agreement shortly.

The Bundesnetzagentur also played an active part in numerous European Telecommunications Standards Institute (ETSI) working group meetings in drawing up and developing European standards for radio equipment for a wide range of radiocommunication services (including fixed links, aeronautical, maritime and inland waterways, radiodetermination and radionavigation) with the aim of creating modern and open high-quality standards that reflect the regulatory objectives as far as possible.

Public safety/security

Automated information procedure

The automated information procedure enables statutorily authorised bodies (mainly the police, state police, federal and state protection authorities and emergency call centres) to request subscriber data including names, addresses and telephone numbers from telecommunications companies via the Bundesnetzagentur's automated and highly secure systems 24 hours a day. At present 110 systems as authorised bodies and 99 telecommunications companies as obligated companies take part in the scheme.

Information can now be provided extremely rapidly – if necessary, within a few seconds – thanks to technological improvements. In 2021 the Bundesnetzagentur's systems processed a total of 24.14 million requests from authorised bodies. This is around 6.35 million more requests than in the previous year and represents an increase of around 36% on 2020.

The Telecommunications Act (TKG) was revised in order to transpose the European Electronic Communications Code (EECC) and the new version with numerous changes entered into force on 1 December 2021.

The revised TKG includes new provisions enabling supervisory action vis-à-vis persons involved with the telecommunications companies' obligations. This is a response to the increasing number of cases reported in which third parties involved in sales used stolen/duplicate identities of actual real persons to register and activate additional prepaid SIM cards and then sold these SIM cards as activated cards. These SIM cards were then frequently used for illegal purposes.

Furthermore, database checks on customer files can be repeated as a supervisory measure under a specific arrangement in the TKG relating to customer file reliability and can be used on a permanent basis to achieve better data quality for public safety/security.

In addition, the administrative order for identification procedures for prepaid SIM cards was revised and published. The new administrative order accommodates the changes in the TKG, including the arrangements for suitable identification procedures to be verified by conformity assessment bodies, and a new, innovative online identification procedure.

Implementation of intercepts, issuing of information, manual information procedure

Under the statutory provisions (for example of the Code of Criminal Procedure (StPO)), anyone providing or cooperating in providing telecommunications services in a business capacity must enable an accused person's telecommunications to be intercepted and recorded and provide information about traffic data. Section 170 of the Telecommunications Act (TKG) sets out whether and to what extent the telecommunications companies subject to these obligations must make arrangements for implementing intercepts or providing information. Customer data may also be requested by certain authorities under section 174 TKG, and certain arrangements for these information requests must also be made.

In the past couple of years, progress in standardisation activities within the European Telecommunications Standards Institute (ETSI) has resulted in the publication of two ETSI specifications enabling the interception of messaging services, which is particularly important in light of the fact that messaging services are now included as number-independent interpersonal communications services in the Telecommunications Legislation Modernisation Act. The Technical Directive relating to the Telecommunications Interception Ordinance (TR TKÜV) was revised because of this and other, technical developments (version 7.2). The following version, version 8.0, included the formal changes to the legal references in line with the revised TKG. Any changes to the TR TKÜV are made in consultation with the authorised bodies and with the participation of industry associations and manufacturers.

Disaster preparedness

In 2021 the telecommunications companies faced a particular challenge following disastrous flooding in the Ahr valley. Even before the flooding occurred, the Bundesnetzagentur had regularly checked the companies' processes and emergency technology maintained in preparation for crises and disasters. The Bundesnetzagentur is working closely with the telecommunications companies on measures to cope with future disasters and is expanding on concepts already in place.

Technical safeguards

Protecting the privacy of telecommunications and personal data, protecting systems against faults or interference, and managing the risks to the security of telecommunications networks and services are the key objectives of section 109 of the 2004 Telecommunications Act (TKG). The Bundesnetzagentur took account of the ever-changing technologies in the telecommunications sector and the attendant shifts in threats and risk exposure (especially for infrastructure with a high level of risk) with the publication of a catalogue of security requirements in the Bundesnetzagentur's official gazette in compliance with the notification requirement pursuant to Directive (EU) 2015/1535. A list of critical functions for infrastructure with a high level of risk was also put out for consultation.

The list of critical functions was published in the Bundesnetzagentur's official gazette in August 2021. Throughout the reporting period, the Bundesnetzagentur carried out random checks at around 370 companies on the implementation of the security concept. Additionally, some 100 new and 400 revised concepts were submitted to the Bundesnetzagentur for review to determine compliance with section 109(4) TKG 2004. A total of 14 companies fulfilled the obligation after being threatened with fines, while four companies met the requirement after a fine was imposed.

The contact restrictions in place due to the coronavirus pandemic meant that implementation checks were increasingly carried out on the basis of requests for documentary evidence and information proving compliance. No on-site inspections were carried out in 2021. In 2021 the Bundesnetzagentur received 52 reports of security breaches within the meaning of section 109(5) TKG 2004.

International cooperation

A key focus of the work of the Body of European Regulators for Electronic Communications (BEREC) was the BEREC Opinion on the European Commission's proposal for a Digital Markets Act, which aims to enable ex ante regulation for digital platforms within the framework of EU competition law.

As a member of the International Institute of Communications (IIC), the Bundesnetzagentur hosted the IIC's International Regulators' Forum; the two-day meeting with over 100 regulatory authorities was held online as a virtual event due to the pandemic.

Work with BEREC

The main focus of the Bundesnetzagentur's international activities in the telecommunications sector in 2021 was once again its work with the Body of European Regulators for Electronic Communications (BEREC).¹¹ BEREC's work is based on its annual work programme and is organised into Working Groups (WGs) made up of experts from the national regulatory authorities (NRAs).¹² In 2021 a representative of the Bundesnetzagentur held the position of Co-Chair of the Remedies WG. The documents are given final approval by the NRAs' delegates (usually the heads or high-level representatives of the NRAs) at the regular meetings of the Board of Regulators.

All the NRAs – and in this case also the European Commission – are represented in the Management Board, which oversees the BEREC Office and its Director in Riga.

All the deliverables and ad hoc projects in the work programme for 2021 were successfully completed on time.

Recast of the Roaming Regulation and BEREC Opinion

On 24 February 2021 the European Commission published a proposal for a recast of the Roaming Regulation. The legislative proposal basically retains and adds to the roam-like-at-home (RLAH) rules, which allow customers to call, text and use mobile data at the same prices as at home while travelling within Europe.

The Bundesnetzagentur played an active role in drawing up the BEREC Opinion published in April 2021 on the legislative proposal.¹³ BEREC essentially welcomed the proposal but also pointed to gaps in regulation and difficulties with applying the existing rules in practice, for instance for customers on board ships and planes.

Political agreement on the new Roaming Regulation was reached at the end of 2021, with the rules set to enter into force on 1 July 2022.¹⁴ The regulation includes new rules for the quality of roaming services. Roaming customers will enjoy the same quality of service as at home, whenever technically feasible. New obligations requiring mobile operators to inform their customers about access to emergency services in the visited network and higher charges for value-added

¹¹ <https://berec.europa.eu/>

¹² https://berec.europa.eu/eng/about_berec/working_groups/

¹³ BoR (21) 59

¹⁴ https://ec.europa.eu/commission/presscorner/detail/en/ip_21_6665

services when roaming aim to increase transparency. BEREC has until the end of 2022 to establish a Union-wide database with information on the numbering ranges for value-added services and the emergency services available in the visited country. The NRAs or other competent authorities will collect and provide BEREC with the information necessary for the database.

The new regulation also sets lower wholesale caps for regulated roaming services. Most notably, the wholesale cap for data roaming services will decrease gradually in five steps from €3.00 per gigabyte to €1.00/GB in 2032. The wholesale cap for roaming calls will be 2.20 cents per minute and then 1.90 ct/min as from 1 January 2025. The wholesale cap for roaming text messages will be 0.40 cents per text and then 0.30 cents per text as from 1 January 2025.

BEREC Opinion on the national implementation and functioning of the general authorisation

Article 122(3) of the European Electronic Communications Code (EECC) required BEREC to publish an opinion on the national implementation and functioning of the general authorisation and on their impact on the functioning of the internal market by 21 December 2021.

Although practical experience was limited, as numerous Member States had not transposed the EECC (and the new provisions for the general authorisation regime) into national law when BEREC produced its Opinion, the Bundesnetzagentur shared the experience it had acquired of the scheme. BEREC published a questionnaire in June 2021 for additional input on stakeholders' experience of the general authorisation regime.

BEREC's Opinion produced on the basis of the experience reported and published in December 2021 stated that the new authorisation scheme was welcomed and that in some cases different rules applied at national level – but partly because of regulations outside telecommunications legislation (such as national security issues).¹⁵ In light of the limited experience of the new regime, one of the recommendations was for BEREC to review the situation at a later point in time.

BEREC Opinion on the Broadband Cost Reduction Directive

The European Commission held a public consultation on the review of the Broadband Cost Reduction Directive. The Bundesnetzagentur was involved both at

national level in the first quarter of 2021 and in the work on the BEREC Opinion requested by the Commission.¹⁶ The main findings of the Opinion are as follows:

- Access to existing physical infrastructure and coordination of civil works are important factors in reducing the costs of deploying high-speed networks.
- The main obstacle is dependence on access to the physical infrastructure of other network operators, who typically have no interest in sharing their infrastructure.
- NRAs are best suited to fulfil the role of dispute settlement body.
- NRAs are also best placed to perform the functions of the single information point.

Digital Markets Act/Digital Services Act

The European Commission proposed a comprehensive set of new rules for regulating the digital space on 15 December 2020. The Commission's aim behind the Digital Markets Act (DMA) is to allow the ex ante regulation of digital platforms acting as gatekeepers within the framework of EU competition law.¹⁷ The Digital Services Act (DSA) focuses on updating the eCommerce Directive and sets binding obligations for online intermediary services (including their content), from small service providers to very large online platforms.¹⁸

BEREC first published a brief response to the DMA proposal in March 2021, followed by a detailed report in September 2021 investigating the issues of platform regulation and the position of gatekeepers as well as the role of NRAs in the proposed regulatory scheme.¹⁹

Supplementing its Opinion on the DMA proposal published in March 2021, BEREC produced a report specifically investigating the extent to which number-independent interpersonal telecommunications services as defined in the EECC (could) also fall within the scope of the DMA and thus be regulated by the European Commission as gatekeeper services.²⁰

BEREC Opinion pursuant to Article 123 EECC

Article 123 of the EECC requires BEREC to monitor the market and technological developments and to publish an Opinion on these developments and their impact on the application of the provisions in the EECC relating

¹⁵ BoR (21) 178

¹⁶ BoR (21) 30

¹⁷ https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/digital-markets-act-ensuring-fair-and-open-digital-markets_de

¹⁸ https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/digital-services-act-ensuring-safe-and-accountable-online-environment_de

¹⁹ BoR (21) 52

²⁰ BoR (21) 85

to end-user rights every three years, with the first Opinion due by 21 December 2021. The Opinion should assess the extent to which the provisions relating to end-user rights and their application meet the objectives set out in Article 3 EECC.

In light of the fact that experience with the application of the EECC was limited due to delays in transposition (see above), the BEREC Opinion published in December 2021 focused on the following issues:²¹

- the market and technological developments observed since the entry into force of the EECC in 2018;
- the ability of end-users to make free and informed choices, including on the basis of complete contractual information;
- contract duration and termination, and provider switching;
- effective access to emergency services;
- equivalent access and choice for end-users with disabilities; and
- questions relating to the full harmonisation of end-user provisions.

The European Commission, taking utmost account of the BEREC Opinion, will publish a report on the application of the end-user provisions and submit a legislative proposal to amend the provisions if it considers this to be necessary to ensure that the objectives set out in Article 3 EECC are met.

Geographical survey

Article 22 of the EECC requires BEREC to issue guidelines for conducting geographical surveys of the reach of broadband networks. In March 2020 BEREC published core guidelines on the main elements of the procedures for conducting geographical surveys. In the course of 2020 BEREC produced and consulted on two sets of additional, optional guidelines for competent authorities. BEREC published these two sets of guidelines together with the core guidelines in a handbook in June 2021.²²

The optional guidelines deal with the procedures for identifying planned broadband deployments and with the question of how the data collected for geographical surveys can be verified.

Activities relating to 5G

In the context of information security in 5G networks, BEREC actively supported the legislative process for a revised Directive on Security of Network and Informa-

tion Systems (NIS 2 proposal) and published an Opinion on the proposed NIS 2 Directive in May 2021.²³ BEREC states in its Opinion that sector-specific rules for network and information security have been in place for over ten years; these rules have been incorporated into the EECC and, as an integral part of the regulatory framework for electronic communications, cannot be repealed from the EECC without loss. In addition, the obligations foreseen in the NIS 2 proposal could be disproportionate for some providers, especially small ones.

BEREC organised two workshops in September 2021, which the Bundesnetzagentur attended. The first workshop gave NRAs and other competent bodies the opportunity to share information and views on promoting science-based electromagnetic field (EMF) exposure limits.²⁴ The second workshop created the opportunity for an open dialogue among experts on identifying and presenting the actual availability of 5G services.²⁵

Net neutrality

BEREC published an updated report on the implementation of the Net Neutrality Regulation in 2021.²⁶

In a further report approved in December 2021, BEREC looked at the lessons to be learned from measures taken since the beginning of the Covid-19 crisis to guarantee the continued functioning of communications networks and services.²⁷ The report looks at the measures adopted at national level in the Member States and analyses the impact of the Covid-19 crisis on European telecommunications networks, including the open internet.

Overall, the report finds that the NRAs have sufficient regulatory tools at their disposal to react to such crises adequately, although BEREC's regular reporting mechanism showed that it was not necessary for them to use these tools thanks to the resilience of the networks. Close cooperation between all those involved – NRAs, BEREC, companies, other national authorities and the European Commission – was a core factor contributing to the proven reliability of the communications networks even under the pandemic conditions.

In May 2021 BEREC held a technical workshop on the deployment of Internet Protocol version 6 (IPv6) in

²¹ BoR (21) 177

²² BoR (21) 104

²³ BoR (21) 60

²⁴ BoR (21) 164

²⁵ BoR (21) 163

²⁶ BoR (21) 119

²⁷ BoR (21) 180

Europe, which was attended by representatives from companies, associations and administrations. The objective of the workshop was to share experiences and best practices with the aim of continuing to encourage IPv6 deployment.

EU-wide termination rates

A Delegated Regulation setting single maximum EU-wide termination rates for mobile and fixed calls came into force on 1 July 2021.²⁸ The rules do away with the need for individual approval of the rates by the NRAs.

The distinction between fixed and mobile networks is now based on the number called. The termination rate for fixed calls is 0.07 cents per minute and for mobile calls 0.2 cents per minute. There is a three-year glide path for mobile termination rates to allow for rates to be adjusted gradually to the set maximum rate.

Revision of Commission's Guidelines on State aid rules for broadband networks

The European Commission published its draft revised Guidelines on State aid rules for broadband networks for consultation from 19 November 2021 to 11 February 2022.²⁹ The Guidelines describe the situations in which and the conditions under which the Commission considers State aid for broadband networks to be compatible with EU law.

The Bundesnetzagentur took part in the consultation through its involvement in the BEREC Opinion, which was published on the BEREC website.³⁰

Environmental sustainability

BEREC decided to include environmental sustainability in its work programme in light of the increasing importance of the topic at political level and on the European Commission's agenda. BEREC's first step was to collect information and generate knowledge on the environmental impact of telecommunications and digitalisation.

BEREC held an internal workshop on 5 and 6 October 2020 entitled "Sustainability within the digital sector. What is the role of BEREC?" and published a summary report in March 2021 with the main points of the presentations and discussions.³¹

BEREC commissioned WIK-Consult and Ramboll with an external study on the environmental impact of electronic communications and published the final report in March 2022.³²

BEREC started work on a report drawing on the outcome of the workshop, the findings of the external study, numerous discussions with various stakeholders, and initiatives taken in this area by individual NRAs. The report aims to highlight the potential for action by BEREC and the NRAs in terms of the sustainability of telecommunications and digitalisation. The draft report was put out for consultation from 15 March to 14 April 2022 and is due to be finalised in June 2022.³³

²⁸ (EU) 2021/654

²⁹ https://ec.europa.eu/commission/presscorner/detail/en/IP_21_6049

³⁰ BoR (22) 16

³¹ BoR (21) 39

³² BoR (22) 34

³³ BoR (22) 35

Independent Regulators Group

The Independent Regulators Group (IRG) was established by European regulatory authorities, and its members include non-EU countries such as the United Kingdom and Switzerland.³⁴ The IRG Secretariat based in Brussels provides a direct link between the NRAs and the European/EU administration, enabling a swift dialogue between NRAs and decision-makers and an up-to-date flow of information. IRG provides a forum for NRAs to discuss topics relevant to the telecommunications sector but outside BEREC's statutory mandate.

IRG organises workshops and webinars on these and other "traditional" telecommunications topics, which are frequently attended by high-level representatives from various institutions and research organisations; one such event was a training webinar on network deployment and provisions in the EECC held over several days in autumn 2021. IRG also organised a workshop for the NRAs' heads about potential topics of the future as well as two webinars on full connectivity and artificial intelligence (AI).

IRG also plays a key role in enabling NRAs to share information and experience, which would not be possible in the same way within BEREC because of BEREC's smaller number of members. In 2021 IRG members requested and shared information on specific regulatory issues in more than 100 questionnaires.

IIC International Regulators' Forum

The Bundesnetzagentur joined the International Institute of Communications (IIC), an independent organisation in the telecommunications and media sector, in 2021.³⁵ The Bundesnetzagentur's membership allows it to enter into dialogue with telecommunications regulators across the globe on topical issues in the telecommunications sector, scope for development in the sector, and regulatory strategies and approaches.

The Bundesnetzagentur hosted the IIC's International Regulators' Forum on 4 and 5 October 2021; the two-day meeting with over 100 NRAs was held online as a virtual event due to the pandemic and was chaired by Bundesnetzagentur Vice President Dr Wilhelm Eschweiler. The Bundesnetzagentur was able to draw on its experience in the digital environment, creating a studio set-up for participants with virtual panels and workshops with multimedia elements. The discussions

focused on AI, online platform regulation, secure mobile network evolution (5G/6G, Open RAN) and connectivity.

International spectrum management

ITU Radiocommunication Sector

Work within the ITU Radiocommunication Sector (ITU-R) in 2021 was again shaped by the Covid-19 pandemic, with all meetings being held online in a tight time frame.

Different positions emerged across the issues on the agenda for the World Radiocommunications Conference 2023 (WRC-23). These differences are mainly due to the wide range of user interests represented (for example in the 7 GHz and UHF bands). The use of common technologies (as in the fixed service international mobile telecommunications (IMT) studies) could be binding in the future. However, clear rules are also needed on a global level, including for satellite communications to unmanned aerial vehicles (UAVs) or for the protection of fixed-satellite services (FSS) in the C-band. During the preparations at European level, it was possible to agree on many common approaches or even common positions.

ITU-R is already looking at technological trends for the next decade's generation of mobile communications under the working title of "IMT for 2030 and beyond".

³⁴ <https://www.irg.eu/>

³⁵ <https://www.iicom.org/>

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://www.ecodocdb.dk/home>).

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 2021, alongside responses to the Commission's mandates, included the harmonisation of satellite applications in various bands to enable satellite communications with high data rates and satellite-based Internet of Things (IoT) applications. The activities relating to short range devices (SRDs) included creating a new possibility for the use of high-definition ground-based synthetic aperture radars (HD-GBSAR) in the 76 GHz to 77 GHz band to provide more accurate measurement results.

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 2021 the RSC's work based on the deliverables provided by the ECC in response to mandates included the following:

The rules for mobile/fixed communications networks (MFCN) were supplemented with technology-neutral usage conditions in the 900 MHz and 1 800 MHz bands to enable the deployment of 5G technology (including the use of active antenna systems (AAS)), with the Bundesnetzagentur making a key contribution.

The Commission Implementing Decision (EU) 2021/1067 on the harmonised use of radio spectrum in the 5 945-6 425 MHz frequency band for the implementation of wireless access systems including radio local area networks (WAS/RLANs) means that almost twice as much spectrum is now available for WAS/RLANs and innovative technologies with wider channels such as WiFi 6E can be used.

The Commission Implementing Decision (EU) 2021/1730 on the harmonised use of the paired

frequency bands 874,4-880,0 MHz and 919,4-925,0 MHz and of the unpaired frequency band 1 900-1 910 MHz for Railway Mobile Radio supports the introduction of the Future Railway Mobile Communication System (FRMCS) as a key element of the European Rail Traffic Management System (ERTMS).

The RSC also dealt with the eighth update of the EU-wide rules for SRDs (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 in the development of radio spectrum policy, involved supporting the Federal Ministry of Transport and Digital Infrastructure, which chaired the RSPG in 2021, and providing substantial input for various opinions (Opinion on the role of radio spectrum policy to help combat climate change, Opinion on the targeted consultation on the 2030 Digital Compass, Opinion on a Radio Spectrum Policy Programme (RSPP), Interim Opinion on WRC-23, Opinion on the application of EEC Article 28(3) in relation to cross-border interference problems between Italy and Croatia in the UHF band, Opinion on Additional spectrum needs and guidance on the fast rollout of future wireless broadband networks, Opinion on Spectrum Sharing – Pioneer initiatives and bands) and reports (Report on the role of radio spectrum policy to help combat climate change, Report on Spectrum Sharing – A forward-looking survey).

The Bundesnetzagentur also took an active part in the Peer Review processes, which allow Member States to share documents and experience about national spectrum awards and authorisations (<https://rspg-spectrum.eu/rspg-opinions-main-deliverables>).

Strong postal markets

The postal sector plays a major role in ensuring that the population has reliable postal services. Supply structures and logistics processes help to sustain basic economic and social activities. The Covid-19 pandemic illustrated this in a distinctive way.

Contents

Market trends	110
Consumer protection and advice	120
Rulings, activities and proceedings	130
International cooperation	134





The past year demonstrated that the postal service is resilient and capable of adjusting quickly to changing conditions. E-commerce, and with it the volume of parcels, has seen unprecedented growth during the pandemic, and parcel companies are forecasting that the growth will continue. The sector is faced with complex challenges to find permanent solutions for handling the high volume. Topics such as "modern inner city logistics", "sustainability" and "new delivery concepts" are more pressing than ever. By contrast, the letters market is characterised by declining volumes. Electronic alternatives such as email, messaging services and online portals will likely continue to strongly impact letter volume trends. The same also applies in respect of public administration initiatives to provide more and more administrative services online.

In spite of declining volumes, the letter nevertheless remains very important as a guarantee of confidential communication.

In the year under review German legislators made changes to the Postal Act that placed price regulation on a legally secure basis in accordance with the Federal Administrative Court's requirements. German lawmakers also strengthened consumer protection by requiring postal companies to participate in extrajudicial dispute resolution procedures.

Market trends¹

Strongly diverging trends continue to emerge in the postal markets as a result of the digital transformation. E-commerce growth and a rise in parcel volumes were further accelerated by the coronavirus pandemic, while letters volumes and revenues continued to decline.

Markets in the postal sector

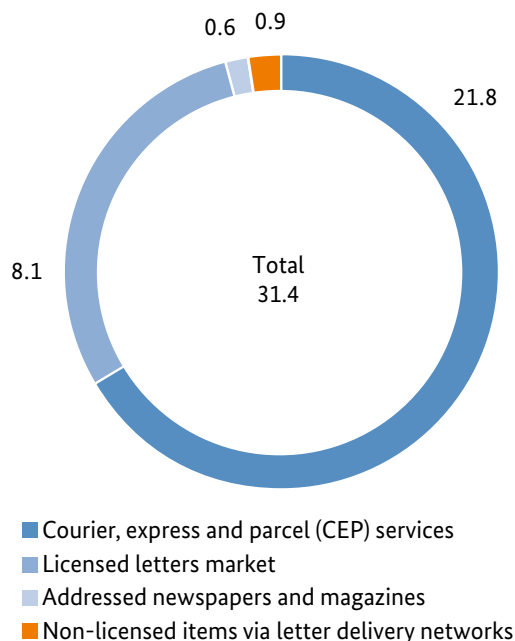
Market trends in the postal sector

The markets in the postal sector comprise courier, express and parcel (CEP) services, the (licensed) conveyance of letters weighing up to 1,000 grams, the delivery of addressed newspapers and magazines (press distribution), and the (non-licensed) conveyance of other postal items, usually via letter delivery networks.

In 2020 revenues in the postal markets totalled €31.4bn, marking an increase from the previous year (€27.6bn) of just over 14%. The parcels market contributed significantly to this increase. Revenues in the CEP market rose by around 19.25% from €18.28bn in 2019 to €21.8bn in 2020. The coronavirus pandemic boosted the trend toward e-commerce and thus there was a large increase in parcel volumes.

The letters market again saw trends in the opposite direction, with licensed letter mail revenues falling by 0.82% from approximately €8.14bn in 2019 to around €8.08bn in 2020. The overall economic downturn due to measures taken to combat the pandemic also led to a significant decline in volumes.

Revenues in the postal sector markets 2020* (€bn)



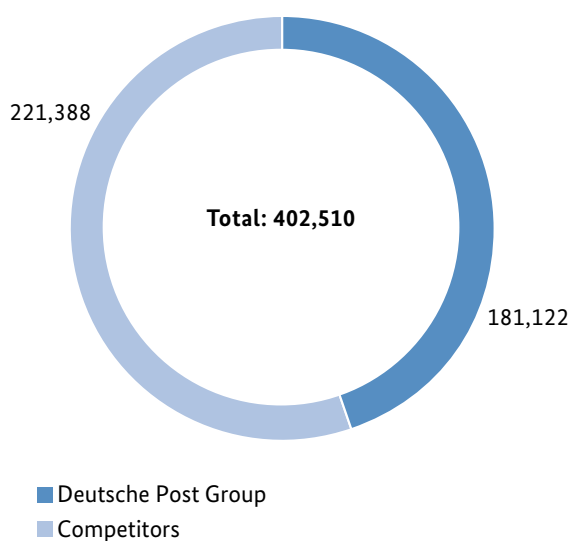
Overall positive postal sector market trends are nevertheless expected to continue in 2021.

¹ Market trends are presented using revenue and volume figures. The absolute figures have been rounded. The percentages have been calculated using non-rounded revenue and volume figures for reasons of accuracy. The figures in the text, charts and tables may therefore differ.

Employment trends

In 2020 a total of 402,510 people were employed in the postal markets. This figure comprises employees providing services in postal matters in Germany plus the estimated number of employees at subcontractors. It does not include employees performing tasks other than postal services in the companies or employees who work outside of Germany for service providers that are registered in Germany.

Employees in the postal markets 2020
(as at 30 June 2020)



The number of employees is expected to have risen in 2021, in part due to the developments in e-commerce, which has seen significant growth in revenues and volumes, especially in the parcels market.

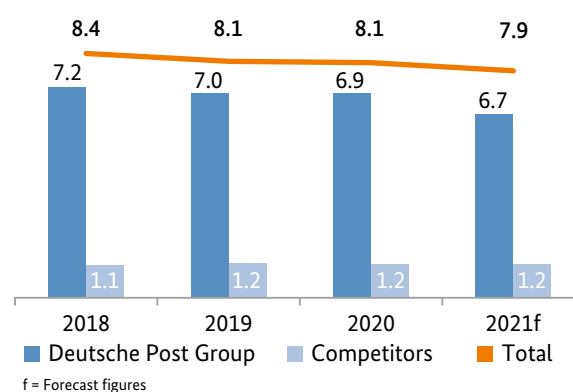
No distinction is made between employees in the letters and the CEP markets. The convergence of letter and parcel delivery services (in particular because of joint deliveries and smaller parcels that fit through letterboxes) makes it increasingly difficult to distinguish clearly between the employees in the two markets.

Letter services

Revenues

Licensed letter services (letters up to 1,000 grams) reported a further decline in revenues from about €8.14bn in 2019 to €8.08bn in 2020. Decreasing revenues are expected in 2021 across the licensed market.

Licensed letters market revenues by provider group
(€bn)



The competitors to Deutsche Post Group in the licensed letters market again reported revenues of around €1.19bn for 2020. The competitors thus recorded a larger revenue increase for 2020 than for 2019 and they expect slight declines in revenue for 2021.

Deutsche Post Group achieved revenues in the licensed letters market of around €6.89bn in 2020, a decline of 1.46% on the figure of €6.99bn for 2019. A further decline in revenues has been forecast for 2021.

The small shift in the revenue-based shares in the licensed letters market in recent years continues. The overall share of Deutsche Post Group remained virtually constant in the reporting period, falling from 85.9% in 2019 to 85.3% in 2020. The revenue-based market share of Deutsche Post Group's competitors consequently increased from around 14.1% in 2019 to around 14.7% in 2020.

Revenue-based shares in the licensed letters market by provider group
(%)

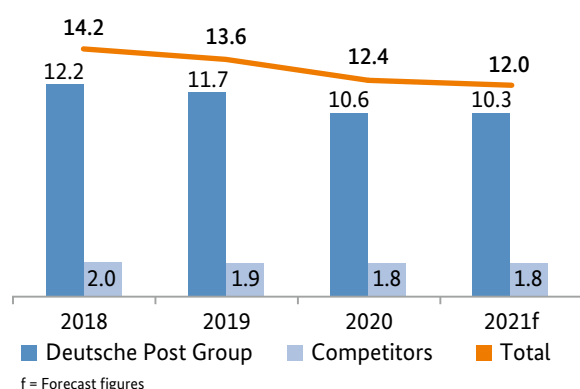
Year	2018	2019	2020	2021f
Deutsche Post Group	86.5	85.9	85.3	85.2
Competitors	13.5	14.1	14.7	14.8

f = Forecast figures

Volumes

The total volume in the licensed letters market fell by around 8.9% from 13.58bn items in 2019 to 12.37bn in 2020. At Deutsche Post Group the volume fell by 9.43% from around 11.69bn items in 2019 to approximately 10.59bn in 2020. Volumes for its competitors also fell. The number of items the competitors conveyed in 2020 was around 1.79bn.

Licensed letters market volumes by provider group
(bn items)



For 2021 Deutsche Post Group and the competitors expect a decline in volumes.

Volume-based shares in the licensed letters market by provider group
(%)

Year	2018	2019	2020	2021f
Deutsche Post Group	85.9	86.0	85.5	85.4
Competitors	14.1	14.0	14.5	14.6

f = Forecast figures

Deutsche Post Group continues to dominate the licensed letters market. On account of its high volume-based share of just under 85.5% in 2020, no fundamental shift in market shares in favour of the competitors is expected in the future despite the decline in volumes. Forecasts for 2021 show an increase in the competitors' volume-based share to about 14.6% and therefore a decrease in Deutsche Post Group's share to 85.4%.

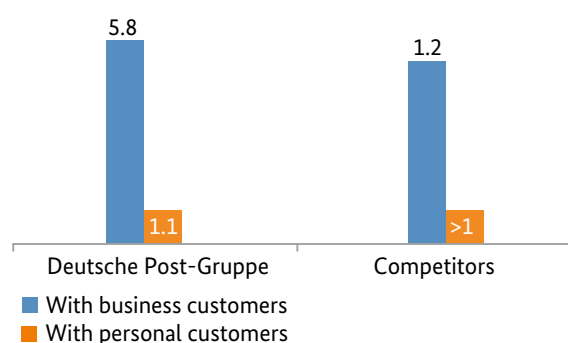
Customer structure in the licensed letters market

As in past years, the competitors to Deutsche Post Group offer their services primarily to business customers. Both in terms of revenue and volume, the average share of business customers for the competitors in this segment in 2019 and 2020 was 98%. Most of the competitors also indicated that they work exclusively for business customers, which means that nearly

all mail services for personal customers were provided by Deutsche Post Group.

Deutsche Post Group's overall percentage of total revenues in 2020 from the business customer segment was around 84% and comprised approximately 92% of its volume. Letter-post items from personal customers and microenterprises thus accounted for around 8% of Deutsche Post Group's volume and roughly 16% of its revenue.

Revenue in 2020 by contracting entity
(€bn)



National stamp prices

In 2021 Deutsche Post AG's standard letter stamp price was €0.80. The price had been approved by the Bundesnetzagentur with effect until 31 December 2021. The newly approved price of €0.85 has been in effect since 1 January 2022. Since being introduced in 2016 the letter price increase has at times been considerably higher than the increase in the consumer price index. With the postal charges unchanged

between 2016 and June 2019, the difference between the general consumer price index and the letter stamp price index narrowed to three points, but the gap widened to 118.5 points on account of the price increases approved with effect from 1 July 2019 and has continued into the first half of 2021.

Deutsche Post AG stamp prices for letters* from 2010 to 2019 (€)

Year	2010–2012	2013	2014	2015	2016–2018	since 2019**
Standard letter up to 20 g	0.55	0.58	0.60	0.62	0.70	0.80
Compact letter up to 50 g	0.90	0.90	0.90	0.85	0.85	0.95
Large letter up to 500 g	1.45	1.45	1.45	1.45	1.45	1.55
Maxi letter up to 1,000 g	2.40	2.40	2.40	2.40	2.60	2.70
Postkarte	0.45	0.45	0.45	0.45	0.45	0.60

* On 1 January of each year

** as from 1 July 2019

European stamp price comparison

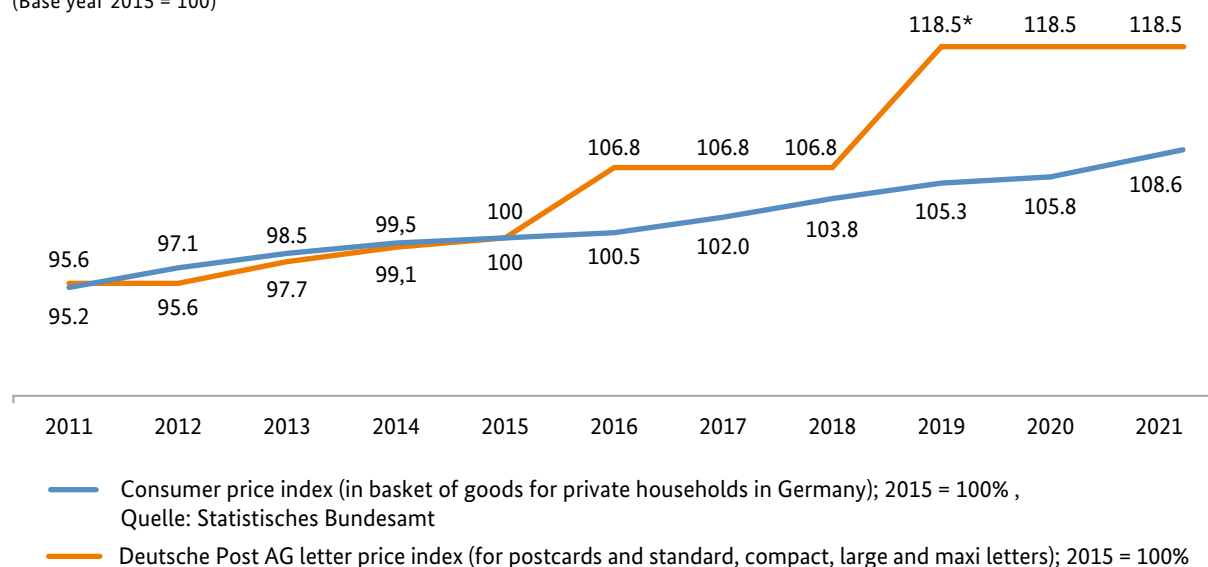
In April 2021 the Bundesnetzagentur again published a comparison of the prices for standard, compact, large and maxi-size letters for personal customers of Deutsche Post AG. The prices were compared with those for comparable products offered by the universal service providers in other European countries. The comparison covered a total of 31 different European countries.

Bundesnetzagentur's publication showed nominal and real prices (inflation-adjusted) and also differentiated between listed and non-listed companies.

Deutsche Post AG's prices are frequently below the European average. The prices for large and maxi letters are well below the European average, with a price difference of €1.43 and €1.49 respectively.

In many countries, unlike in Germany, there are two 20 gram (inland) letter products – premium with D+1 delivery and standard with D+X delivery – which were therefore taken separately in the comparison. The

General price trend and Deutsche Post AG letter prices (Base year 2015 = 100)



* Price increase as from 1 July 2019

Courier, express and parcel (CEP) services

Revenue trends of the individual CEP market segments varied in the reporting period. While revenue in the parcels market saw strong growth through the effects of the Covid-19 pandemic, developments in the courier and express markets were much more moderate.

The majority of items in the CEP market are parcels. Only a comparatively small proportion are express items, although the relative revenue for these items is considerably higher. This is reflected in much higher unit revenues for express services when comparing revenues and volumes for the individual segments.

Parcel services made up around 72% of revenues (2019: around 66%). The express market generated 10% of revenues (2019: around 13%) and the courier market around 18% (2019: around 21%).

Revenues

In 2020 total revenues in the CEP market amounted to €21.8bn. Courier services accounted for around €4.0bn and express services for €2.2bn. Parcel services (domestic and international parcels) again made up the largest share of revenues in the CEP market in 2020 at €15.61bn. For 2021 a continued increase of overall revenues in the CEP market is forecasted.

Volumes

In 2020 a total of around 3.82bn express and parcel items were conveyed. This represents an increase on the previous year (2019: 3.18bn items). As with revenues, volumes continued to follow the upward trend of previous years. Total parcel volumes increased from 3.06bn items in 2019 to 3.70bn in 2020. The forecast for 2021 shows that volumes for parcel items will continue increasing. Again in 2020, express volumes were largely unchanged from the previous year.

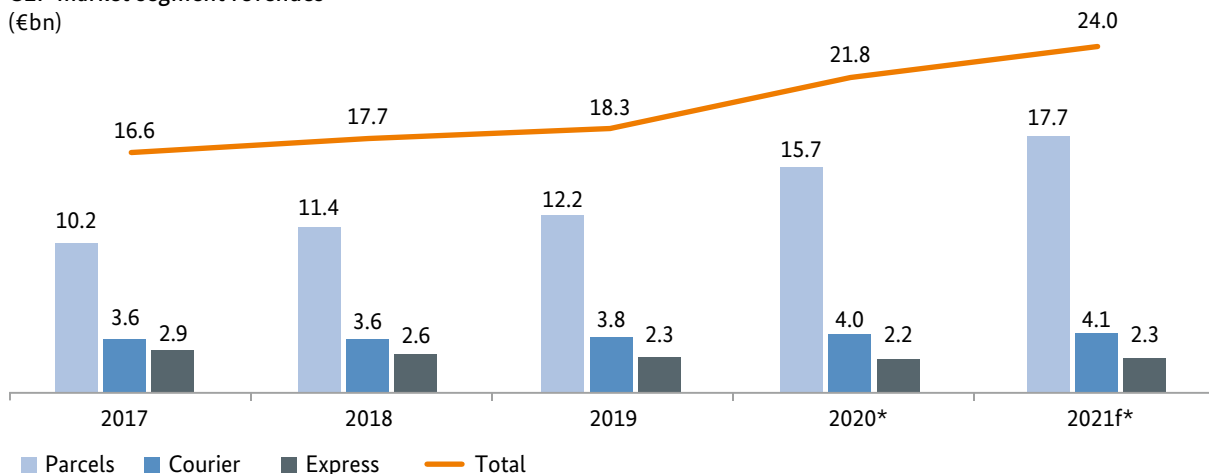
The volume of items in the courier market cannot be determined as for the parcels or express market. Courier service providers do not always record individual items but rather the number of journeys made, hence no figures for volumes in the courier market are included here.

Parcel services

The positive economic development in the parcels market was further accelerated by the coronavirus pandemic. The strong rise in parcel volumes is driven by e-commerce within Germany. In 2020 total revenues in the parcels market (domestic and international parcels) amounted to €15.61bn, which was around 28.23% more than in the previous year. In 2019 parcel revenues had totalled €12.17bn.

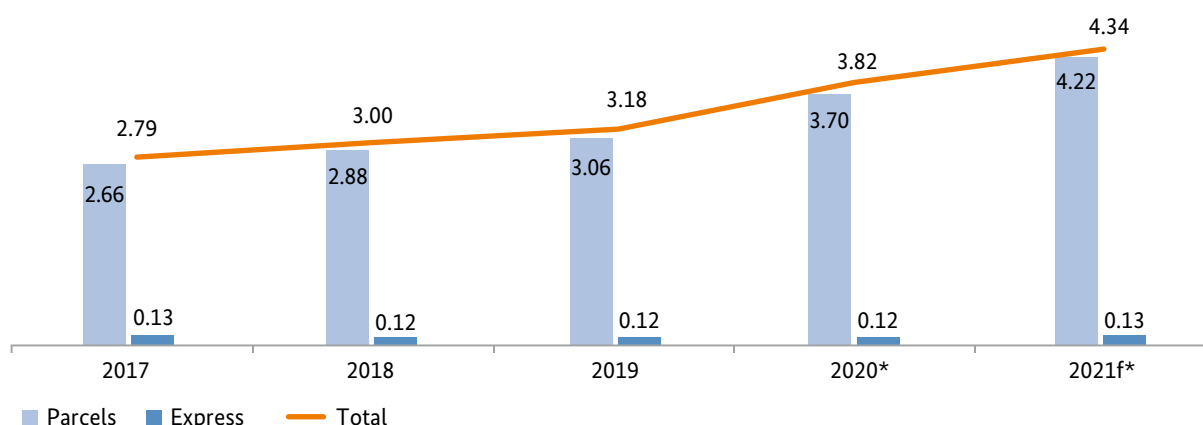
Parcel operators forecasted total revenues across the parcels market (domestic and international parcels) to grow substantially in 2021 by almost 13% to nearly €17.67bn.

CEP market segment revenues
(€bn)



*Updated figures based on new market data
f = Forecast figures

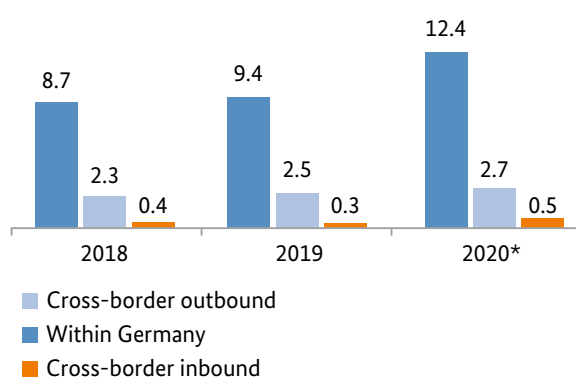
Parcel and express volumes (bn items)



* Updated figures based on new market data
f = Forecast figures

Domestic parcels made up 80% of total parcel revenues in 2020. International parcels comprised 20% of total revenues, of which 17% were outbound and 3% were inbound. Most of these revenues were from the conveyance of parcels to and from EEA (European Economic Area) countries.

Revenue-based shares in the parcels market (domestic/cross-border) (€bn)



*Updated figures based on new market data

National parcel price comparison

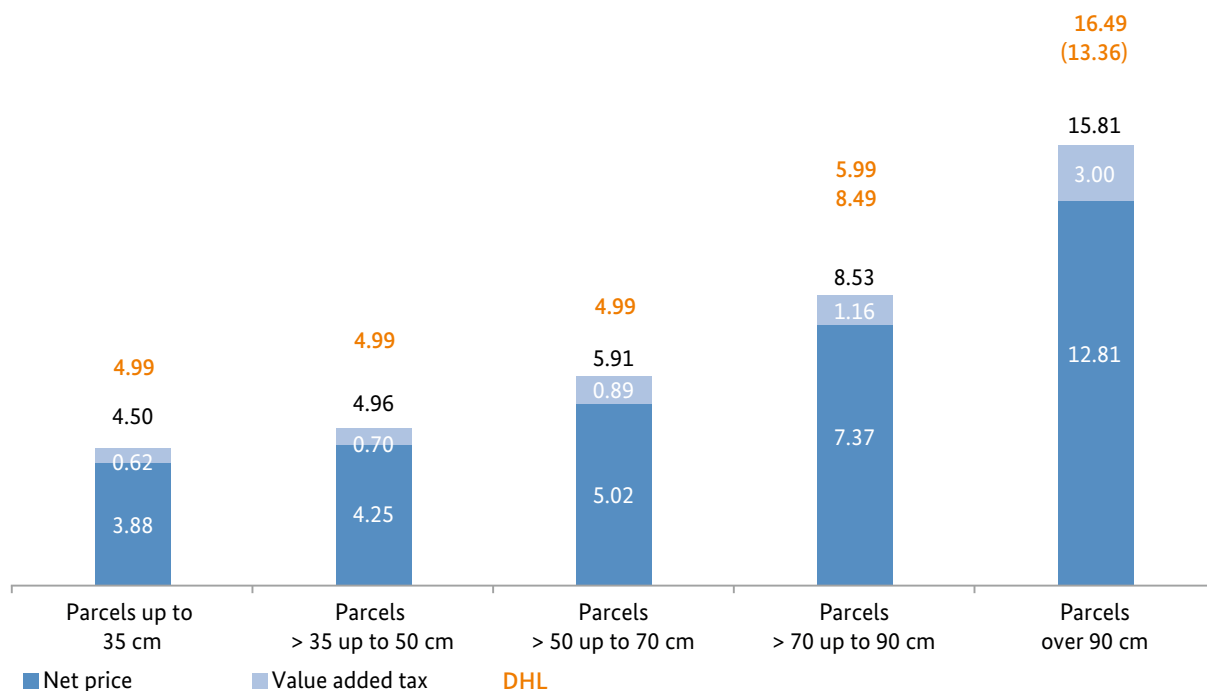
The Bundesnetzagentur updated its report on parcel prices in Germany and other European countries in December 2021. For the first time the conveyance of international parcels was included in the national parcel price comparison. Parcels to Germany's direct neighbours with the exception of Switzerland were compared, including Austria, Belgium, the Czech Republic, Denmark, France, Luxembourg, the Netherlands and Poland.

The comparison of parcel prices covers the largest parcel operators on the German market whose standard services include parcel delivery for personal

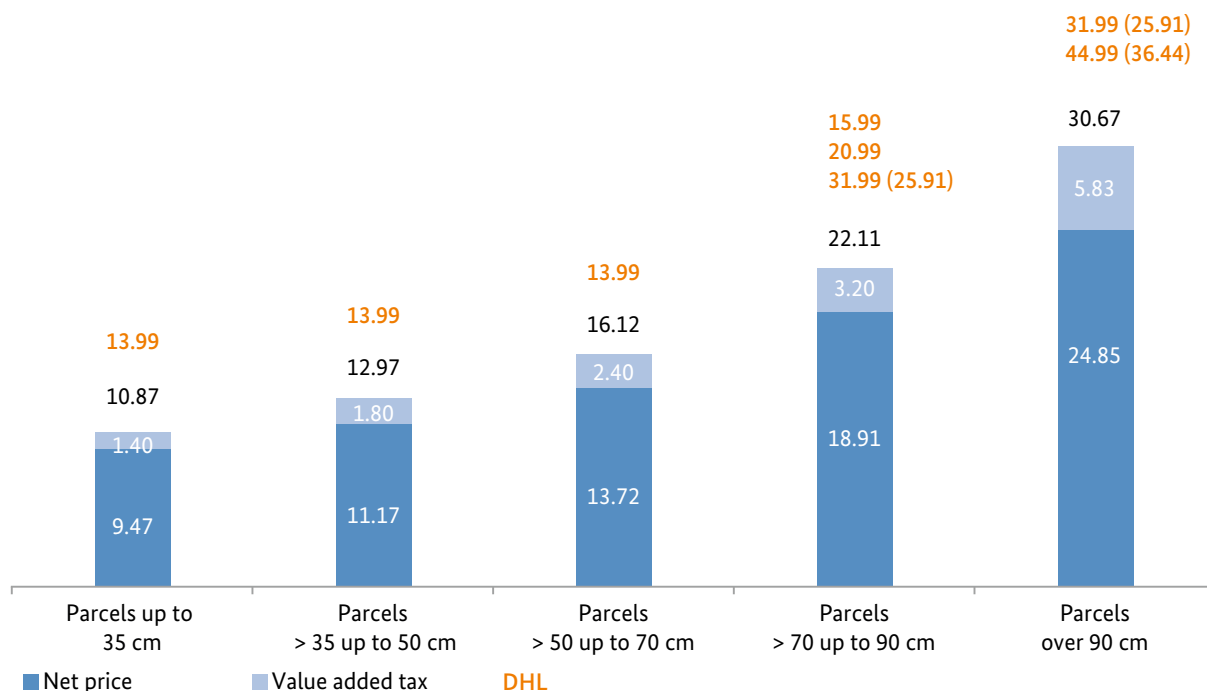
customers (Deutsche Post DHL, DPD, GLS, Hermes). The analysis focuses on standard parcel delivery services; in the case of DHL these services mainly comprise the universal service products. The companies have different definitions for the products covered in the comparison. While DHL has different prices for different combinations of weights and sizes, the other companies have different prices for different sizes. The prices were compared using the "sum of the longest and the shortest side" as a criterion. This made it possible to break down the products into five groups.

Deutsche Post DHL product prices for international parcels with online franking are also both above and below the determined averages.

Average (online franking) prices in euros



Average (online franking) prices in Austria as an example in euros



International parcel price comparison

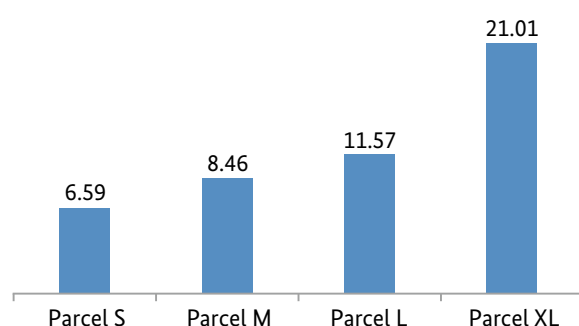
The international parcel price comparison covered the inflation-adjusted over-the-counter prices of the universal service providers in 31 European countries. The comparison was based on the German universal service provider's products. Product groups were formed using the products comparable with each of Deutsche Post DHL's four parcel products – S, M, L and

XL – in each country. Some products in the other countries are comparable to more than one of DHL's products because of differences in size, weight and delivery speed.

Deutsche Post DHL's prices (Parcel S: €4.92, Parcel M: €7.39, Parcel L: €9.36, Parcel XL: €16.42) are all lower

than the European average. (Parcel S: €6.59, Parcel M: €8.46, Parcel L: €11.57, Parcel XL: €21.01.

International average prices by product group (€)



Courier and express services

Both the courier and the express services market profited during the reporting period from the boom in e-commerce. Even though the core of courier and express services is normally B2B delivery and that segment actually experienced declining revenues and volumes due to the pandemic-related economic decline in 2020, overall revenues and volumes remained more or less at the previous year's level.

The reason for this may be that growth in e-commerce, mostly in the business to consumer (B2C) segment, compensated for the stagnation in the B2B segment that was caused by the pandemic since the share of B2C deliveries is also on the rise in the courier and express services market due to special customer needs such as same-day delivery.

Express service revenues amounted to €2.2bn in 2020. Courier service revenues increased by 4.7% compared with the previous year to slightly less than €4bn in 2020.

Market structure and competition

Although the structures of the individual markets in the CEP sector vary widely, it is becoming increasingly difficult to draw clear lines between them or examine them separately. The courier services market is characterised by a large number of small operators, mostly sole proprietorships and mostly regional operators. Some of the operators (such as GO! and inline Kurierdienst) work in large networks. The German courier services market is generally seen to be a saturated and fully segmented market. Courier services mainly operate in the B2B (business to business) segment. Customer demand for same-day delivery of goods bought online is opening up opportunities for courier services to operate in the B2C segment.

Express services are provided in Germany by global operators (such as Deutsche Post DHL, UPS and FedEx) as well as national operators (medium-sized businesses) that sometimes work in partnership with other operators (such as GEL and GO!). Additional potential for growth is being created by e-commerce and the associated increase in demand for express services in the B2C segment.

The national parcels market is largely characterised by competition. Although the market has recently recorded particularly high growth rates, from which most of the parcel operators have benefited, there is still a large gap between the market leader and the next biggest competitor in terms of their revenue-based shares in the market.

Alongside the five major operators – Deutsche Post DHL, DPD, GLS, Hermes and UPS – Amazon Deutschland Transport GmbH made its way into the 5%-15% range for the first time in 2020. More detailed information about the impact of Amazon's activities on the parcels market is available in the 2020/2021 Activity Report for the postal sector. There are also several smaller providers in the market that individually have significantly less volume and revenues in the parcels market.

Share of domestic and international parcels in the CEP market in 2020

>40%	DP DHL				
5 - 15%	Amazon Deutschland Transport GmbH	DPD Deutschland GmbH	General Logistics Systems Germany	Hermes Germany GmbH	UPS Management LLC
<2%	other competitors				

The companies are listed in the table in alphabetical order.

Market access

Licensing

During the period from 1998 to 2021, the Bundesnetzagentur issued around 3,250 licences to sole proprietorships, business partnerships and corporations for the conveyance of letters weighing up to 1,000 grams. The number of new licences issued in 2021 was 38 (2020: 33). A total of 14 licensed operators exited the market in 2021 because their licences expired or they returned them (2020: 40). In spite of the economically difficult climate that has resulted from the Covid-19 crisis there has been a slight increase in the number of new licences issued since 2019. By contrast the number of operators exiting the market has decreased sharply since 2019. The total number of valid licences on 31 December 2021 was 1,131.

Electronic licence application

Since 2019 service providers have had the option to apply for a licence online. This option has been very well received by applicants though it has not yet replaced the paper application. Around two thirds of the applications received in 2021 were submitted using the online form.

Regulatory offence proceedings

Fines can be imposed for various breaches of the provisions of the German Postal Act (PostG). The most common regulatory offence is failing to give notice of the provision of postal services, followed by conveying letters without a licence. There were 10 cases where either warnings or fines were issued, which is less than half as many as in 2020 (24 penalised offences). Due to the Covid-19 crisis fewer external audits were conducted where violations could have been identified. There were a total of nine violations of the obligation to give notice and one violation of the licence requirement.

Bulk mailers and mail consolidators

In 2021 the Bundesnetzagentur again published its report on the conditions and rates for bulk mailers and mail consolidators. The report in particular presents the rate trends for large volume mailers and consolidators, the conditions for Deutsche Post AG's basic products for partial service items, and the structures and players in the business customer segment.

The 2021 report provides updated figures and has been published on the Bundesnetzagentur website.

Rates for bulk mailers and consolidators (with maximum refund) 2021

	Postage	Refund by type of posting		Refund for infrastructure services	Partial service rate by type of posting including refund for infrastructure services	
		Outgoing	Incoming		Outgoing	Incoming
Standard letter	0.800 €	41%	44%	5%	0.432 €	0.408 €
Compact letter	0.950 €	33%	36%	5%	0.589 €	0.561 €
Large letter	1.550 €	31%	34%	5%	0.992 €	0.946 €
Maxi letter	2.700 €	29%	32%	5%	1.782 €	1.701 €
Postcard	0.600 €	41%	44%	5%	0.324 €	0.306 €

Postal secrecy, postal market checks and notification obligation

The Bundesnetzagentur maintains records of the persons and companies that are subject to the Postal Act (PostG) notification obligation. Operators of licence-exempt postal services are required to notify the regulatory authority in writing and within one month when they commence, change or cease operations.

This includes, for example, activities in the parcels market or as subcontractor in the letters and parcels sectors. The records are mainly of small and medium-sized businesses and also frequently of individual courier drivers, for some of whom it is a second job for additional income. Hence the market is characterised by a very small-scale provider structure for postal services with a notification obligation. There is typically a lot of fluctuation in market participants and many microenterprises are actually not aware of the

notification obligation under the PostG, so they submit their notification later when the Bundesnetzagentur learns that the company exists.

Postal market checks regularly conducted by the Bundesnetzagentur deterred negligence, provided information for market participants and helped to maintain an overview of this heterogeneous market. The number of postal service companies notified to the Bundesnetzagentur increased during the reference period and at the end of 2021 there were around 68,000 active postal operators that had notified their services to the Bundesnetzagentur.

In the course of the checks anomalies were revealed at one postal service provider regarding the handling of mail items where delivery had failed. The mail items were relabelled so that they could be held for collection at a company location. The new label designated the collection location as the new recipient. Such an action frequently constitutes a breach of postal secrecy if the recipient has not agreed to the use of the collection location as a substitute recipient.

The Bundesnetzagentur strongly advised the provider to change the labelling so as to ensure that the recipient is clearly identified.

In 2021 the Bundesnetzagentur processed approximately 150 complaints about breaches of postal secrecy. Thus the number of complaints returned to the 2019 level following an increase in 2020. Most of the complaints, as in the previous year as well, involved wrongly delivered letters where mail was delivered to the wrong address within the correct street or residential area. Whenever necessary the Bundesnetzagentur notifies the service provider that they have repeatedly delivered to a wrong address, warns that such errors in letter delivery should be eliminated and thus works toward an immediate improvement in the delivery situation.

Consumer protection and advice

The number of complaints has fallen significantly, though they began rising again as from November. Complaints covered all the postal operators. The proportion of parcel complaints about Deutsche Post DHL's competitors increased again this year. The number of dispute resolution requests more than doubled.

Consumer advice

In 2021 the Bundesnetzagentur's postal consumer advice team was again a frequent point of contact for customers whose complaints had not met with a satisfactory response or any response from their postal operator. The complaints show that operators did not always adequately deal with customers' questions and criticisms.

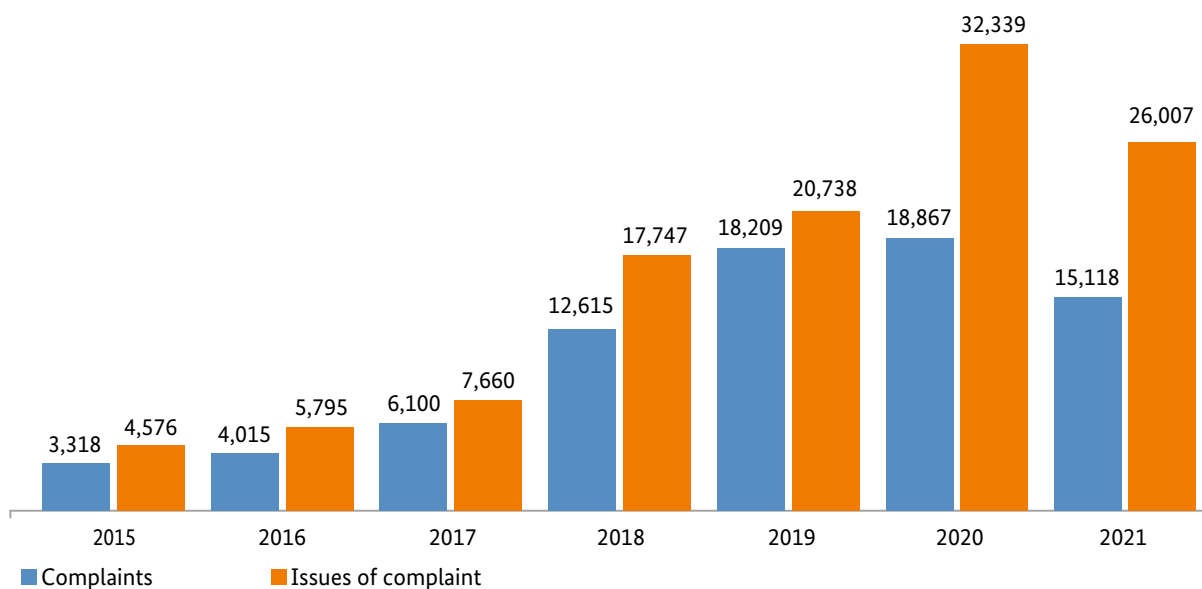
The Bundesnetzagentur regularly assesses the complaints it receives. If a large number of anomalies occur in a certain region or if those anomalies have a common theme, the Bundesnetzagentur will undertake an investigation of the postal operator in question.

Complaints

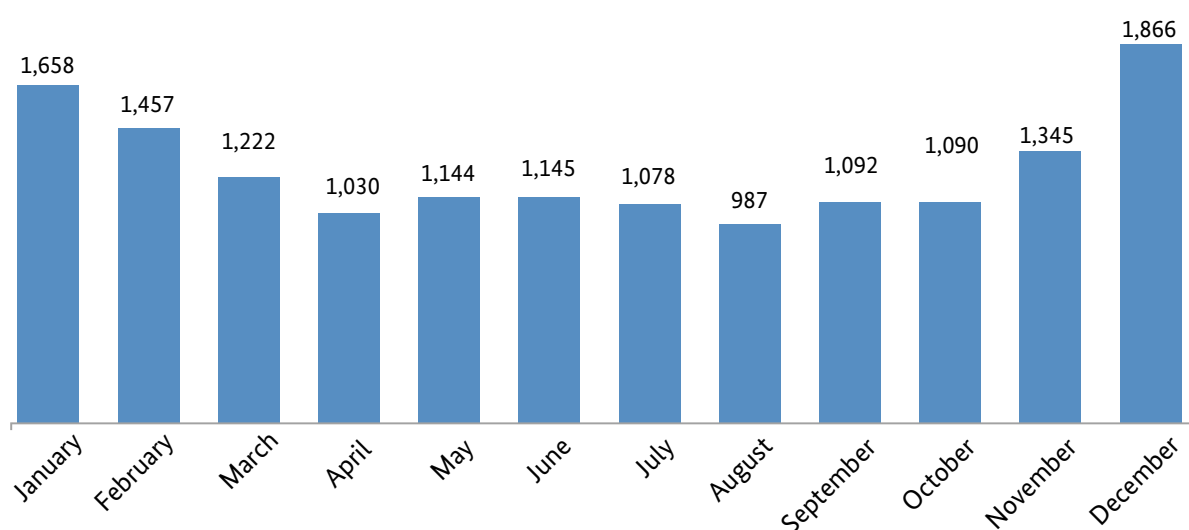
Up to the end of December 2021, the postal consumer advice team received 15,118 complaints, compared to 18,867 in 2020. This represents a decrease of nearly 20%. However, the number of complaints in December 2021 (1,886) was higher than in December 2020 (1,701).

The number of complaint issues in 2021 differed again noticeably from the number of complaints (a complaint often comprises more than one issue). One reason for this discrepancy is that most complaints (81%) are now submitted using the online form and the form contains a list of the most common complaint issues, which the complainant can simply select.

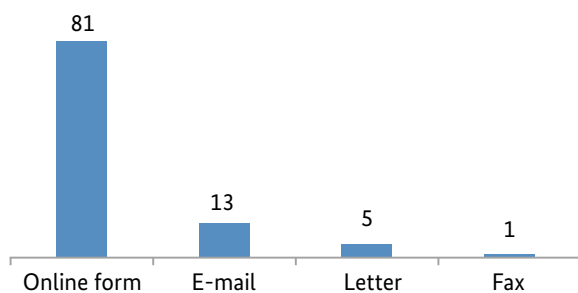
Complaints and issues of complaint 2014 - 2021



Complaints per month 2021



Complaints by input channel 2021 (%)



The number of complaints made by telephone decreased by about 29% year-on-year from 3,859 in 2020 to 2,738 in 2021.

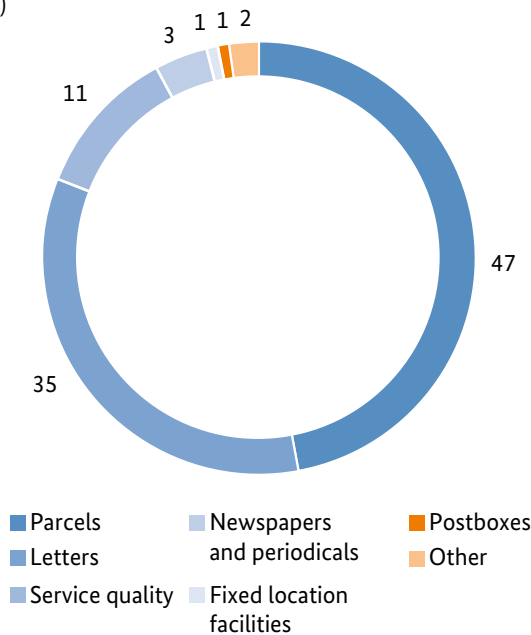
The most common reason for complaint to the Bundesnetzagentur was problems with letter and parcel deliveries. Postal operators did not appear capable of consistently implementing and guaranteeing the promised service across Germany. This was the case in particular with Deutsche Post AG.

Complaint issues

Letters and parcels

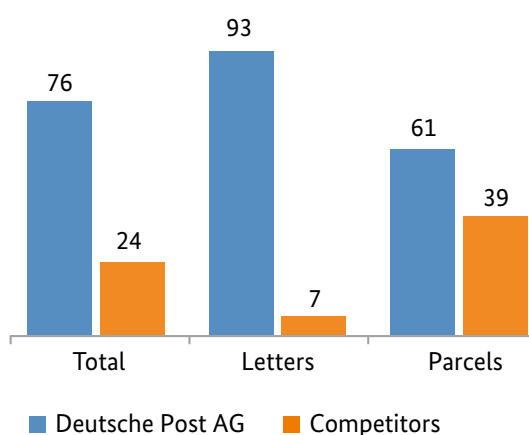
The percentage breakdown of the reasons for complaints in 2021 was similar to the previous year. Parcel services were the most common cause of criticism, comprising nearly 50% of complaints and again topping the list of all complaint issues. Similar to the previous year 35% of all complaint issues related to letter services.

Breakdown of complaint issues 2021
(%)



Around 39% of the parcel service complaint issues related to Deutsche Post DHL's competitors, compared to 27% in 2020. The 12% increase can be attributed to some extent to the continued growth in e-commerce.

Complaint issues by operator 2021
(%)



A total of 93% of complaint issues concerning letter services related to Deutsche Post AG. This percentage is slightly lower than in 2020 (95%).

Parcel complaints

Lack of quality in delivery speed was the most common cause of complaints (75%) in parcel services in 2021. Another criticism was that no attempt was made to deliver a parcel at the customer's address. Instead the parcel was left at another address or taken to a collection point for collection.

Letter complaints

Delivery was again the focus of complaints about letter services in 2021 (66%). Criticism was levelled primarily at repeatedly late delivery and at a lack of delivery occurring over a period of days.

Investigations

The Bundesnetzagentur began carrying out investigations in October 2020. If the postal consumer advice service finds anomalies in the course of its quality monitoring, sees a large number of complaints from one region or postal code area or notices a common theme to any irregularities, it will call on the postal operator in question to restore and permanently ensure the legally required quality.

In the reporting period, 20 investigations were conducted following a large number of complaints relating to 17 different postcode regions. The investigations all stemmed from complaints about letter deliveries by Deutsche Post AG. According to the company, the quality deficiencies were due largely to staffing shortages, interruptions in delivery caused by increasing parcel volumes and Covid-19 related reorganisation.

Details of the investigations are published by the postal consumer advice service and grouped by year on the Bundesnetzagentur website at

www.bundesnetzagentur.de/DE/Vportal/Post/Aufgaben-Massnahmen/start.html.

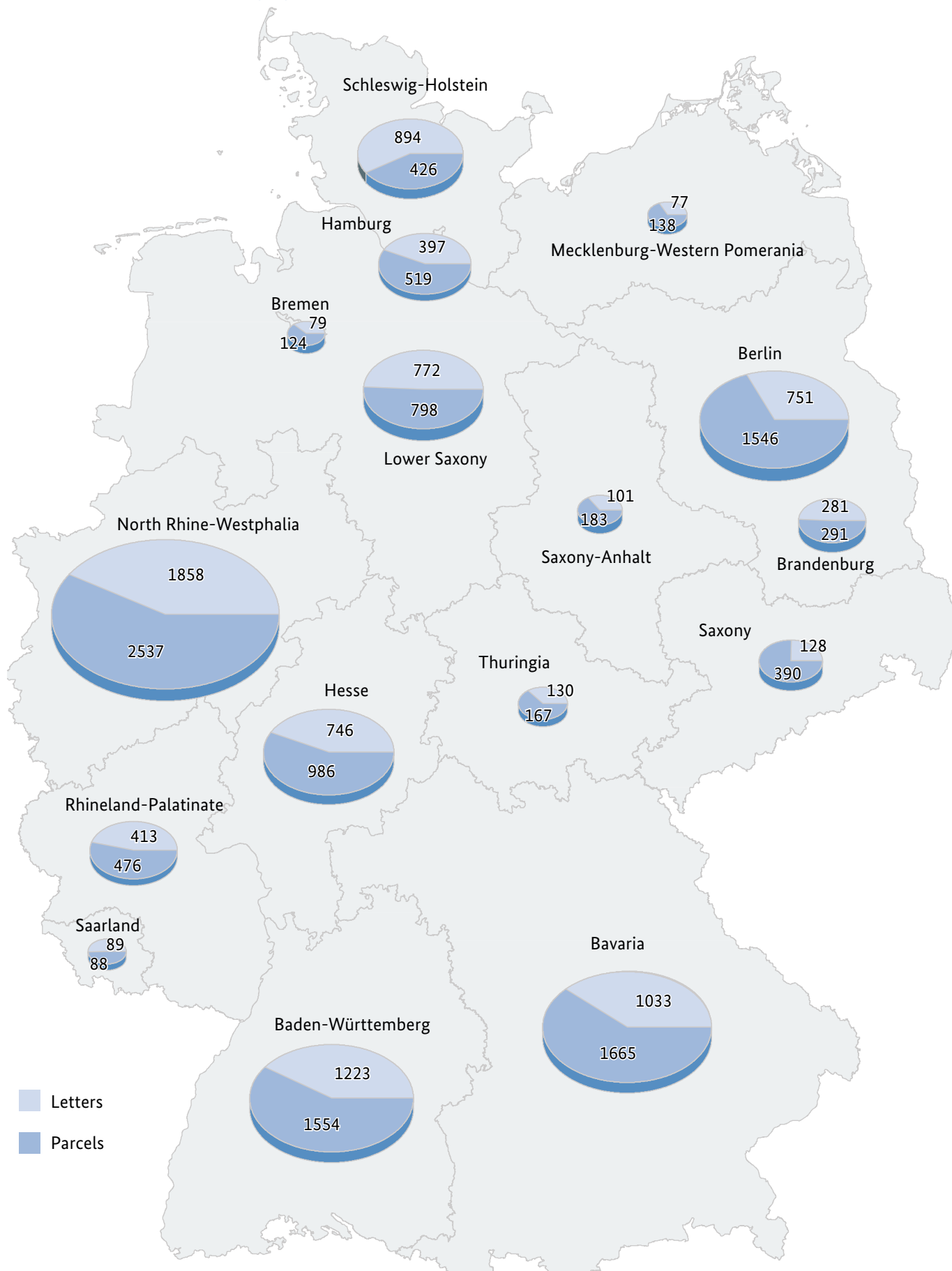
Complaints in federal states and routing regions

As in previous years, North Rhine-Westphalia had the most complaints of all the federal states in 2021, followed by Bavaria and Baden-Württemberg. Parcels and letters accounted for the vast majority of the complaints.

The routing regions with the most complaints in 2021 were in and around Berlin and in Hamburg and the surrounding area.

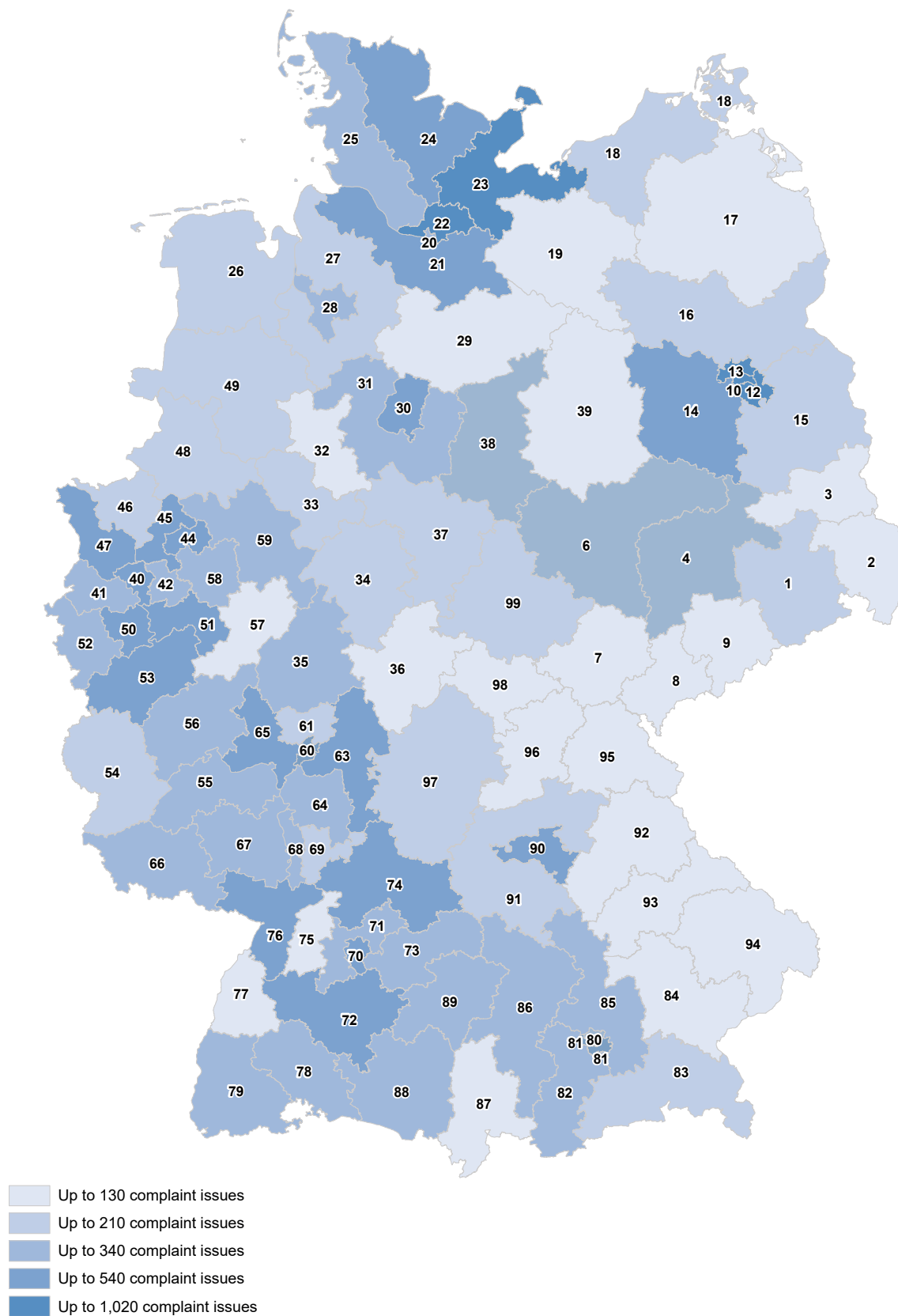
The routing regions with the most complaints are in Berlin, Hamburg and the surrounding area and routing regions in Schleswig-Holstein and Mecklenburg-Western Pomerania, followed by routing regions in the

Complaint issues by routing region 2021



Rhineland and the Ruhr region. As was the case in 2020, Germany's southern federal states and their routing regions are not in the top 10.

Complaint issues by routing region 2021



Top 10 regions for complaints

Routing region	Region	Complaint issues
10	Berlin	1.010
12	Berlin	836
22	Hamburg and the surrounding area	832
13	Berlin	717
23	Lübeck, Bad Segeberg, Wismar, Mölln	660
24	Kiel, Flensburg, Schleswig, Neumünster	553
21	Hamburg	536
50	Cologne (west of the Rhine) and the surrounding area	525
45	Essen, Mülheim an der Ruhr, Recklinghausen, Gelsenkirchen	513
44	Bochum, Dortmund, Herne and the surrounding area	489

Universal service/ basic provision of postal services

The legislator has set minimum standards for basic postal service provision (universal service) to secure the provision of general interest services in the postal sector. The Postal Universal Service Ordinance (PUDLV) specifies the content and scope of the basic provision of postal services (universal service). The ordinance also defines certain quality standards for letter and parcel services, and specifies in particular the frequency and modalities of delivery, the number and distribution of post offices or postal retail outlets (fixed location facilities) and postboxes, and the average transit times for letters and parcels. Deutsche Post AG has undertaken to ensure provision of the legally required universal service.

The statutory requirements have been published on the Bundesnetzagentur's website.

The Bundesnetzagentur's role

The Bundesnetzagentur checks compliance with the legal requirements for the provision of postal services and for this purpose analyses a vast amount of data on quality criteria (eg transit times, post offices, postboxes) as part of regular monitoring. Selected information is published on the Bundesnetzagentur website.

If the Bundesnetzagentur finds through its quality monitoring and a large number of complaints that there are anomalies, it will call on the postal operator in question to restore and permanently ensure the legally required quality.

Letter delivery/transit times

Measured transit times for letters delivered by Deutsche Post AG are presented to the Bundesnetzagentur on a quarterly basis. An external independent quality and market research institute certified by TÜV Rheinland conducts the measuring in line with norm DIN EN 13850.

When measuring quality of service performance targets, Deutsche Post AG differentiates between operator perspective and consumer perspective. The following is used for transit times from the consumer perspective: transit time measurement for all mail items begins on the working day on which the item was posted in a postbox or handed over at a post office by 5pm, regardless of whether box collection or handover took place at an earlier time. The following applies for measuring transit times from the operator perspective: transit time measurement does not begin until the mail item is taken from the postbox or handed over at a post office. In the first six months of 2021 the statutory transit time requirements for D+1 and D+2 were again met, with a rate of 83% and 97% respectively (from a consumer perspective). There has been a decrease in both rates since 2012.

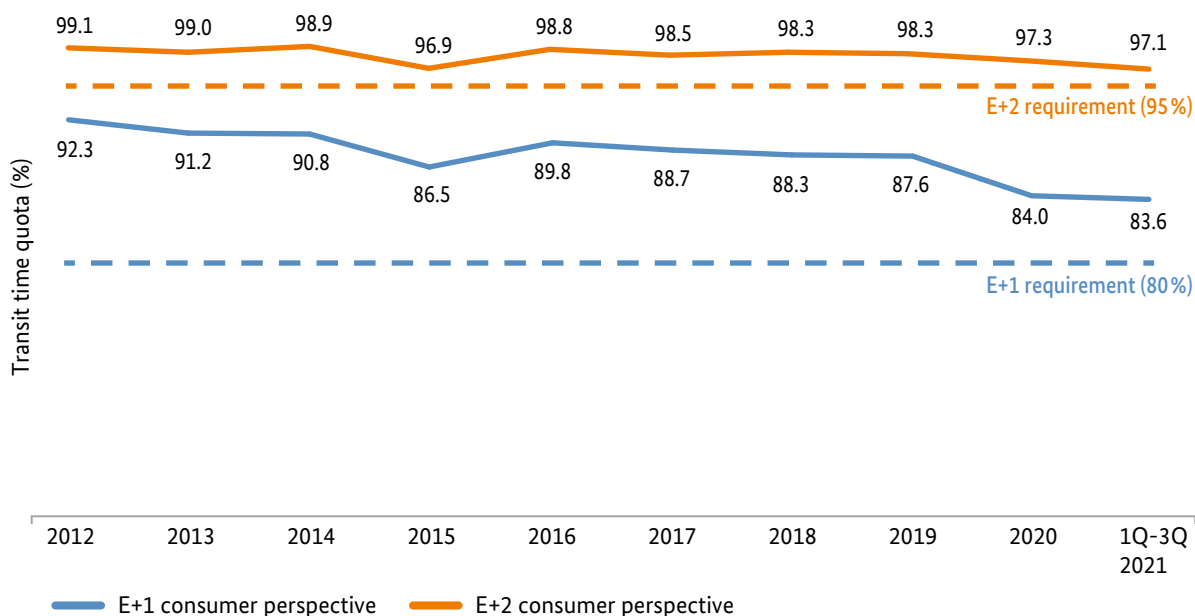
Parcel delivery/transit times

In 2021 the Bundesnetzagentur commissioned the study "Untersuchung von Paketlaufzeiten und der Zustellqualität" ("Assessment of parcel transit times and speed of delivery"), which will provide the Bundesnetzagentur with illustrative and statistically valid data on parcel transit times and delivery speeds in Germany.

Post offices and postal retail outlets

Deutsche Post AG alone operates more than 12,000 post offices and postal retail outlets (12,000 are required by law). There are also parcel shops in various cities and municipalities that are usually operated by the five major parcel companies (DPD, Deutsche Post

Deutsche Post AG letter mail transit times from a consumer perspective



DHL, GLS, Hermes and UPS). There were 59,198 parcel shops in Germany in 2020. The figure for 2021 was not yet available at the end of the reporting period.

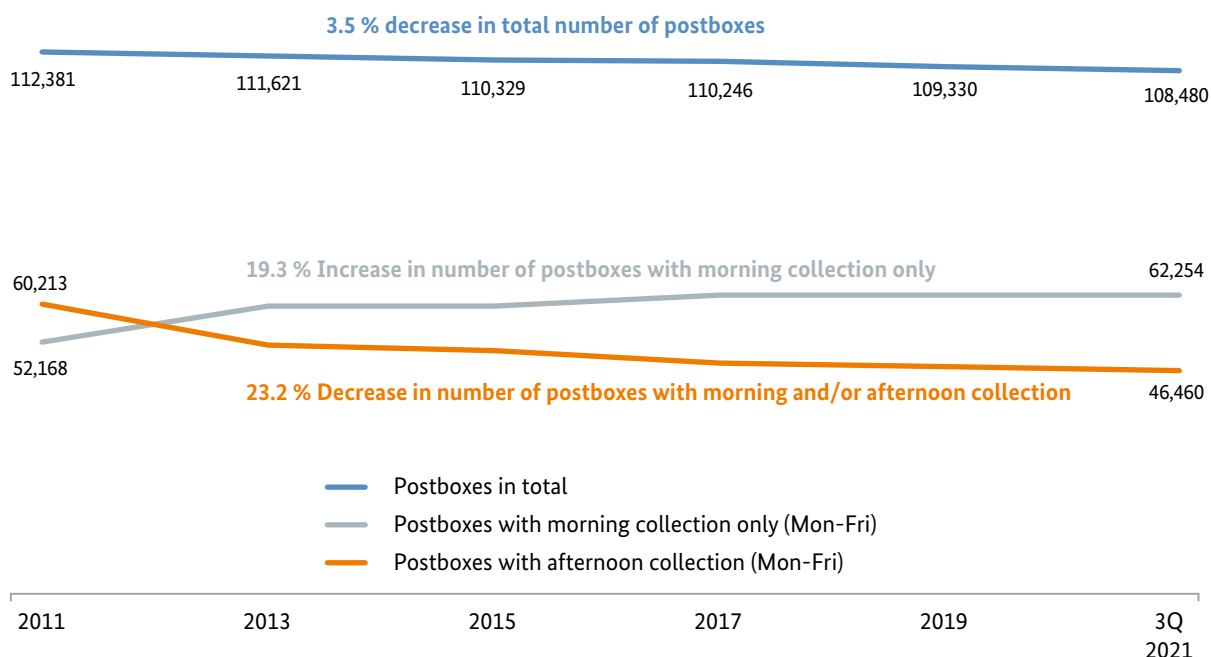
Postboxes

The statutory requirements for the number of postboxes were met by Deutsche Post AG's postboxes in the period under review (until September 2021). In addition to those postboxes, Deutsche Post AG's competitors also have postboxes in various cities and

municipalities, though they do not take the PUDLV as a basis.

As postbox collection times are still important today for many personal customers, as well as for small and medium-size enterprises, the Bundesnetzagentur examined changes to collection times. Postbox collection times in the morning only are becoming more common.

Deutsche Post AG postbox collection times



Postal dispute resolution panel

Statutory mandate

Since the Postal Services Ordinance (PDLV) entered into force in August 2001 the postal dispute resolution panel has been conducting dispute resolution procedures to resolve disputes between postal operators and their customers. It is an official dispute resolution entity – as referred to in the Act on Alternative Dispute Resolution in Consumer Matters (VSBG) – within the European Economic Area and is recognised by the European Commission as such. Participation in a dispute resolution procedure was voluntary for postal operators until the Postal Act was amended in March 2021.

The amended Postal Act gave the dispute resolution procedure a new legal basis and also introduced the requirement that postal operators participate in dispute resolution procedures if the consumer submits the complaint and the other procedural requirements are met.

Dispute resolution

Postal dispute resolution is conducted at the request of customers. If a consumer submits the request, the postal undertaking's participation in the dispute resolution procedure is now compulsory.

Dispute resolution serves to resolve disputes outside of court and are a cost effective alternative to court proceedings. Dispute resolution comes into question whenever a customer's rights have been violated due to loss, theft or damage of postal items or a customer's rights set out in the PDLV have been violated.

Dispute resolution request figures

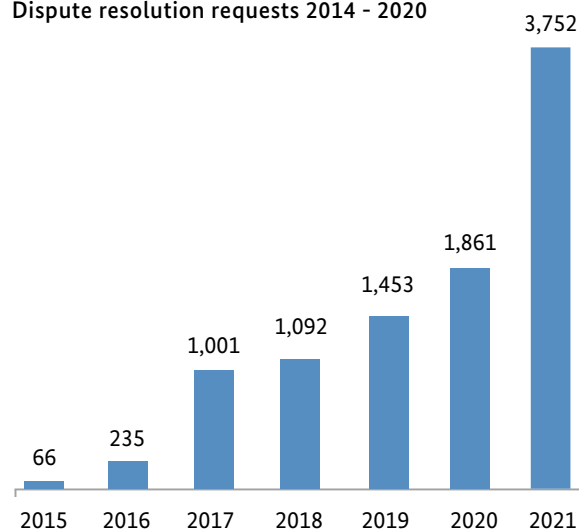
The number of postal dispute resolution requests has steadily increased over the past several years. There were 3,752 requests in 2021, more than twice as many as in 2020 (1,861).

Dispute resolution cases

At the end of 2021, 3,395 of the 3,752 dispute resolution requests received had been closed and 357 cases were still in process. In 1,160 cases it was not possible to conduct a dispute resolution procedure, most often because the dispute did not fall under the authority of the postal dispute resolution panel since the complainant was unable to demonstrate that there had been a violation of any right set out in the PDLV.

A total of 2,235 requests met the legal requirements for a dispute resolution procedure and in 1,325 (59.3%) of those cases there was an amicable settlement. Proce-

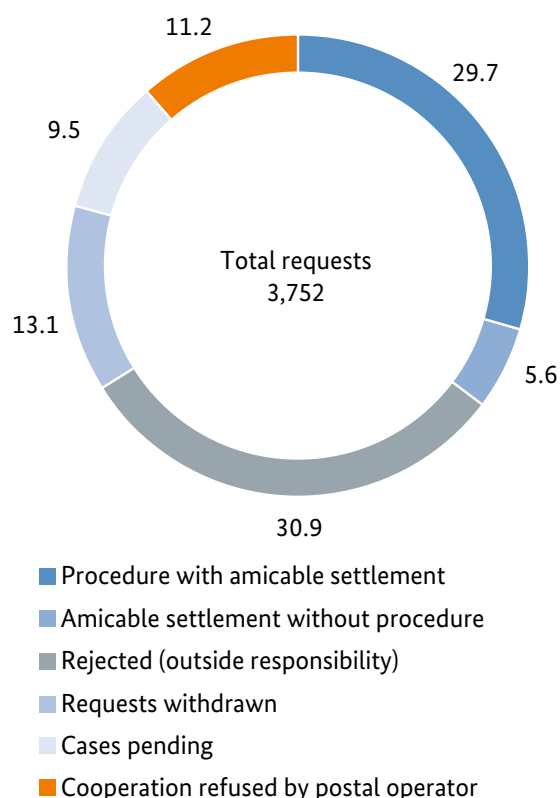
Dispute resolution requests 2014 - 2020



dures that ended with an amicable settlement took an average of just under four weeks.

Postal operators refused to participate in 402 (18%) dispute resolution procedures in 2021. In the reporting period there were 492 (22%) cases where the complainant withdrew their request or objected to continuing the procedure.

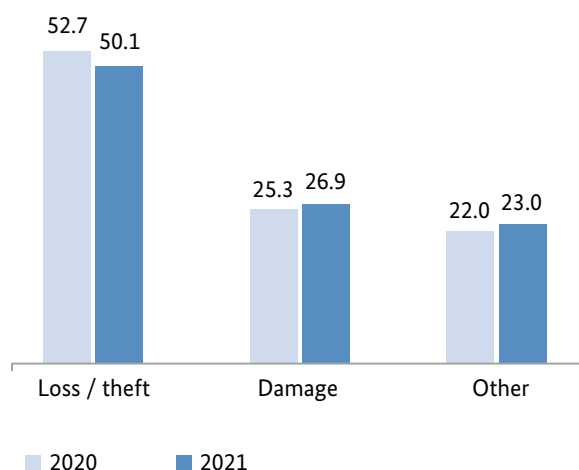
Dispute resolution cases 2021 (%)



Reasons for dispute resolution requests

As in the previous year the majority (just over 50%) of the disputes referred to the dispute resolution panel in 2021 concerned lost or stolen items.

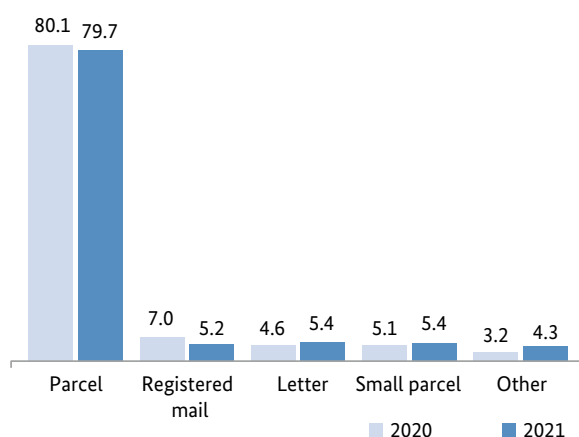
Reasons for requests in 2020 and 2021 (%)



Dispute resolution requests by shipment type

As was the case in 2020, requests related to parcels accounted for the largest share (nearly 80%) of dispute resolution requests in 2021.

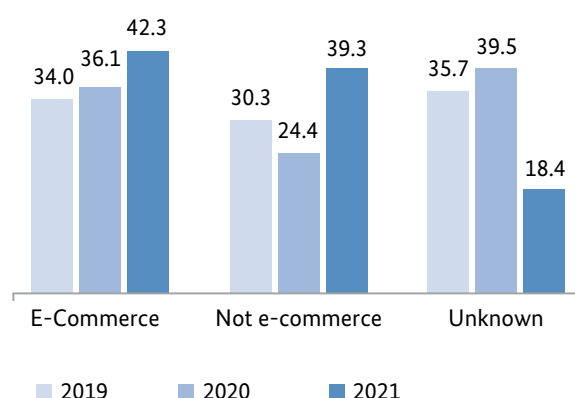
Breakdown of dispute resolution requests by item type in 2020 and 2021 (%)



E-commerce or not e-commerce

The postal dispute resolution panel was not always able to determine whether the conciliation request was linked to an e-commerce transaction. For this reason the postal dispute resolution panel added a question to the online request form in 2021 as to whether the object being mailed was or was not from an e-commerce transaction. This led to a decline in the number of requests that could not be assigned to a category in 2021.

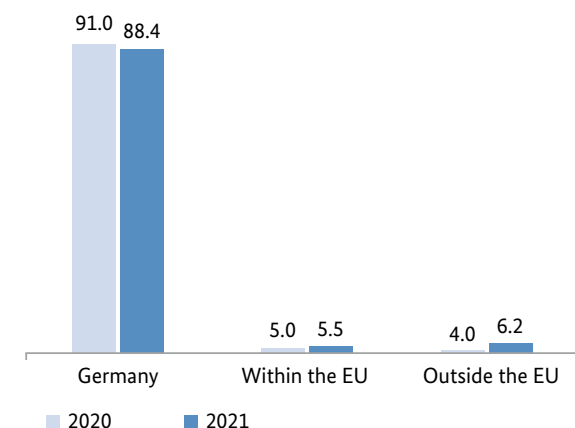
E-commerce / not e-commerce requests 2020 and 2021 (%)



Location of filings for dispute resolution

Despite rising cross-border deliveries brought about by e-commerce, most resolution procedure requests in 2021 (88.4%) still concerned disputes of a purely national scope.

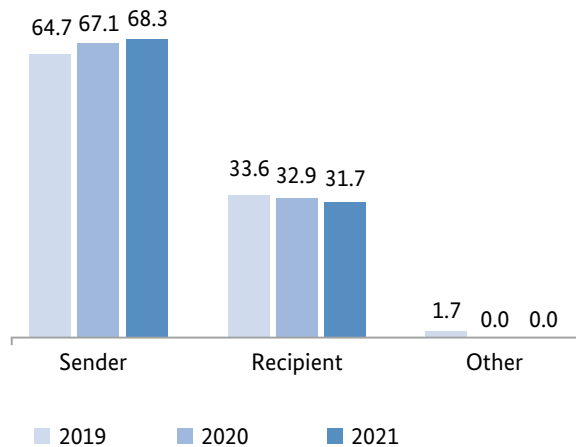
Location of disputes 2020 and 2021 (%)



Complainants

As in previous years, senders comprised the majority (around 68%) of complainants in 2021 by submitting 2,561 of the 3,752 requests for dispute resolution. Recipients of postal items submitted 1,191 requests, which was nearly 32% of the total.

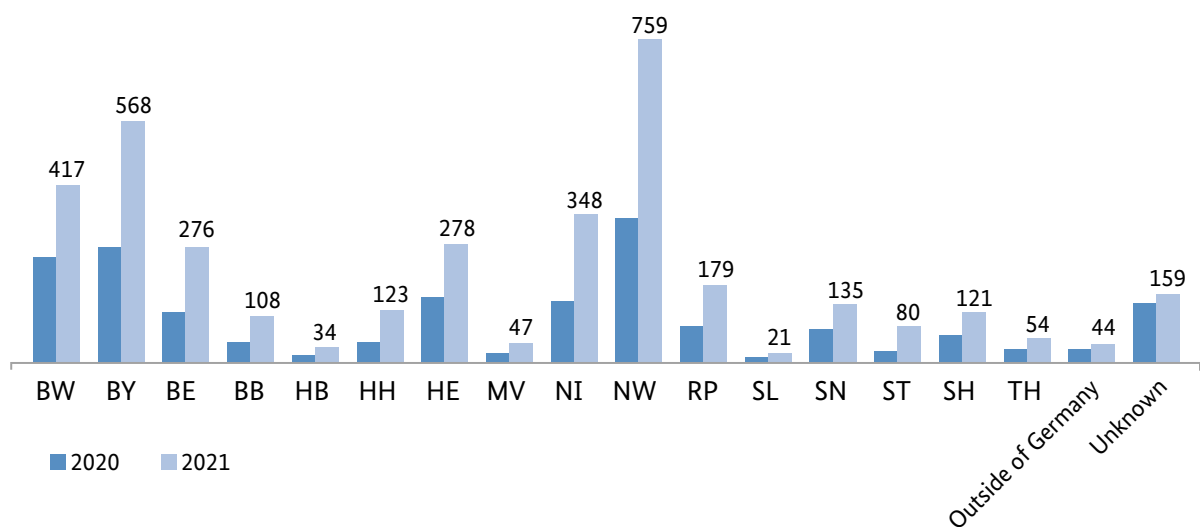
Complainants 2019-2021 (%)



Residence of the complainants by federal state

As in the previous year, around 46% (1,741) of the 3,752 complainants in 2021 came from Germany's three most populous federal states of Baden-Württemberg, Bavaria and North-Rhine Westphalia. The other dispute resolution cases came from the remaining federal states or from outside of Germany. The number of requests has increased in all federal states.

Residence of the complainants by federal state



Rulings, activities and proceedings

The benchmarking procedure was again the predominant topic in the year under review because the price-cap price approval that was in effect would be expiring at the end of 2021. The benchmarking procedure took into account the amendment to the Postal Act, which also had the effect of ceasing the review of the 2019 postage rates approval. The legislative amendment introduced the auditing of anti-competitive price squeezing into postal regulation. The auditing was relevant to the "E-POST letters with traditional delivery" product. Rates for this product were submitted for approval twice in 2021.

Ruling chamber decisions

Price-cap benchmarking

On 31 December 2021 the Deutsche Post AG rates approval from 2019 expired for the standard letter products (including standard, compact, large and maxi-size letters, postcards, outbound international letters, as well as special services such as registered delivery, cash-on-delivery and sending valuables, money and jewellery).

For 2022 a new rates approval was required for the aforementioned shipment types and special services. These rates are determined in a two-step process using price cap regulation. First, in the benchmarking procedure, the key principles are formulated for the rates approval that will follow (eg limits to the price changes, period of validity and individual reporting requirements). Then follows the price-cap price approval procedure, in which the individual prices submitted by Deutsche Post AG are approved. The ruling chamber set the benchmarks for the standard letter products on 23 November 2021. The rate of price changes is derived from the development of inflation and the company-specific rate of growth in productivity, or "X factor". The X factor is calculated on the basis of the development in costs and volumes at Deutsche Post AG.

A maximum price increase of 4.6% that was set by the ruling chamber can be applied by Deutsche Post AG to the products included in the price cap. The rates proposal was submitted on 24 November 2021. The new price level is derived from the difference between the rate of inflation (3.25%) and the rate of growth in productivity, which was set to negative 1.35%. This means that the rate of price changes currently set is significantly less than it was in the previous pricing period (8.86%).

The price cap covers a period of three years and thus ends on 31 December 2024.

Price-cap price approvals

The ruling chamber approved the proposed new letter prices in its decision of 10 December 2021. However, the approvals were not final, but rather they were provisional in the form of an interim ruling. It was not possible to conclude the procedure within the statutory two-week period due to the fact that a third party was summoned and the summoned third party had a legal right to be heard. A price approval procedure requires a public hearing.

Prices¹ for basic products and special services (domestic)
(€)

Basic product	Prices until 31 December 2021	Prices 1 January 2022 - 31 December 2024
Postcard	0.60	0.70
Standard letter	0.80	0.85
Compact letter	0.95	1.00
Large letter	1.55	1.60
Maxi letters	2.70	2.75

Special service

Prio	1.00	1.10
Registered mail	2.50	2.65
+ Registered mail For delivery to the addressee in person	2.20	2.20
+ Registered mail Advice of delivery	2.20	2.20
Registered mail placed in letterbox	2.20	2.35

¹ Prices are retail prices and, under the Value Added Tax Act (Umsatzsteuergesetz, UStG), are not subject to value added tax.

Prices¹ for basic products and special services (international)
(€)

Basic product	Prices until 31 December 2021	Prices 1 January 2022 - 31 December 2024
Postcard	0.95	0.95
Standard letter	1.10	1.10
Compact letter	1.70	1.70
Large letter	3.70	3.70
Maxi letter (up to 1,000 g)	7.00	7.00
Maxi letter (up to 2,000 g)	17.00	17.00

Special service

Registered mail (at base price value)	3.50	3.50
Registered mail For delivery to the addressee in person	2.20	2.20
Registered mail Advice of delivery	2.20	2.20

¹ Prices are retail prices and, under the Value Added Tax Act (Umsatzsteuergesetz, UStG), are not subject to value added tax.

A final decision will be made once the formal procedure has been completed, which is expected to be in the first half of 2022.

The most important price changes were the 5-cent increases for all basic products. Stamp prices for postcards increased by 10 cents.

Procedure to review the withdrawal of and to re-decide the 2019 price cap approval

Following the Federal Administrative Court's decision of 27 May 2020 the ruling chamber initiated an administrative procedure to examine whether or not the BK5-19/013 rates approval that would expire on 31 December 2021 could be withdrawn. The procedure was discontinued by way of administrative order on 14 April 2021 after the amended Postal Act (PostG) had entered into force.

At the same time that the ruling chamber was examining the rates approval, legislators were following the guidance/taking note of the Federal Administrative Court. In the "Gesetz zur Verbesserung der Strafverfolgung hinsichtlich des Handels mit inkriminierten Gütern unter Nutzung von Postdienstleistungen" ("Law to improve the prosecution of using postal operators to trade with incriminated goods"), which entered into force on 9 March 2021, new rules were created for determining profit and deducting costs in section 20 PostG.

The withdrawal procedure was to be discontinued following action by legislators, and the deficiencies identified by the German Federal Administrative Court were remedied by the amended PostG. A new decision would not have led to a significantly different result and so there was no overriding, discernible public interest in the withdrawal of or in a re-approval of the postage rates. As a result Deutsche Post AG prices remained unchanged until the end of 2021.

German Parcel and Express Association's urgent appeal against the price-cap approval of 2019

The German Parcel and Express Association (BIEK) submitted a fast track procedure request to Cologne Administrative Court for an order establishing the suspensory effect of its appeal against the 2019 price approval and for a new, provisional determination of the prices. The Court's ruling of 4 January 2021 partly upheld the urgent appeal lodged by the BIEK. The Court ordered that the BIEK's appeal against the Bundesnetzagentur's price-cap price approval had suspensory effect with regard to the approval of the prices for national standard, compact, large and maxi-size letters. The order only applies to the BIEK and is thus an "inter-partes" order. It means that until 31 December 2021 the BIEK did not have to pay for postage and Deutsche Post AG had to transport letters

for the BIEK free of charge until that date. Deutsche Post AG can charge the BIEK for the letters it transported once the prices have been re-approved.

The Court ruled that the BIEK's additional appeal to require the Bundesnetzagentur to re-approve the prices within three months was, however, inadmissible. The requirement under the Postal Act to have prices approved is not tied to any subjective rights enjoyed by postal service users.

The BIEK appealed to the Higher Administrative Court of North-Rhine Westphalia against the rejection of its request. The appeal was rejected on 13 December 2021.

Rates approval for access to post office (PO) box facilities

On 23 November 2021 the Bundesnetzagentur approved Deutsche Post AG's charges for competitors' access to its PO box facilities for the period from 1 January 2022 to 31 December 2026.

Deutsche Post AG is required to enable alternative postal operators to deliver items that are addressed to PO boxes. This makes it possible for Deutsche Post's competitors to deliver all of their customers' items. Without access to PO box facilities, the competitors would have to separate items addressed to PO boxes and either post them through Deutsche Post AG with full postage paid or return the items to their customers. Access to PO box facilities is thus an important element in promoting competition in the postal market.

Deutsche Post AG is entitled to charge for the work involved at a rate that must be approved in advance by the Bundesnetzagentur. The rates comprise an acceptance charge, which is payable for each delivery for the activities entailed in accepting the items, and an item-related sorting charge for placing the items in the boxes.

The approved sorting charge remained virtually unchanged at 3.9 cents per item. The approved acceptance charge of €1.06 is slightly higher than the previous charge of 99 cents and is considerably lower than the per-delivery rate of €3.46 put forward by Deutsche Post AG.

Rates approval for Deutsche Post AG's delivery and collection service (HIN + WEG)

On 23 November 2021 the ruling chamber issued a decision replacing the rates approval that was due to expire at the end of 2021 for Deutsche Post AG's HIN + WEG delivery and collection service.

Deutsche Post AG introduced the HIN + WEG service in 1997. According to the service specifications, it provides the following services and terms of payment:

HIN (delivery): The drivers or the applicant's service partners collect the items from the customers' post office boxes at Deutsche Post and deliver the items to the customers' business premises.

WEG (collection): The drivers or the applicant's service partners collect the items on the customers' business premises and take the items to the nearest offices of origin.

HIN + WEG: HIN and WEG products can be combined with one another, which gives rise to HIN + WEG. Usually the combination consists of a delivery in the morning and a collection in the afternoon.

Even though most mail batches comprise more than 50 letters, the prices for the service need to be approved because the service has no minimum batch size and is available to anyone wanting to have one or more items collected or delivered.

A monthly flat-rate price is calculated based on the time and cost per run and the average number of runs per month, taking into account the number of working days per month. This cost-based method of calculation ensures that the monthly flat-rate price is fair for all customers (with comparable lengths of time and runs).

The prices were approved for the period from 1 January 2022 until 31 December 2026.

E-POST letters with traditional delivery

The approval for the prices for E-POST letters with traditional delivery expired on 31 December 2020. Deutsche Post E-Post Solutions GmbH (DP EPS), which offers the service, did not apply for a follow-up approval by the statutory 10-week deadline.

It informed the Bundesnetzagentur that it would not be putting in an application. This meant that it was not possible to continue offering the service after 31 December 2020. Deutsche Post DHL nevertheless wanted to continue offering its E-POST letters with traditional delivery beyond 31 December 2020.

To counteract the need for approval of E-POST letters with traditional delivery, Deutsche Post AG had begun offering two versions of the product as from 1 January 2021, one version for business customers handing over volumes of 50 or more items and another version for personal customers handing over volumes of less than 50 items. The price of the business customer product under the new model remained unchanged and was no longer subject to price approval because its minimum posting volume was now 50 or more.

The personal customer product, now offered by Deutsche Post AG, has been conveyed since the beginning of 2021 at the rate already approved in the price-cap prices. Deutsche Post AG did not consider a further rates approval to be necessary, which was seen by the ruling chamber as circumventing the price approval requirement. Although Deutsche Post AG argued that its action eliminated the need for an approval of prices, the chamber maintained that not seeking a new rates approval also resulted in artificially induced added cost (shipment splitting) that made the product more expensive, which was a potential breach of the legal requirement to align costs with the provision of efficient service. According to the chamber, the rates for E-POST letters were subject to approval because they differed in content from the rates approved in the price-cap procedure.

On 8 February 2021 DP EPS, which is once again the provider of the single-version product, ultimately submitted an application for approval that merged the products again for business and personal customers. On 23 April 2021 Ruling Chamber 5 approved the following rates for E-POST letters with traditional delivery for the conveyance of letter items up to 1,000 grams as from 1 June 2021 until 31 December 2021:

•	Standard letter	€0.46
•	Compact letter	€0.63
•	Large letter	€1.06
•	Maxi letter	€2.21

On 30 November 2021 Ruling Chamber 5 approved DP EPS's follow-up request to extend the rates listed above for the year 2022.

International cooperation
The Bundesnetzagentur
is active at European level
both within the European
Regulators Group for Postal
Services and in cooperation
with the German Institute
for Standardization within
the European Committee
for Standardization. It also
supports the Federal Minis-
try for Economic Affairs and
Climate Action, as Germany's
representative within the
Universal Postal Union, at
international level.

European Regulators Group for Postal Services (ERGP)

The ERGP chair was held in 2020 and 2021 by the Greek regulatory authority. The representatives of the Spanish and Cypriot regulatory authorities were appointed chair for 2022 and 2023 respectively.

The main focus of ERGP's work was on the possible revision of the Postal Services Directive and EU Parcels Regulation and on the increasingly active role played by online platforms in the postal sector, together with

their impact on traditional postal service providers and on the postal value chain, consumers and markets in general. ERGP also continued its work on analysing the consequences of the Covid-19 pandemic for the postal sector and its future.

ERGP's work in 2020 and 2021 was divided between five regular work groups. ERGP's structure, with its work groups and the authorities chairing the work groups, is illustrated below.

The Bundesnetzagentur was represented in all of the work groups and co-chaired the Cross-Border Parcel Delivery Work Group together with the Greek regulatory authority.

The first Plenary in 2021 was held on 25 June as a virtual meeting and the second on 26 November as a hybrid meeting (Athens/online). An internal workshop marking ERGP's tenth anniversary was held immediately before the second Plenary meeting. The draft ERGP Work Programme 2022, based on the three strategic pillars of revisiting the postal sector, promoting a competitive EU postal single market and empowering end-users, and the draft Report on the contractual situation of consumers of postal services were approved for public consultation at the first Plenary meeting. The following documents were given final approval for publication on 26 November 2021:

- ERGP PL II (21) 9 – Report on COVID-19 pandemic impact on the future of the postal sector
- ERGP PL II (21) 10 – ERGP Report on the contractual situation of consumers of postal services (and ERGP PL II (21) 10a – ERGP Report on the outcome of the public consultation on the draft ERGP Report on the contractual situation of consumers)
- ERGP PL II (21) 20 – ERGP Report on the Cross Border Regulation implementation
- ERGP PL II (21) 23 – ERGP Report on online platforms and e-retailers: implications for the future
- ERGP PL II (21) 24 – ERGP Report on quality of service, consumer protection and consumer handling 2020
- ERGP PL II (21) 25 – ERGP Report on core indicators for monitoring the European postal market
- ERGP PL II (21) 26 – ERGP Report on the harmonised measures related to standardised cross border parcel delivery
- ERGP PL II (21) 27 – ERGP Report on Green Deal and the postal sector.

The ERGP Communication Plan 2022 (ERGP PL II (21) 42) was also approved as an internal document.

The report on the impact of the Covid-19 pandemic on the postal sector and its future analyses the long-term impact of the pandemic; it looks at the reasons for growth in the parcels market and distinguishes between structural factors such as the spread of digital technology and special pandemic-related factors that have given an additional boost to e-commerce. The report on online platforms and e-retailers also takes a close look at the increasingly active role played by large online platforms both as service providers and as customers in the postal sector and the implications. The report points to the need to adapt and update the postal regulatory framework.

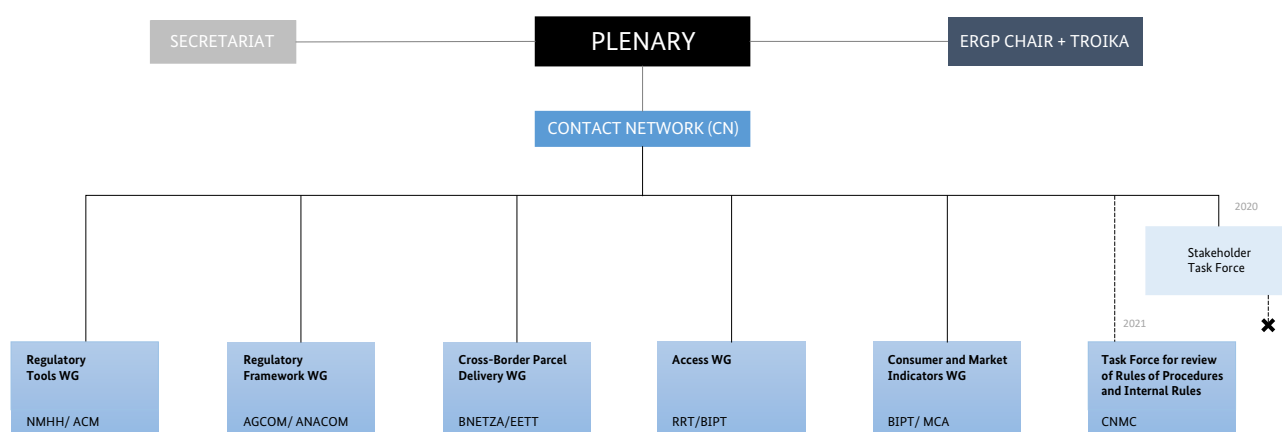
Following publication of the European Commission's evaluation reports on the application of the Postal Services Directive and the EU Parcels Regulation (2018/644/EU) on 8 November 2021, ERGP and the Commission held initial discussions on 25 and 26 November at a workshop and at ERGP's Plenary meeting. In view of the fundamental changes in the postal sector triggered by e-commerce and new players such as online platforms, which play an even greater

role because of the pandemic, ERGP remains in favour of a fundamental revision of the postal regulatory framework to make it more pro-competitive. ERGP will produce further input papers in the near future and submit them to the Commission.

The cross-border parcel delivery work group followed up its reports on the implementation of the 2018 EU Parcels Regulation (2018/644/EU) with an in-depth analysis of the comparability and use of the data collated. The analysis covered both the data on market monitoring by the regulatory authorities and the tariff data to be collected and forwarded to the European Commission for publication in its database in accordance with the EU Parcels Regulation. The analysis also looks at whether problems with implementation are longer term or only due to the initial phase of implementation.

All the ERGP documents are available online at <https://ec.europa.eu/ergp>

ERGP structure 2020 - 2021



European and international standardisation

European standardisation activities in the postal sector are the responsibility of the European Committee for Standardization (CEN). The Technical Committee for postal services (CEN/TC 331) currently comprises four working groups (WGs), which are mirrored at national level within the German Institute for Standardization (DIN): WG 1 "Customers, products and services", WG 2 "New digital postal services", WG 3 "Physical processing chain and associated data", and WG 5 "Equipment of the end receivers".

Around 80 experts from 34 European countries are active within CEN/TC 331 and its working groups. The working groups bring together representatives of industry, postal operators, online traders, trade associations and consumer organisations, and regulatory authorities – such as the Bundesnetzagentur – and ministries.

CEN/TC 331's standardisation activities are closely coordinated with the UPU's standardisation body, the Standards Board. Cooperation between the two bodies is based on a memorandum of understanding. This agreement serves to avoid disparities and duplication of work and promote the joint development of topical technical standards.

Cooperation between the two committees TC ESI "Electronic Signatures and Infrastructures" at the European Telecommunications Standards Institute (ETSI) and TC 315 "Cold chain logistics" at the International Organization for Standardization (ISO) was also strengthened further in 2021.

A main focus of discussions within CEN/TC 331 in 2021 was on areas that had grown significantly in importance during the pandemic, including e-commerce, the spread of digital technology in postal services (customs and freight documents, track-and-trace applications) and contactless delivery.

A new mandate from the European Commission is expected in the first half of 2022 to officially support these standardisation activities. The new mandate is also expected to include sustainability as a topic of focus. One of the elements is a standard already under development with a method for calculating the carbon footprint of parcel deliveries in advance (Parcel Delivery Environmental Footprint – PDEF). Such a standard is indispensable in particular for the implementation of the Commission's European Green Deal.

Universal Postal Union (UPU)

Every four years, a Universal Postal Congress sets the UPU's strategic and financial course. The International Bureau (IB), based in Berne, takes care of day-to-day business between the regular Universal Postal Congresses. The IB works under the supervision of the Council of Administration (CA). The CA, which consists of 40 elected member countries together with the country hosting a Congress, also has control over the IB's finances. The Postal Operations Council (POC) has 48 elected members and is responsible for international postal operational matters.

The Federal Ministry for Economic Affairs and Climate Action (BMWK) represents Germany within the UPU and is supported by the Bundesnetzagentur in regulatory issues. The federal government nominated Deutsche Post AG as the designated operator responsible for the contractually agreed operational rights and obligations within the UPU.

A Congress was due to be held in Abidjan, the capital of Côte d'Ivoire, in August 2020 to set the course for the next four years. The three-week event with a four-figure number of participants from all over the world had to be postponed for a year because of the pandemic. The Congress was held as a hybrid meeting in Abidjan from 9 to 27 August 2021, enabling participation both in person and online. A special arrangement was put in place for the event of any secret ballots. The arrangement restricted voting to those participating in person but allowed remote participants to authorise member countries with representatives attending in person to vote for them.

Masahiko Metoki of Japan was elected as the new Director General and Marjan Osvald of Slovenia as Deputy Director General in a secret ballot. The members of the CA and the POC were also newly elected. Germany is again represented in both bodies in the work cycle from 2022 to 2025. While Côte d'Ivoire, as the host country, holds the CA Chair, France was elected to take the POC Chair.

There was a fundamental change regarding the Universal Postal Convention. In the past, the whole Convention together with any amendments made to the previous Convention was newly agreed every four years at a Congress. The new Convention that was adopted in Abidjan and entered into force on 1 July 2022 will be valid indefinitely. In future, only amendments to the Convention will need to be newly agreed. This will make things simpler for numerous member

countries in ratifying the Convention and its amendments.

The system for member countries' contributions to the UPU was redesigned, with Germany acting as mediator, resolving a long-standing point of contention. A scale for the level of individual countries' contributions was first developed on the basis of a distribution key for the expenditure of the United Nations (UN). Several countries (including China, Germany, Japan and the USA) then committed themselves to a considerable expansion of their contributions given a stable budget for the UPU. However, this will only benefit those countries whose contribution matches or exceeds the scale or those undertaking significant steps to get close to this target.

Opening up the UPU for wider postal sector stakeholders has been a topic of discussion for some time. Member countries' expectations still differ widely in terms of the objectives and notions behind the idea. The CA established a Task Force co-chaired by Algeria and the USA to develop further proposals for opening up the UPU.

Against the backdrop of climate change, the German delegation, together with Austria and France and with a significant contribution from Deutsche Post AG, presented a proposal for international cooperation in the postal sector. The idea behind this initiative, which is supported by national postal organisations, is to explore ways for the transfer of knowledge regarding strategies for reducing greenhouse gases, climate financing measures and climate change adaptation measures, in particular in the context of international postal cooperation. It is explicitly open to the whole postal sector and so also to undertakings not active as designated operators for UPU member countries. One issue directly affecting customers was the question of whether to shorten the period within which an inquiry has to be made in order to be guaranteed acceptance from six months to three months from the time an item was posted. The member countries decided to leave the period at six months.

The opening up of the UPU, budgetary issues related to transfer payments to the UPU's pension fund, and the climate change initiative launched in Abidjan were recognised as three topics of such significance and consequence that it was decided not to restrict further discussions to within the CA. It is planned to hold an Extraordinary Congress in 2023 to deal with these topics. The next regular Congress will be held in 2025 in Dubai, United Arab Emirates.

European-Chinese cooperation

In addition to the international cooperation activities at European level and within the UPU, bilateral discussions also took place in 2021. Following a suggestion from Technical Committee TC 462 at the Standardization Administration of China (SAC), a joint working group was established together with CEN/TC 331 within which experts from China and Europe, including the Bundesnetzagentur, discussed details of mutual customs and import VAT arrangements, such as the EU rules that entered into force on 1 July 2021.

In June 2021 the amended Rail Regulation Act entered into force. Changes to the Act also implemented European Court of Justice case law on the classification of passenger platforms.

By way of numerous proceedings, the Bundesnetzagentur is paving the way for stable development and safeguards competition in the rail sector.



Contents

Market trends	140
Rulings, activities and proceedings	144
International cooperation	154



The Covid-19 pandemic continued to affect competition in the railway market in 2021. Passenger transport in particular was severely impacted. Passenger kilometres in regional and local rail passenger transport and in long-distance rail passenger transport declined by more than 40%. By contrast, tonne-kilometres in rail freight transport fell by only 5%. The Bundesnetzagentur has calculated an additional pandemic-related loss of around €2.55bn for the whole of 2020.

Market trends

The share held by competitors to Deutsche Bahn AG in the long-distance rail passenger transport segment fell in 2020 because most of the non-federally owned long-distance, charter and special train services were cancelled due to low demand. In contrast, however, they were able to increase their shares of the regional and local rail passenger transport and the rail freight transport segments.

Effects of the Covid-19 pandemic on the railway market

The Covid-19 pandemic has significantly affected the development of the German railway market. The Bundesnetzagentur surveyed around 100 railway undertakings about the pandemic's effects in 2020. The undertakings were active in the German market either as railway undertakings or as route operators.

Transport performance in long-distance rail passenger transport fell to 10% due to the April 2020 lockdown. Regional and local rail passenger transport performance dropped to 25% of the previous year's average.

By contrast, transport performance in the rail freight transport segment rose in the fourth quarter of 2020 to levels beyond 100% of the 2019 average. The Bundesnetzagentur calculated the additional losses in 2020 caused by the Covid-19 pandemic using the difference

between revenue and expenditure changes. The calculations took into account the special expenditure due to the pandemic and the financial support provided by the state. Additional pandemic-related losses for railway undertakings and route operators after state aid was around €2.55bn for the whole of 2020.

The losses were proportionately reduced via a refund granted retroactively of track access charges for 2020 that had been paid in or after March 2020. Financial support provided by the federal government for long-distance rail passenger transport covers 98% of the track access charges, which means that the railway undertakings in the long-distance rail passenger transport segment received an additional €825m retrospectively in support.

The amount of financial support already available in the rail freight transport segment (€350m) was increased to also cover 98% of the track access charges, meaning that rail freight transport undertakings received retrospectively an additional €270m.

The assistance programme for mitigating the economic effects of the Covid-19 pandemic expired at the end of 2021. The original assistance amount of around 45% in the rail freight transport segment went back into effect as from January 2022. Financial support for the long-distance rail passenger transport segment is currently scheduled to continue until the end of March 2022.

Traffic volume and revenue trends

Transport performance in all rail transport services fell due to the pandemic in 2020. Passenger kilometres in regional and local rail passenger transport and long-distance rail passenger transport declined by more than 40%. By contrast, tonne-kilometres in rail freight transport fell by only 5%.

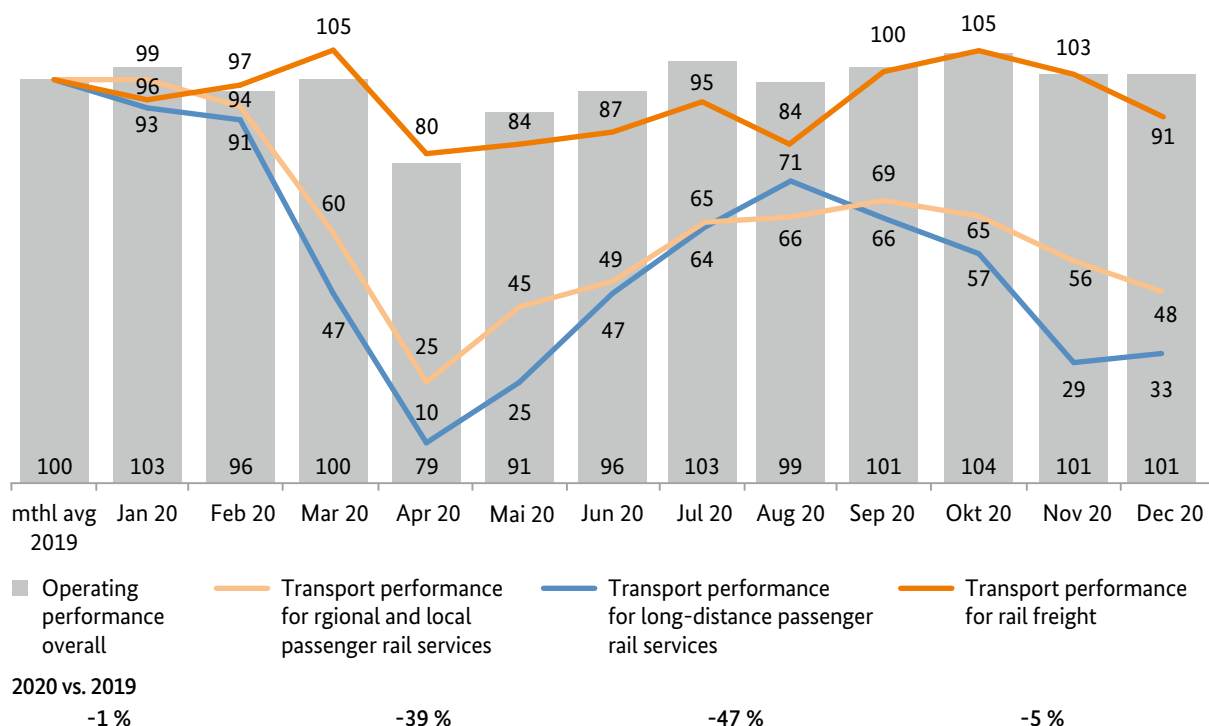
The railway undertakings' revenue fell to the level it was at five years ago. According to market participants it will take time after the pandemic for revenue to return to pre-pandemic levels.

Long-distance rail passenger transport saw a revenue drop of more than 40% and the non-federally owned long-distance rail passenger transport undertakings' revenue dropped by around 70%.

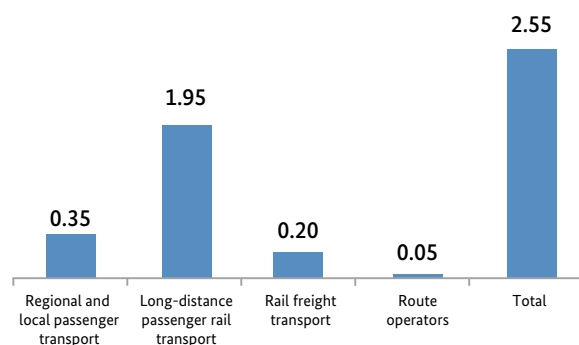
Subsidies from the federal states to regional and local rail passenger transport undertakings guarantee the largest share of their revenue. The resulting revenue losses were balanced for the most part by the regional

RUs transport and operating performance

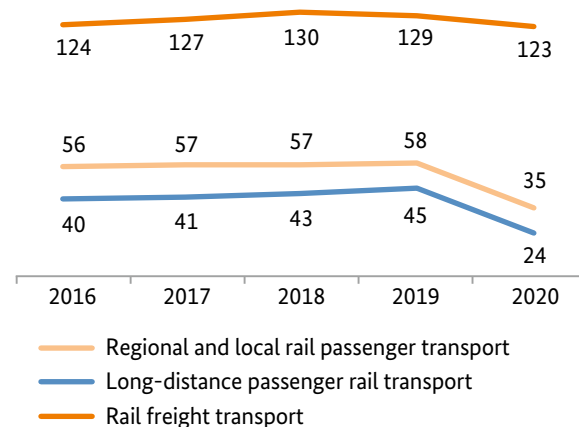
Passenger/tonne/ train-kilometres in %



Pandemic-related economic loss for RUs in Germany 2020 (in €bn)

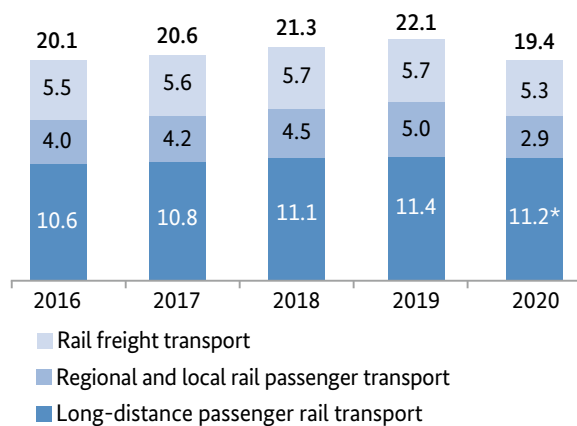


RUs transport performance in billions of passenger kilometres, shares in %



transport authorities. The rescue package for local public transport covered the remaining losses caused by low fare revenue at regional and local rail passenger transport undertakings. Revenue dropped by around 6% in the rail freight transport segment, though the non-federally owned rail freight transport undertakings saw only a marginal decline in revenue. Several undertakings in this segment were able to stabilise their revenue in spite of temporary standstills by procuring additional transport orders.

RU revenue in the rail market by type of transport
(€bn)



* Regional and local rail passenger transport revenue includes €0.8bn of payments from the local public transport rescue package

Competition trends

The pandemic only partially affected market share in the German railway market in 2020.

The share held by competitors to Deutsche Bahn AG in the long-distance rail passenger transport segment fell, mainly because most of the non-federally owned long-distance, charter and special train services were cancelled due to low demand, which then negated the most recent market share gains by competitors in this segment. However, the competitors were able to increase their shares of the regional and local rail passenger transport and the rail freight transport segments.

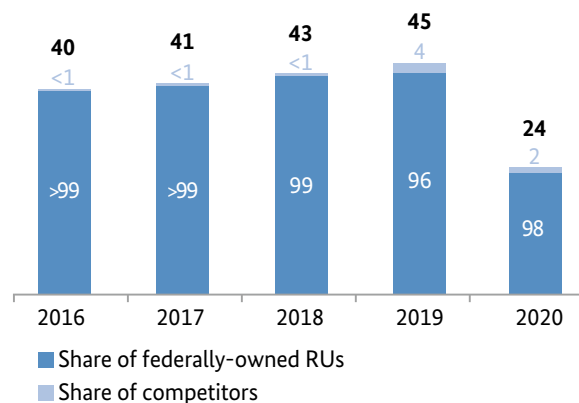
Many non-federal rail freight transport undertakings secured new transport orders and some were even able to increase their freight traffic and transport volumes. The undertakings reported growth in cross-border and transit traffic.

Non-federally owned railway undertakings in the regional and local rail passenger transport segment won regional transport authority tender awards for regional networks that began running in December 2019 and thus had an impact on 2020. In the first half of 2021 the competitors continued to make gains in market share in the regional and local rail passenger transport and the rail freight transport segments, adding around 2% of the market share for each segment. The first half of 2021 did not show a change compared to 2020, but an increase in the market share of the competitors is expected in the second half of the year when traffic resumes.

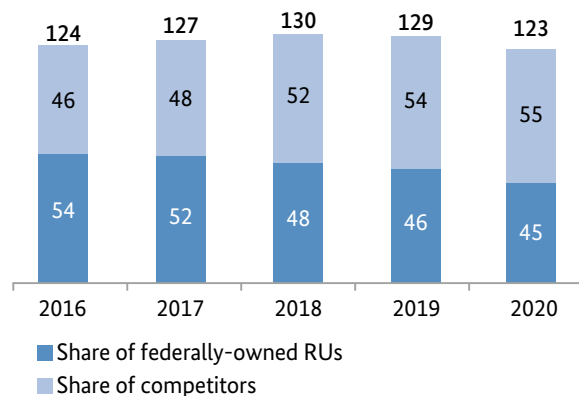
Competition in regional passenger rail transport
By traffic volume in billions of passenger kilometres, shares in %



Competition in long-distance passenger rail transport
By traffic volume in billions of passenger kilometres, shares in %



Competition in rail freight transport
By traffic volume in billions of tonne-kilometres, shares in %



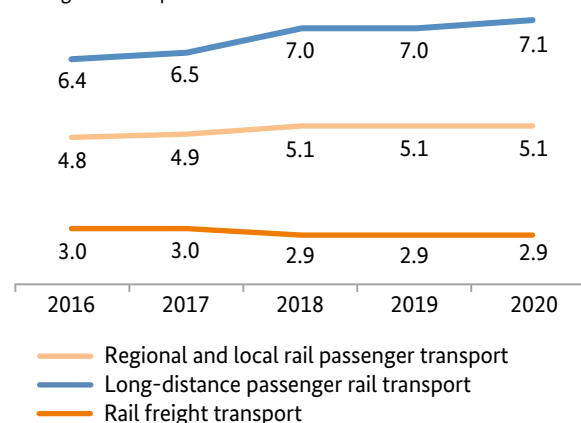
Infrastructure charges

Average track access charges for each unit of service (before track access charge assistance) were consistent with the trend of previous years. Overall there have been only marginal declines in revenue from track access charges. In fact most passenger transport continued and was paid for. For the year as a whole, operating performance in freight transport could be held stable. The rescue package for local public transport compensated for lower fare revenue at the regional transport authorities and railway undertakings. Cancellations in regional and local rail passenger transport services were mostly limited to the month of April 2020, so the route operators had hardly any loss of track access charges for regional passenger transport.

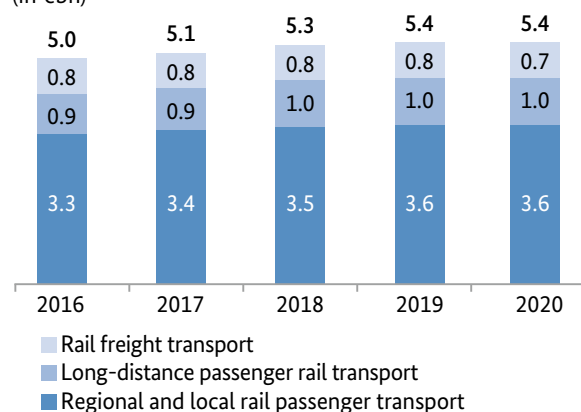
DB Fernverkehr AG payments for connecting long-distance routes also continued to flow smoothly. Long-distance services offered by non-federally owned competitors (eg Flixtrain GmbH), which at times came to a standstill, did not play a significant role for route operators because of their small share of total rail traffic.

Track access charges

Average in euros per train-km



Route operator revenues from track access charges (in €bn)



Revenue from rail freight transport track access charges fell 6% between 2019 and 2020. Track revenue in long-distance transport dropped 1%, while regional and local rail passenger transport track access charges even saw a 1% increase. Revenue from track access charges for the three transport segments amounts to an overall decrease of 0.4% from 2019 to 2020.

Profit trends of the railway undertakings

The railway undertakings' overall economic situation continued to worsen for all rail transport services in 2021. Undertakings in the long-distance rail passenger transport segment lost billions of euros in revenue due to the pandemic. There was also extra expenditure for precautionary health measures.

In addition to direct payments from the federal government for regional and local rail passenger transport from the rescue package created for local public transport, the federal government made the decision to provide track access charge assistance by refunding around 98% of railway undertakings' track costs in the rail freight transport and the long-distance rail passenger transport segments that were incurred in or after March 2020. The retroactive track access charge assistance would roughly halve the losses in the long-distance rail passenger transport segment for 2021. In the rail freight transport segment, additional track access charge assistance would improve railway undertakings' 2021 results compared with 2019. Retroactive track access charge assistance was paid in the second half of 2021, so in accounting terms it will only be recognised in the 2021 annual financial statements.

Developments in the first six months of 2021

The lockdowns resulting from the pandemic also influenced traffic trends in 2021.

All three segments of rail transport service (regional and local passenger transport, long-distance rail passenger transport and rail freight transport) were able to stabilise their operating performance in the first half of 2021.

In the first half of 2021 the rail freight transport segment already surpassed its pre-pandemic level of net tonne-kilometres transported. In rail passenger service, the number of passenger kilometres was as much as 75% below the pre-pandemic level but returned by the middle of 2021 to around 50% of the 2019 level.

Rulings, activities and proceedings

Deutschlandtakt has developed into a forward-focused project for the rail sector, with the aim of implementing a nationwide synchronised timetable. A target timetable is used to determine which infrastructure projects will be necessary. The Bundesnetzagentur supports a working group from the Federal Ministry for Digital and Transport in the institutional implementation of Deutschlandtakt.

Access to railway infrastructure

DB Netz AG – snow clearing and gritting

In 2021 the Bundesnetzagentur required DB Netz AG to include in its network statement an arrangement for restoring the navigability of lines closed due to wintry weather conditions. Where navigability cannot be immediately restored, the arrangement sets out that navigability must be restored within a maximum period of 24 hours after a line has been closed unless objective proof is furnished that restoration of navigability is not possible within that time frame.

The requirement was prompted by input from the professional associations NEE e.V. and mofair e.V. criticising DB Netz AG's handling of wintry weather conditions during a nationwide winter storm in February 2021. The onset of winter had caused prolonged closings of some lines on the DB Netz AG network.

The Bundesnetzagentur conducted proceedings to assess the initiation of line closings, communication with access beneficiaries and preparations for winter service (with particular regard to preparation processes at different organisations within the associations). The ruling chamber's objective was to find out where it was necessary to require DB Netz AG to make changes for handling future winter storms.

The Bundesnetzagentur's decision is not yet final.

Rail network congestion

A total of €1.4bn is available until 2030 as part of the Climate Action Programme for "minor and medium-sized works" to relieve congested railway infrastructure. Typical works include the extension of passing tracks, optimisation of track planning, closer signal blocks and repositioning signals. The first step in the process is identifying which measures make the most sense. These are first and foremost the measures proposed as part of the procedure to be followed where railway lines are congested and towards implementing Deutschlandtakt, the nationwide synchronised timetable.

Between 2008 and 2021 there were a total of 18 congestion procedures where plans to increase the railway infrastructure capacity (PEK) were drawn up, or are currently being drawn up or revised. This developed into an area of focus for 2021 with the upgrading due of lines in Kinzigtal (Fulda), on the Upper Rhine, the entire Rhine-Ruhr axis from Cologne to Dortmund via Duisburg as well as in the Gemünden/Würzburg/Nuremberg area. Two lines west of Berlin and the Gelsenkirchen - Münster section of the main line from

the Ruhr region to Hamburg were declared congested and will therefore be worked on. The growing demand for train paths is one reason for the overall unsatisfactory quality of service on Germany's railway network, which again worsened in 2021.

However, rapid improvements are not expected with regard to infrastructure expansion and so DB Netz AG has hardly any "minor and medium-sized work" projects ready for construction where the need has been foreseeable for a long time. Specific planning and integration into general construction activities continues to take years, which is why infrastructure expansion cannot begin until around 2024/25 at the earliest.

Deutschlandtakt

Deutschlandtakt has developed into a forward-focused project for the rail sector, with the aim of implementing a nationwide synchronised timetable. Rail passengers will benefit from synchronised timetables with reliable connections and there will also be adequate capacity for freight traffic. A target timetable is used to determine which infrastructure projects will be necessary.

The final Deutschlandtakt report about the target timetable made it clear that the infrastructure expansion necessary will yield good results. The Bundesnetzagentur has drawn up a statement on the topic expressing its commitment to ensure that competition is secured on a lasting basis and that Deutschlandtakt must ultimately be politically responsible with participation from the entire railway transport services markets, and not be shaped by one key undertaking.

To gradually implement Deutschlandtakt there is a tentative plan for 2026 to 2030 to offer train services every half hour on important long-distance lines. However, that could lead to freight traffic "freezing" at 2019 levels. The Bundesnetzagentur supported freight transport undertakings' criticism of the plan that such a freeze would be unacceptable for a market currently seeing such positive growth.

The Bundesnetzagentur supports a working group from the Federal Ministry for Digital and Transport in the institutional implementation of Deutschlandtakt. The complexity of capacity management and timetabling is operationally and technically challenging, and there are also constraints in European law that must be observed. The legislators have therefore decided to first test regulatory rules on pilot routes to be assessed by the Bundesnetzagentur.

DB Netz AG Network Statement (NBN 2023)

For the 2023 working timetable period the Bundesnetzagentur rejected several of DB Netz AG's intended modifications to and amended versions of the network statement. The rejections, some of which were linked to provisions, mostly concerned parts of the network statement having to do with access to railway infrastructure (especially with regard to the reintroduction of framework agreements). DB Netz AG had previously informed the Bundesnetzagentur of intended modifications to and amended versions of the network statement.

One focus of the intended modifications was the (re) introduction of framework agreements. Several years ago DB Netz AG decided to no longer offer framework agreements due to more stringent requirements under European law. Market players in particular from the regional and local rail passenger transport segment had criticised this decision because framework agreements make it possible to secure traffic over a longer time period. To create an incentive for introducing framework agreements, the legislators made it mandatory for framework agreements to receive approval from the Bundesnetzagentur. The approval is required so that, among other things, certain European legal requirements for a subsequent change to framework agreements do not apply. Approval of individual framework agreements is an administrative procedure that is separate from the aforementioned network statement revision procedure.

Another focus was the introduction of the obligatory use of train radio devices in the DB Netz AG infrastructure that have better protection against interference. The aim is to help prevent the formation of security-related dead spots in train radio caused by LTE900 expansion near railway lines.

Working timetable train path rejections

DB Netz AG submitted a total of 89 intended rejection notifications for train path applications (from the first and second scheduling phases) to the Bundesnetzagentur for the 2021/2022 working timetable. Thus the number of procedures was slightly lower than in the previous year (92 intended rejection notifications). Overall there were around 80,000 train path requests.

Nearly 40% of the intended train path rejections from the first scheduling phase were linked to construction work in the Elbe Valley that will make international freight service to Czechia more difficult as from 26 June 2022. In those path conflicts most of the path requests were from the rail freight transport segment.

Other intended rejections, most of which affected long-distance rail passenger transport, concerned train paths between Berlin and Hamburg, Munich and Salzburg, and in Munich itself.

The Bundesnetzagentur did not object to the intended rejections.

Construction work / implementation of Delegated Decision (EU) 2017/2075

For several years the European Commission has been uniformly regulating the planning and coordination of construction work throughout Europe by route operators with neighbouring infrastructure managers and access beneficiaries.

Requirements are based on what impact the construction work will have on railway operations. The larger the impact, the sooner communication and coordination must take place. Construction work that will cause the cancellation of more than 30% of traffic on more than seven consecutive days must be planned more than two years in advance. In some cases alternative design options must be discussed and weighed up against each other in light of the effects on the users. Capacity on potential alternate routes must also be taken into account and coordinated. Construction work that will have less impact does not need to be planned as far in advance. However, in those cases as well the constraints must be coordinated and published six months before the start of the working timetable period affected. Urgent work or work that does not affect users can be completed at any time. Overall the delegated decision aims to minimise the impact of construction activities on railway operations and to coordinate them transparently with all relevant market participants.

In 2021 the Bundesnetzagentur gave DB Netz AG specific guidelines for implementing the decision and will continue to provide support for the steps necessary to comply with the decision.

Train path request turnaround times for non-scheduled rail services

Due to a complaint by an access beneficiary, the Bundesnetzagentur required DB Netz AG in 2021 to remove from its network statement by the middle of 2022 the longer turnaround times of two to four weeks for what are referred to as particularly complex train path requests for non-scheduled rail services.

DB Netz AG's network statement has to date contained deadlines of two to four weeks in addition to the regular turnaround time of five business days for train path requests for non-scheduled rail services. DB Netz AG considers the processing of these requests to be especially complex. This relates to, among other things, cross-border travel, requests for changes to the working timetable, exceptional transports and other special cases.

In addition to European legal requirements the Bundesnetzagentur's decision to remove the longer turnaround times was also based on the fact that DB Netz AG was unable to demonstrate a proportionate need for longer turnaround. The decision is not yet final.

Reserve capacity in the working timetable for non-scheduled rail services

In response to a complaint from an access beneficiary, the Bundesnetzagentur required DB Netz AG to adjust its process for assessing the need for reserve capacity in the working timetable for the anticipated (short-term) non-scheduled rail services to be registered throughout the year. In the regulatory authority's view DB Netz AG's evaluation process was insufficient because it did not sufficiently take the access beneficiaries' spatial and temporal needs into account.

Route operators must evaluate the need to maintain reserve capacity within the final scheduled working timetable to enable them to respond rapidly to foreseeable ad hoc requests for capacity. This requirement arises from the Rail Regulation Act and DB Netz AG's own published network statement and also applies in cases of congested infrastructure. The evaluation must at a minimum include the ad hoc requests that have been submitted within the last two working timetable periods. In the Bundesnetzagentur's opinion the law requires an evaluation based on the spatial and temporal needs of the access beneficiaries.

The decision is not yet final. As part of the interlocutory injunction sought by DB Netz AG, Cologne Administrative Court has meanwhile granted DB Netz AG's request for an order establishing the suspensory effect

of its legal action. With recourse to a more recent decision by the Higher Administrative Court for the Federal State of North-Rhine Westphalia in Münster, the court however emphasized in its reasoning behind the decision that the requirement for an evaluation in line with the Bundesnetzagentur's specifications is fundamentally lawful.

In November 2021 DB Netz AG notified the Bundesnetzagentur about the intended modification in its network statement with regard to adjustments of reserve capacity checks. The Bundesnetzagentur has not reviewed the intended adjustments. It has required DB Netz AG to develop a regulation concept (target version) that corresponds to the provisos in the decision for maintaining reserve capacity in the working timetable. For a transition period DB Netz AG must make two modifications to the arrangements it intends to adopt. Firstly, the Bundesnetzagentur has required DB Netz AG to adjust its network statement so that maintaining reserve capacity is limited to two reserve capacities per line section, direction and day. This accommodates the interests of the access beneficiaries that are registering capacity for the working timetable. Secondly, DB Netz is required to make an adjustment so that protected capacity can only be booked for traffic where the first day of traffic is planned for no more than two months after the train path request. This ensures that reserve capacity is used for traffic that can only be planned at short notice. The Bundesnetzagentur did not have any other objections to the intended arrangement.

Access to service facilities

Capacity constraints and refusals of requests to use service facilities

Operators of service facilities must notify the Bundesnetzagentur of intended refusals of usage requests. The regulatory authority will then assess whether the procedure that led to the intended refusal was correctly applied.

The Bundesnetzagentur received a total of 37 notifications of intended refusals of requested usage in the DB Netz AG service facilities capacity allocation process for the 2022 working timetable. Thus the number was up slightly from the previous year (34 notifications).

The reasons for capacity constraints and the difficulties associated with them are similar to those of previous years. Most of the capacity in the requested operating locations (especially those with passenger transport) is allocated through long-term contracts, so the capacity is only available for the other market participants where shared use is granted. Additionally, there were constraints in operating locations that are in high demand with freight transport companies that ship wood.

The Bundesnetzagentur did not reject any of the intended refusals. It continues to closely monitor capacity constraints and examine whether awarding long-term contracts in certain operating locations presents an access barrier for railway undertakings. In future, refusals of requests for secondary use in non-scheduled rail services will also be evaluated.

Maximum loads of power feeder pillars

DB Netz AG's Network Statement 2023 (NBN 2023) notification included a plan to prohibit the attachment of additional distribution panels to individual power feeder pillars. Power feeder pillars can be booked as additional equipment in service facilities. Among other things, the pillars supply parked trains with electricity to place and maintain the trains in a ready-to-operate state.

In DB Netz AG's view, attaching additional power connections should be prohibited. It argues that there is no way to ensure that the power feeder pillars would withstand additional loads of electricity and a system overload would cause an outage of the main fuse, which would shut down the entire system. Thus, according to DB Netz AG, more power feeder pillars should be booked to meet any additional needs. The Bundesnetzagentur, in agreement with the Federal Railway Authority's opinion, rejected the intended

arrangement. A general prohibition is not compatible with the law. The Bundesnetzagentur sees a violation of the principle of proportionality because a lack of safety brought about by using distribution panels could not be proven. Rather, in order to maintain infrastructural capability, the operator must take a nuanced approach.

Implementation of the new rules of the Rail Regulation Act in Network Statements for Service Facilities (NBS)

In June 2021 the amended Rail Regulation Act (EReG) entered into force. The adjustments in the service facilities segment were made in light of the Commission Implementing Regulation on access to service facilities and rail-related services, which entered into force in June 2019. The changes also implement European Court of Justice case law on the classification of passenger platforms.

In May 2021 the Bundesnetzagentur therefore called on the operators to update and adjust their NBS. The regulatory authority is available as a competent and trustworthy point of contact to assist with this.

Bulk freight terminals also subject to regulation

The Higher Administrative Court for the Federal State of North-Rhine Westphalia in Münster reached a decision in the Bundesnetzagentur's favour. Trimodal terminals specialising in bulk freight with only a small business interest in railway transloading are to be classified as freight terminals within the meaning of the Rail Regulation Act.

The court case concerned a silo facility through which bulk freight (grain and animal feed) is transshipped. The purpose and usual operational procedures of the silo facility as a whole would technically and functionally be associated with railway operations. A freight terminal would fall under railway law as soon as transloading from another mode of transport to the railway or vice versa takes place. Thus a freight terminal service facility generally includes all parts of the facility used for loading and unloading rail freight wagons. Only the parts of the facility that have nothing to do with railway operations are not included. By contrast, direct transshipment between the modes of transport would not be necessary. Even long-term storage service would not break the transport chain. It is not important whether or not other services (eg processing services, aspirating, crushing, fumigating) besides freight transloading are offered in or with the facility in question.

The operator of this type of terminal must create a network statement if the facility (or parts thereof) and services are related to railway operations.

Infrastructure charges

DB Station&Service AG's station charges for 2022

The Bundesnetzagentur approved DB Station&Service AG's station charges for the 2022 calendar year. The company is the largest operator of passenger stations and passenger platforms (together referred to as stations) in the Federal Republic of Germany.

Following a ruling by the European Court of Justice and the resulting amended Rail Regulation Act that went into force on 18 June 2021, the Bundesnetzagentur had to approve the charges for the use of passenger platforms and for all other uses of passenger stations separately. The approved charges add up to the respective station charge. The calculation of the station charges was checked during the approval procedure. After individual adjustments were made to the applicable costs, the station charges were ultimately approved in the amount requested. As was the case in the previous year, only the fee for unused station stops was approved with a 5% deduction.

Costs for operating the Mobility Service Centre (MSC) were taken into account in the approval decision for the first time. On the basis of agreements that have been made with all federal states and with regional and local passenger transport authorities, DB Station&Service AG will assume the operation of the Mobility Service Centre as from 1 January 2022. The MSC accepts requests from travellers with restricted mobility who need assistance boarding, changing and alighting trains.

DB Netz AG's 2022 train path price system

The Bundesnetzagentur approved the charging principles and charges submitted by DB Netz AG for the 2021/2022 working timetable period (2022 train path price system).

Approved train path charges for 2022 increased by an average of 2% compared with the 2021 approved charges. This average charge increase can be broken down into a 0.5% increase in the rail freight transport segment, a 3.8% increase in the long-distance rail passenger transport segment and, in accordance with legal provisions ("train path price curb"), a 1.8% increase in the regional and local rail passenger transport segment. Deviating from the charges submitted for approval, the Bundesnetzagentur slightly increased the rail freight transport charges and offset that increase by slightly reducing the long-distance rail passenger transport charges.

In addition to setting conditions in the design and delineation of individual transport segments, the ruling chamber reduced the charge submitted for approval in the "Point-to-point services" market segment of long-distance rail passenger transport by 21%. This market segment is used primarily by market entrants. The approval was granted on condition that maximum prices (caps) comparable to previous years would be introduced for cancellation or alteration charges

Other important topics of the approval procedure were the effects of the Covid-19 pandemic and an accusation of margin squeezing. Margin squeezing is an anti-trust abuse of market power where a company that is also active in the market for a certain intermediate product (here infrastructure capacity awarded by a network operator) "squeezes" the potential profit margin to be made in the retail market (here rail transport services from a railway undertaking) by raising prices for the intermediate product and/or lowering the prices of an end customer service. Margin squeezing serves to drive away competitors.

The ruling chamber shared the consensus of those involved in the procedure that it is not possible to say with certainty what effects the Covid-19 pandemic had on the approval period. However, at the time the decision was made (March 2021) studies were showing that the transport markets would likely recover by the approval period. The accusation of margin squeezing in the long-distance rail passenger transport and rail freight transport segments was brought forward by outside parties and rejected as unfounded by the Bundesnetzagentur.

Upper limit on DB Netz AG's 2023 total costs

The Bundesnetzagentur set the DB Netz AG's 2023 upper limit on total costs to €5.548bn, which is €54mn (around 1%) more than the 2022 limit of €5.494bn.

The upper limit on total costs is part of the statutory incentives for route operators to reduce costs and increase traffic volume. The incentive system is set to run over a regulatory period of five years. The current regulatory period is from 2019 to 2023. Prior to the start of a regulatory period the average costs and traffic volumes are determined on a one-off basis for each route operator for a reference period of one to five complete fiscal years in the past (base year). The base year is used to determine the base level of total costs, which is then used to set an upper limit on total costs for each working timetable period. The upper limit is calculated by adding the rate of price increases to the base level of total costs minus any rate of growth in productivity. In some cases there are further aspects to take into account such as the existence of regulatory agreements between the public sector and the route operator. The third step is approving the charges, which is done while taking the determined upper limit on total costs into account.

In the past, eight other companies in addition to DB Netz AG had to apply a pricing system that includes incentives. Due to the amendment of the Rail Regulation Act in 2021, the related provisions no longer apply to route operators of networks up to 1,000km in length. Thus the Bundesnetzagentur now only sets an annual upper limit on total costs for DB Netz AG.

Charge approval procedure for other route operators

In contrast to the approval procedure for DB Netz AG charges, all other route operators undergo a simplified charge approval procedure. Certain conditions for exceptions or exemptions have been fulfilled for these undertakings so that only selected charge regulations apply. These route operators' charges are to be approved if they are reasonable, non-discriminatory, transparent and so calculated that they do not exceed the cost of providing the services plus a reasonable profit. The Bundesnetzagentur informed approximately 78 route operators in summer 2021 about the legal basis for this and the steps involved in the procedure.

For the simplified charge approval procedure, the Bundesnetzagentur placed greater focus in 2021 on implementing the Rail Regulation Act's new legal requirements and accelerating the procedures. As part of a continuous improvement process, work was also done to further simplify and standardise processes and, as in previous years, to continue providing

information sessions on recently added services and non-binding preliminary reviews of charge approval requests. The objective was to minimise the administrative burden of the route operators affected and to support the companies throughout the administrative proceedings.

The Bundesnetzagentur assumes that all charge approval proceedings can be finalised by spring 2022 at the latest.

Notification procedure for operators of service facilities

The operators of service facilities must notify the regulatory authority of their intended revisions or changes to network statements for service facilities including which charging principles they plan to use and the amounts they intend to charge. The Bundesnetzagentur must assess the notifications within six weeks. In 2021 around 80 proceedings related to charges were conducted by the Bundesnetzagentur with operators of service facilities. Most of the planned arrangements in the service facility operators' notifications did not require a rejection.

During the assessment the Bundesnetzagentur provided more information about the incentive system for minimising disruptions and for increasing the efficiency of the service facilities and about arrangements in connection with cancellation charges. One other recurring topic was the adjustment of network statements to changes in the legal framework, including the Commission Implementing Regulation and the Rail Regulation Act, which was most recently amended on 9 June 2021. The newly introduced right to choose with regard to determining passenger platform charges was another area of focus in the second half of 2021 that will continue to be important in 2022.

With its decision from 29 April 2021 the Bundesnetzagentur set specifications for notification procedures. In the event of extensive changes to the charges, the infrastructure manager must submit an overview of the forecasted costs, volumes of services, annual revenue and the corresponding figures from recent fiscal years. The Bundesnetzagentur has prepared a data form for service facility operators to submit this information.

Important court decisions

Federal Court of Justice (BGH): Ruling on liability when delays are linked to infrastructure

The BGH ruled that infrastructure-related delays do not preclude DB Netz AG's contractual liability since a contractual obligation includes the timely provision of infrastructure at the contractually-agreed times.

The dispute was referred back to the appellate court for it to re-open the case and decide whether a claim for damages existed. Previously and contrary to the view of the BGH, the appellate court had denied any such claim because it interpreted the finalised contract between the parties to mean that claims for financial damages beyond any rights to a reduction of payment were precluded.

A railway undertaking in the regional and local rail passenger transport segment had filed a claim for damages for the amount that the regional transport authorities had deducted from their compensation for non-compliance with timetables, which had been caused by delays. The BGH made the suggestion that railway undertakings filing claims for damages should in future be granted relief from the procedural burden of proof incumbent on them according to the principles for proving negative facts. This suggestion is to be welcomed since it is very difficult for the claimant, who bears the burden of proof, to impartially demonstrate a breach of duty on the part of the infrastructure manager without being able to shift the burden of proof.

However, we do not share the opinion of the BGH that any exclusion of liability in the network statement should be examined under civil law criteria and, if necessary, before a civil court. Under current case law it is the responsibility of the regulatory authority to examine whether the contract for use and control operation mechanisms conform to railway law. Items to examine could include intended revisions, changes and network statements already in force. The BGH's assessment has thus called the relationship between civil law and regulation under railway law into question. It remains to be seen whether the appellate court deciding the dispute will concur with this opinion.

Other issues

Market consultation

The ERegG provides for the Bundesnetzagentur to consult at least every two years with representatives of the users of services in the rail freight and passenger rail transport segments. The Bundesnetzagentur conducted a market survey with representative associations in the field of rail freight transport in 2021. It gave participants the opportunity to comment on topics such as the effects of the Covid-19 pandemic, the Rail Freight Masterplan and the Deutschlandtakt timetabling and capacity redesign. The results of the consultation have been published in German on the Bundesnetzagentur's website at:

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

Rail Regulation Fees Ordinance

The Rail Regulation Fees Ordinance (EReg-BGebV) entered into force on 15 May 2021. This fees ordinance was created for the Bundesnetzagentur's procedures in the area of rail regulation. The ordinance enables billing for the tasks carried out by the Bundesnetzagentur in accordance with the Rail Regulation Act or European Commission implementing regulations. The current version of the EReg-BGebV was developed in collaboration with the Bundesnetzagentur. In 2021 the Bundesnetzagentur made its own assessments of statements made during the second consultation with associations. Those assessments were included in the process of adopting the EReg-BGebV.

The Bundesnetzagentur created an administrative rule on the general fees and early in 2022 issued the first invoices for fees after the administrative rule was published.

Monopolies Commission - eighth railway sector report

This year the Monopolies Commission published its eighth railway sector report, "Competition on the rail!" In the report the Monopolies Commission expresses its views on current and foreseeable developments in competition in the railway transport services market. The Bundesnetzagentur contributed to the report by answering questions and then participating in an oral discussion.

The report focuses on, for example, capacity constraints with regard to access to service facilities and proposed solutions that could be taken into account in future legislative procedures. From the regulatory practice perspective, some of the observations and assessments in the report cannot be shared without reservation.

Following publication of the report in July 2021 the Bundesnetzagentur submitted a statement containing the main points of the Monopolies Commission report to the Federal Ministry for Digital and Transport. The report does not indicate any immediate need for action.

Railway Law Research Days 2021 "Current Problems in Railway Law"

The Railway Law Research Days 2021 "Current Problems in Railway Law" event series took place for the 27th time. Jointly organised by the Bundesnetzagentur and the Universität Regensburg, the event provided an exchange opportunity for experts from the areas of science and law, and professionals in the field.

The main topics were the pending changes in capacity management for rail networks, integrating service facilities into capacity management and further European and legal developments in rail regulation. The symposium will be held in Regensburg in 2022.

Specifications for infrastructure managers' notifications

Under legal requirements, railway infrastructure companies must notify the Bundesnetzagentur of, for example, intended modifications to the network statement or intended refusals of train path requests. The legislators grant the Bundesnetzagentur the opportunity to draw up specifications for infrastructure managers' notifications. The Bundesnetzagentur drew up the specifications by means of a general administrative order addressed to the infrastructure managers in Germany and published the order on the Bundesnetzagentur web site.

AG Netz AG, which is Germany's largest infrastructure manager, has thus far not been unsuccessful in its attempts to obtain an interlocutory injunction. Cologne Administrative Court has denied DB Netz AG's request and emphasized the Bundesnetzagentur's privilege in determining the specifications of the notification.

Consultation on methods for determining interest rates for railway infrastructure managers

The Bundesnetzagentur published a report on the methods for determining interest rates for railway infrastructure managers. The starting point is the examination of the methods used in the past. The report sets out and discusses the approaches taken in the past to determine the rate of return on equity and the interest rate on borrowings and also explores possible alternative methods and further developments.

The report presents considerations on determining the rate of return on equity using various capital market models, different possible ways for deriving the market risk premium and calculating the risk-free interest rate, and options for determining the interest rate on borrowings.

The methods report and the comments received will provide the basis for a further report on determining the rate of return on equity and the interest rate on borrowings. This report will be drawn up in the first half of 2022. The Bundesnetzagentur will take account of the report and the comments received when specifying the interest rates in the individual proceedings for charges. The parties involved will also be able to state their views on the planned rates in the course of the individual proceedings.



International cooperation

The Bundesnetzagentur is involved internationally in the European independent regulators' group for the railway sector. This body's work in 2021 included the publication of a special report on the impact of the coronavirus crisis on the European railway markets in 2020.

Working groups at IRG-Rail and ENRRB

As was the case in 2020, the year 2021 was largely characterised by the Covid-19 pandemic and its impact on the European railway. The working groups continued their focus on questions about the future development of the European railway market.

Two European Network of Rail Regulatory Bodies video conferences were held where participants were able to talk about current trends and cases. Key topics were passenger platforms, services in port terminals, the redesign of the timetabling process (TTR) and policies and arrangements with regard to temporary capacity restrictions.

The Bundesnetzagentur is involved internationally in IRG-Rail, the European independent regulators' group for the railway sector. Together, regulatory authorities from 31 member countries comprise IRG-Rail. The regulatory authorities exchange ideas in various working groups on current and strategic railway regulation topics.

In 2021 the IRG-Rail working groups published the following position papers:

- The Access Working Group created, among other things, a summary of the introduction of current rules concerning temporary capacity limitations. Insufficient planning and coordination of temporary capacity limitations has long been a main obstacle to international rail transport and inefficiencies in capacity planning at national level.
- Several new general deadlines and processes for negotiating, publishing and coordinating temporary capacity limitations in Europe were introduced by delegated decision. A 2020 survey of IRG-Rail members showed that most route operators have begun taking steps to incorporate these deadlines and processes into their network statements, but further steps may be necessary to fully comply with the delegated decision's requirements.
- For the 2021 timetable all of the specifications of the delegated decision were applied for the first time, presenting the regulatory authorities in each country with an opportunity to gain a complete overview of the implementation of the regulations. Several regulatory authorities were involved in complaints and ex officio studies concerning the delegated decision. The experience had by

Germany and Sweden highlights some key aspects and IRG-Rail will continue to monitor, discuss and share findings with interested parties.

- The sub-working group Access to Service Facilities created a document showing how various European countries classify railway infrastructure in the most important sea and inland ports for purposes of regulation. Railway infrastructure can be classified as a service facility or a rail network.
- The Charges Working Group created an overview of the application of market segmentation and markups when determining track access charges. The document is supplemented by case studies on the implementation of market segmentation and markups in several countries.
- The sub-working group Charges for Service Facilities updated its summary document on fees and fee policies for freight terminals, which was first published in November 2020.
- The Emerging Legislative Proposals Working Group created a document on integrated ticketing measures and through tickets in the EU, providing an overview of the current status of ticket solutions within the IRG-Rail member states. The document identified challenges in ticketing and outlined the regulatory authority's powers in this area.
- In 2021 the Market Monitoring Working Group completed the Ninth Market Monitoring Report. The monitoring report provides an annual overview of market trends and the economic conditions of the railway sector with respect to the IRG-Rail member countries. The report also enables a comparison of the railway market's competitiveness over the course of time. The monitoring report consists of two parts: the main part presents results at the pan-European level, while the working document contains country-specific data with more detailed findings from 30 countries. The data from the charts is also published on the IRG-Rail web site. The ninth report, which covers the year 2019, assesses Covid-19's impact on the European railway market in the first half of 2020 and the measures taken by the member states and their local authorities to mitigate its effect while ensuring public health. Furthermore, a special report was completed and published on the impact of the coronavirus crisis on the European railway markets in 2020.

All published IRG-Rail documents are available at:
www.IRG-Rail.eu

The Bundesnetzagentur's core tasks and organisation

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 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 rail sectors and to guarantee non-discriminatory network access. Alongside regulatory measures in the energy sector, as the national 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, on the basis of various pertinent laws and ordinances, provides regulations for the use of frequencies and numbers. Furthermore, the Bundesnetzagentur is the competent authority under the Electronic Signatures Act (SigG). The Bundesnetz-

agentur'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.

In the energy sector the Bundesnetzagentur has been assigned key market supervisory tasks resulting from electricity and gas network development planning, from the Market Transparency Unit for Wholesale Electricity and Gas Markets set up in 2013, and from its responsibility for safeguarding security of supply. A major departmental function is to give ruling chambers specialist assistance in their decision-making.

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 Bundesnetz-

agentur 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 rates regulation. In addition, the statutory decision in 2011 to phase out nuclear power as part of the *Energie-wende* 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. 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 Bundesnetzagentur's regional offices, the contact point with consumers and industry, are managed and coordinated centrally by a single department. 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 this year. 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 are to be 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 (the Energiewende database) are also to be performed in Cottbus. Approval procedures will continue 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 IS and Z are carried out there.

Human resources management

Human resources management is a top priority at the Bundesnetzagentur. It is important both to assign 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 and cost-effective 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 berufund-familie Service GmbH for having personnel policies that take both family life and the various stages of life into account. In recruiting new staff the Bundesnetz-

agentur 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 and scientists from various 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 2021, a total of 172 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. In 2016 the Bundesnetzagentur added a vocational training-integrated dual study programme for computer science students (Bachelor of Science) in combination with posts as IT trainees. For the first time in 2021 two students were also hired for a practice-integrated dual study programme in electrical engineering in Mainz. Moreover, since 2012 civil servants preparing for the rank of Regierungsinspektor have been selected to take a university degree in IT in public administration. Vocational and university training courses are offered

at a total of nine Bundesnetzagentur locations, including the 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 2021 (target and performance) and 2022 (target figure in the first government draft).

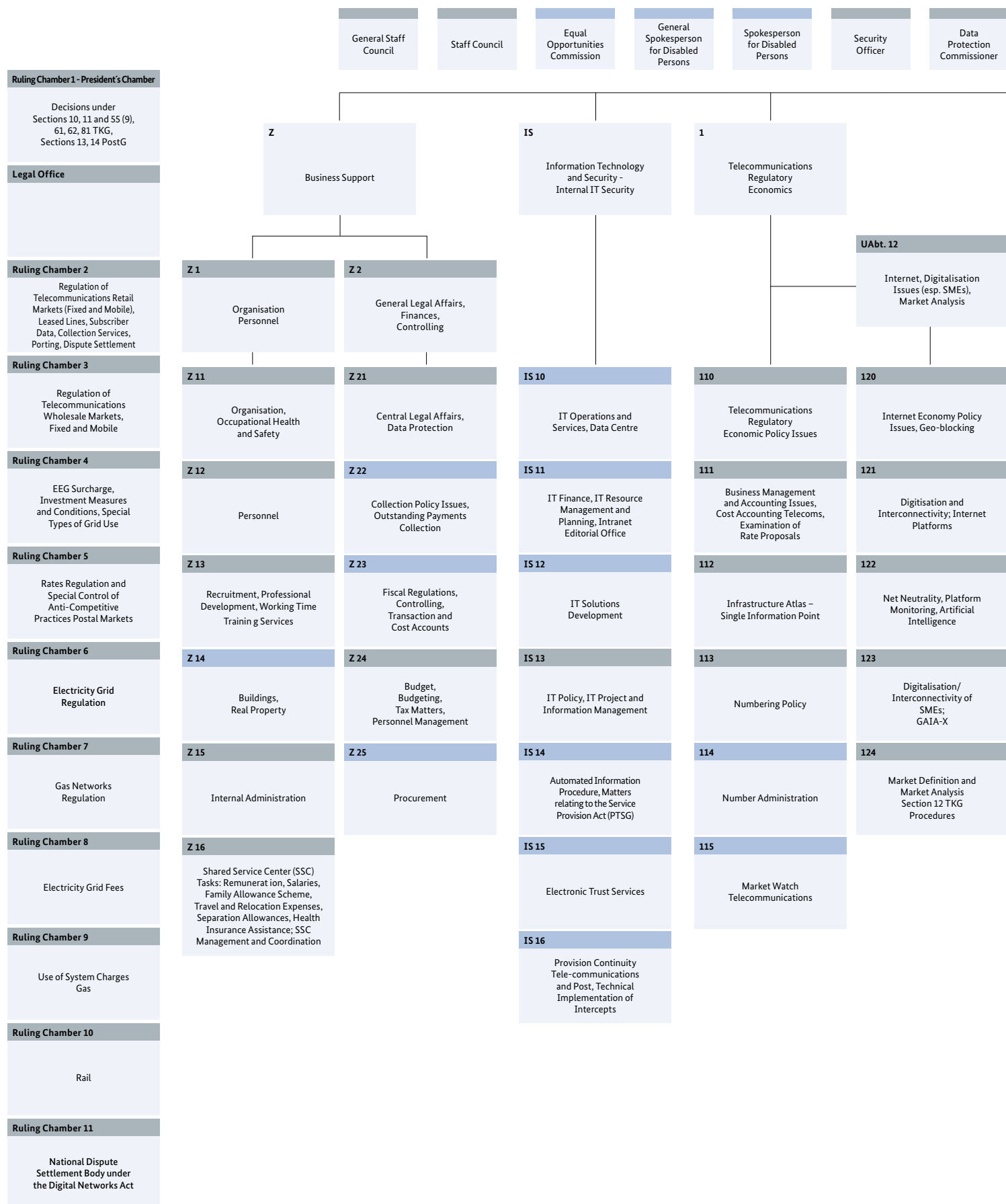
Type of income	Target 2020 €'000	Performance 2021 €'000	Target 2022 €'000
Fees, contributions and other charges in the telecoms sector	35,607	75,908	47,625
Fees and other charges in the postal sector	17	15	17
Fees and other charges in the rail sector	0	-1	0
Fees and other charges in the energy sector (electricity, gas, EEG)	5,763	11,912	8,820
Fees and other charges under the Grid Expansion Acceleration Act	22,560	56,736	35,000
Other administrative income, eg fines and rental and sale income	23,158	23,135	21,243
Administrative income	87,105	167,705	112,705

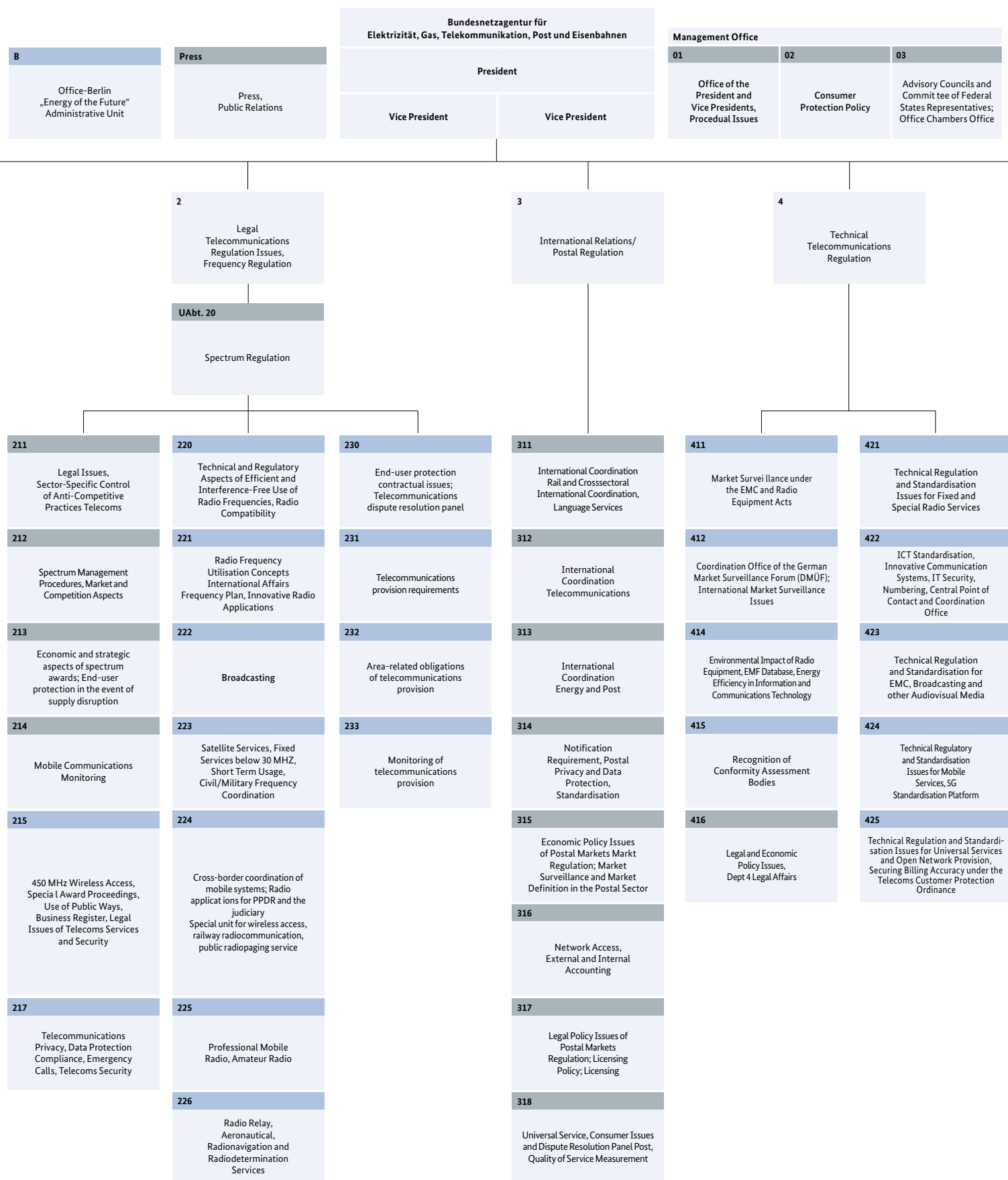
The higher than expected income generated in the telecommunications sector is mainly due to frequency fees and contributions subsequently collected for the protection of interference-free frequency usage. Once again the energy sector and network expansion have seen an increase in income as well. Collection of revenue in the rail sector was still not possible last year due to the lack of a fee ordinance. The table below shows the expenditure for 2021 (target and performance) and 2022 (target figure in the first government draft).

Type of expenditure	Target 2021 €'000	Performance 2021 €'000	Target 2022 €'000
Staff costs	185,736	156,357	172,666
General administrative expenditure, appropriations and special financing expenditure	62,484	55,654	68,119
Investments	14,441	14,984	13,856
Total expenditure	262,661	226,995	254,641

Mobile working has been expanded as a result of the coronavirus pandemic. Acquisitions relating to the pandemic led to increased investment expenditure in 2020. The increase in budgeted expenditure for 2021 is attributable to building up and extending the human and material resources in locations and organisational units in response to the assignment of new tasks.

Organisation Chart

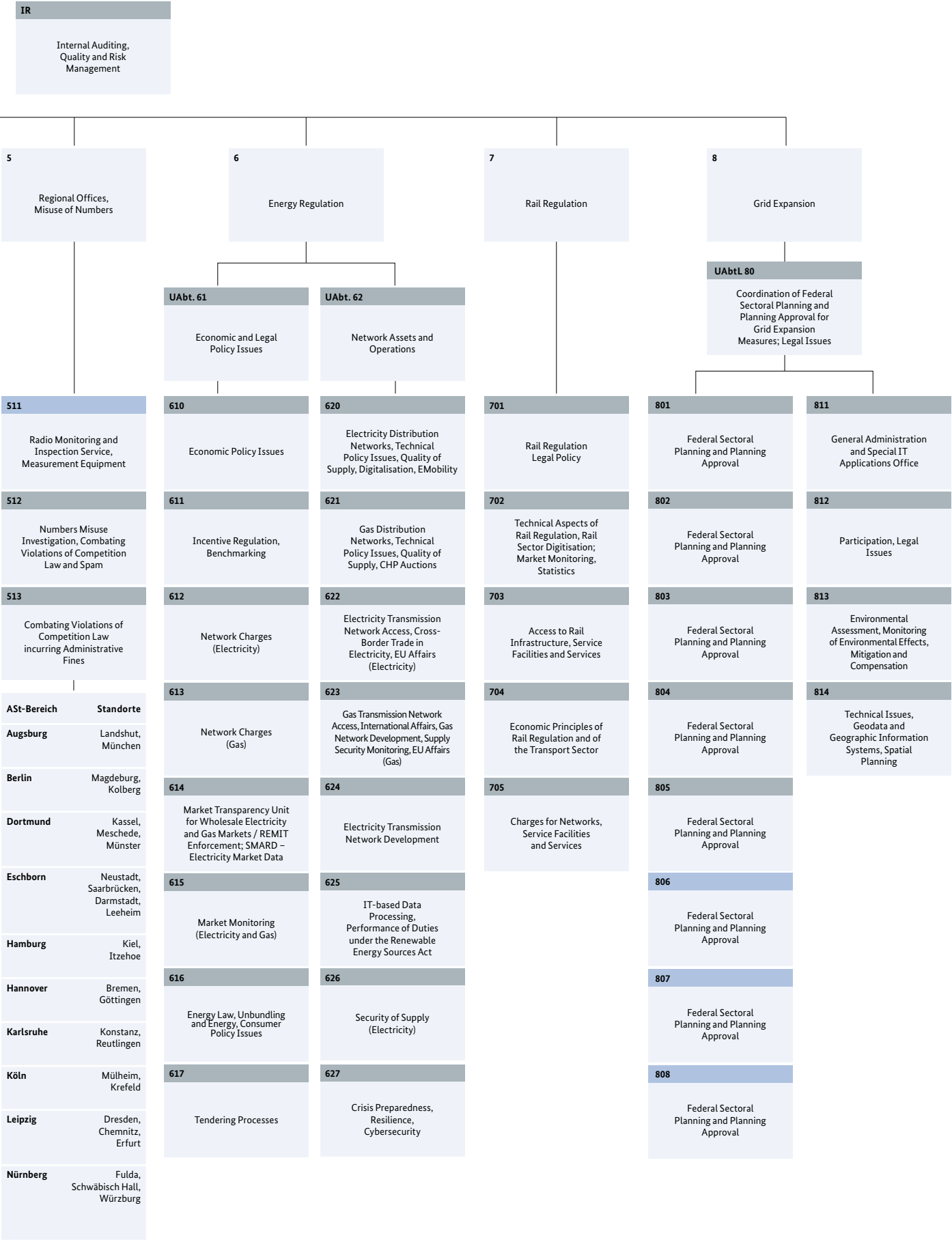




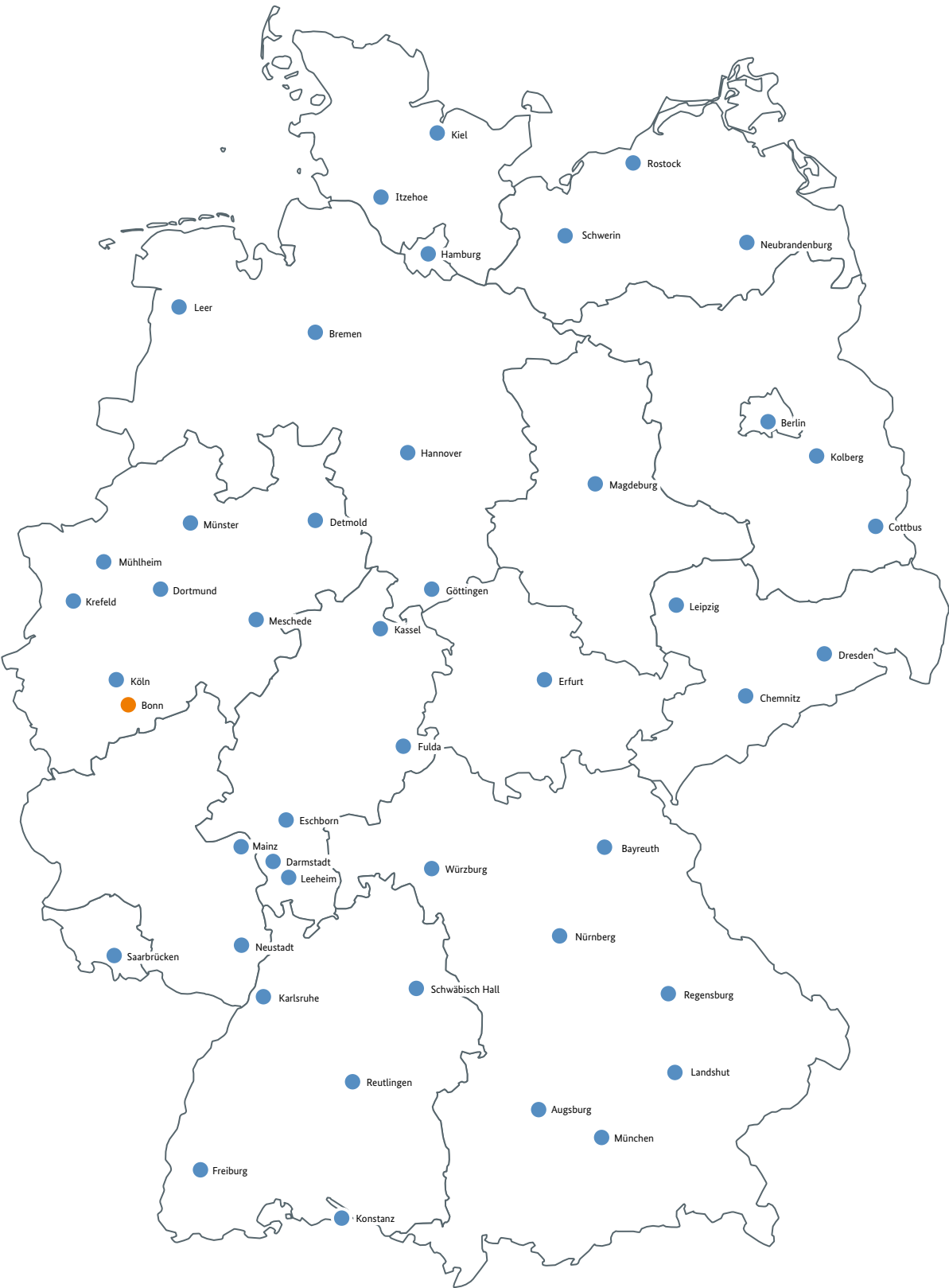
■ in Bonn

■ At other locations (Berlin, Mainz, Saarbrücken)

As at: 18 August 2021



Locations



Abbreviations

3GPP 3rd Generation Partnership Project

A

AAs active antenna systems

ACER Agency for the Cooperation of Energy Regulators

aFRR automatic frequency restoration reserves

AI artificial intelligence

AP5G 5G dialogue platform

ARegV Incentive Regulation Ordinance

ASIDI Average System Interruption Duration Index

B

B2C Business-to-Customer

BBPig Federal Requirements Plan Act

BDEW Bundesverband der Energie- und Wasserwirtschaft e.V.

BEREC Body of European Regulators for Electronic Communications

BGH Federal Court of Justice

BIEK German Parcel and Express Association

BIL eG national information system for pipeline enquiries

BKompV Federal Compensation Ordinance

BMDV Federal Ministry for Digital and Transport

BMWi Federal Ministry for Economic Affairs and Energy

BMWK Federal Ministry for Economic Affairs and Climate Action

bn billion

BSH Federal Maritime and Hydrographic Agency

BSI Federal Office for Information Security

BSI KRITIS-VO BSI Critical Infrastructure Ordinance

BWA broadband wireless access

C

CEP courier, express and parcel

CEP European Conference of Postal and Telecommunications Administrations

CH combined heat and power installations

COCOM requirements defined by the European Commission in its latest broadband report

CPC European Consumer Protection Cooperation

ct/kWh cents per kilowatt hour

CUII Online Copyright Clearance System

D

DMA Digital Markets Act

DMÜK German Market Surveillance Conference

DNG Data Usage Act

DNS domain name system

DP EPS Deutsche Post E-Post Solutions GmbH

DSA Digital Services Act

DSO distribution system operator

DSS Dynamic Spectrum Sharing

E

ECC Electronic Communications Committee, European Consumer Centre

ECC Reports producing ECC Decisions and ECC Recommendations, studies on radio spectrum issues

ECJ European Court of Justice

EEA European Economic Area

EECC European Electronic Communications Code

EEG Renewable Energy Sources Act

EEX European Energy Exchange

EFZN Energy Research Centre of Lower Saxony

EGC European General Court

eIDAS Regulation Regulation on electronic identification and trust services for electronic transactions in the internal market

EMC electromagnetic compatibility

EMF electromagnetic field

EMVG Electromagnetic Compatibility of Equipment Act

EnLAG Power Grid Expansion Act

ENRRB European Network of Rail Regulatory Bodies

ENTSO-E European Network of Transmission System Operators for Electricity

EnWG Energy Industry Act

EoI equivalence of inputs

EReg-BGebV Rail Regulation Fees Ordinance

ERegG Rail Regulation Act

ERTMS European Rail Traffic Management System

ETSI European Telecommunications Standards Institute

F

FCR frequency containment reserves

FRMCS Future Railway Mobile Communication System

FSS fixed-satellite services

FTTB fibre-to-the-building

FTTH fibre-to-the-home

FTTH/FTTB fibre networks

FUAG Radio Equipment Act

G

GasNEV Gas Network Charges Ordinance

GasNZV Gas Network Access Ordinance

GG Basic Law

GIS ISA's web geographic information system

GS-DMÜF The Office of the German Market Surveillance Forum

GTSOU Gas Transmission System Operator of Ukraine LLC

GW gigawatt

GWh gigawatt hour

H

HD-GBSAR high-definition ground-based synthetic aperture radars

HFC hybrid fibre coaxial

HIN + WEG delivery and collection service

HVDC high-voltage direct current (systems)

I

IIC International Institute of Communications

IMT international mobile telecommunications

InnAusV Innovation Auction Ordinance

IoT Internet of Things

IP internet protocol

IPTV internet-based TV

IPv6 Internet Protocol version 6

IRG Independent Regulators Group

IRG-Rail European independent regulators' group for the railway sector

ISA infrastructure atlas

ISDN Integrated Services Digital Network

ISM industrial, scientific and medical equipment

IT information technology

IWG Public Sector Information Act

K

km kilometre

KSG Climate Change Act

kV kilovolt

KVBG Act to Reduce and End Coal-Fired Power Generation

kW kilowatt

kWh kilowatt hour

KWKG Combined Heat and Power Act

L

LAN Local Area Network

L-Gas Low calorific gas

LNG Liquefied Natural Gas

LSV Charging Station Ordinance

LTE Long Term Evolution

M

m metre

M2M machine-to-machine data communications

MARI Manually Activated Reserves Initiative

MaStR core energy market data register

MFCN mobile/fixed communications networks

mFRR manual frequency restoration reserves

mn million

MsbG Metering Act

MSC Mobility Service Centre

MüG Market Surveillance Act

MVNO mobile virtual network operator

MW megawatt

N

NABEG 2.0 (revised) Grid Expansion Acceleration Act

NBN DB Netz AG Network Statement

NDP Electricity Network Development Plan

NEMO nominated electricity market operator

NEMoG Network Charges Modernisation Act

NetzResV Grid Reserve Ordinance

NGN IC next generation network interconnection

NICAs NGN interconnection accesses

NI-ICS number-independent interpersonal telecommunications services

NRAs national regulatory authorities

O

OLG Higher Regional Court

OTT voice transmission by over-the-top providers

OVG NRW Higher Administrative Court for North-Rhine Westphalia

P

PDLV Postal Services Ordinance

PEK railway infrastructure capacity

PICASSO Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation

pkm passenger kilometre

PostG German Postal Act

PSTN public switched telephone network

PUDLV Postal Universal Service Ordinance

R

reBAP uniform imbalance price applicable to all control areas

REMIT wholesale energy market integrity and transparency

RLAH roam like at home

RSC The European Commission's Radio Spectrum Committee

RSPG Radio Spectrum Policy Group

RSPG Radio Spectrum Policy Programme

S

SAIDI System Average Interruption Duration Index

SDH synchronous digital hierarchy

SDSL symmetric digital subscriber line

SGV rail freight transport

SME small/medium-sized enterprise

SMS short messaging

SPFV long-distance rail passenger transport

SPNV regional and local rail passenger transport

SRD short range device

StPO Code of Criminal Procedure

StromNEV Electricity Network Charges Ordinance

T

THE Trading Hub Europe

TKG German Telecommunications Act

tkm tonne-kilometre

TMG German Telemedia Act

TR TKÜV Technical Directive relating to the Telecommunications Interception Ordinance

TSOs transmission system operators

TTDSG Telecommunications Telemedia Data Protection Act

TWh terawatt hour

U

UAVs unmanned aerial vehicles

UWG Act against Unfair Competition

V

VAT value added tax

VDSL very high data rate digital subscriber line
Verbraucherzentrale Bundesverband e. V. – vzbv
Federation of German Consumer Organisations

VG Köln Cologne Administrative Court

VoIP Voice over Internet Protocol

VoLTE Voice over LTE

VoNR Voice over New Radio

VPN virtual private network

VSBG Act on Alternative Dispute Resolution in Consumer Matters

VwVfG Administrative Procedure Act

vzbv Federation of German Consumer Organisations

W

WACC Notice Commission Notice on the calculation of the cost of capital for legacy infrastructure in the context of the Commission's review of national notifications in the EU electronic communications sector

WasserstoffNEV Hydrogen Network Charges Ordinance

WGs Working Groups

WHG Federal Water Act

WMS web map service

WRC-23 World Radiocommunications Conference 2023

X

xDSL/FTTx digital subscriber/fibre

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The Bundesnetzagentur provides reliable information and advice to anyone who wants help or has a complaint

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