

CONSULTATION DRAFT

Consultation draft of a decision of the President's Chamber on the order for and choice of proceedings for award, the determinations and rules in detail (award rules) and the determinations and rules for conduct of the proceedings (tendering rules) for spectrum in the 450 MHz band for mobile/fixed communications networks (MFCN)

-Reference: BK1-20/001-

The spectrum usage rights in the 450 MHz band (451.00 - 455.74 MHz / 461.00 - 465.74 MHz) expire on 31 December 2020; the spectrum will be made available primarily for critical infrastructure applications within the framework of the designation for mobile/fixed communications networks (MFCN). The needs of other user groups are to be taken into consideration within an overall strategy for the bands below 1 GHz.

The provision of the 450 MHz spectrum for critical infrastructures will help to pave the way for the digitisation of the energy transition. The spectrum is particularly suitable for use in building a highly available and blackout-resilient nationwide wireless network infrastructure for sectors such as electricity, gas, wastewater, water and district heating.

It should also be taken into account that no alternative broadband spectrum and no exclusive bands are currently available for critical infrastructure operators. The provision of the spectrum can therefore make a significant contribution to the energy transition.

The functioning of critical infrastructures is an essential part of society and the economy. Degradation or failure of these infrastructures together with supply shortages can bring society in Germany to a standstill, endanger public safety and order and even put lives at risk.

In particular shortages in water and energy supply represent realistic crisis scenarios that can have a significant impact on public and private life. A disruption to energy supply, for instance, can have knock-on effects on many different areas of everyday life. With the transition to an increasingly decentralised and digitalised energy system, in particular the secure connection of millions of small, distributed generation installations is increasingly important for security of supply. Failure of the supply networks could potentially lead to traffic chaos as a result of the failure of traffic management systems (such as traffic lights). In addition to chaos on the roads, public transport, for example trains, would come to a halt en route or at stations. Furthermore, heating, air conditioning and water pump systems might stop working, production facilities might come to a standstill, and in the health sector essential operations might not be able to be carried out. An electricity power cut could result in the failure of telecommunications infrastructure, depending on how long energy is buffered for the network elements. As a result, it would no longer be possible to make emergency calls and get help or coordinate the restoration of the supply networks. There is a threat of similar crisis scenarios in the event of the failure of other infrastructure essential for meeting society's basic needs, for example water supply infrastructure. The purpose of use is not restricted to crisis communications or the connection of critical infrastructures within the narrower meaning of the BSI Critical Infrastructure Ordinance (BSI-KritisV) but, in the energy supply sector for instance, includes the whole digitisation of the energy transition. It is therefore important to be able to respond adequately to future events in the supply networks and for the telecommunications infrastructure to be "blackout-resilient" in these circumstances. This is also in line with the requirements of Commission Regulation (EU) 2017/2196 of 24 November 2017 establishing a network

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code on electricity emergency and restoration. The nationwide availability of adequate telecommunications infrastructure is crucial for a reliable energy supply.

In the case of supply for critical infrastructures, the technical aspects of the reliability and security of communications networks are therefore of particular importance. The exceptional resilience of critical infrastructural services thus forms a fundamental basis for the functioning of modern society.

To enable the spectrum to be used for the digitisation of the energy transition as soon as possible, the President's Chamber of the Bundesnetzagentur has drawn up and is putting out for consultation a draft document on the provision of the 450 MHz spectrum for critical infrastructure applications.

Interested parties are hereby invited to comment on the consultation draft.

Responses are to be submitted in German

by **28 August 2020**

in writing to the postal address below
Bundesnetzagentur
Referat 212
Kennwort: 450 MHz
Tulpenfeld 4
53113 Bonn

and

electronically in Microsoft Word (or Microsoft Word-compatible) or PDF format (copying and printing must be enabled) to the email address below referat212@bnetza.de.

It is intended to publish the original responses on the Bundesnetzagentur's website. Respondents are therefore asked to give their consent to publication when they submit their comments. If comments contain business and trade secrets, respondents are asked to submit an additional version for publication in which the business and trade secrets have been blacked out, together with a list justifying the blacked-out parts.

Decision of the President's Chamber of [date] on the order for and choice of proceedings for award, the determinations and rules in detail (award rules) and the determinations and rules for conduct of the proceedings (tendering rules) for spectrum in the 450 MHz band for mobile/fixed communications networks (MFCN)

-Reference: BK1-20/001-

The Bundesnetzagentur für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen, through Ruling Chamber 1 (President's Chamber), hereby issues the following decisions under section 55(10), section 61(1), (2), (3) and (5) and section 132(1) and (3) of the German Telecommunications Act (TKG) on the award of spectrum for mobile/fixed communications networks (MFCN) in the 450 MHz band:

I. Order for award proceedings

It is hereby ordered under section 55(10) TKG that the assignment of spectrum for MFCN at 451.00 MHz - 455.74 MHz (lower band) and 461.00 MHz - 465.74 MHz (upper band) is to be preceded by award proceedings as set out in section 61 TKG.

II. Choice of award proceedings

The award proceedings as provided for by section 61(1) TKG will be conducted in the form of tendering proceedings in accordance with section 61(5) TKG.

III. Determinations and rules for the award proceedings

III.1 Requirements for participation in the tendering proceedings, section 61(3) sentence 2 para 1 TKG

III.1.1 No restriction on participation

The right to take part in the tendering proceedings, given the minimum specialist and other requirements within the meaning of section 61(3) sentence 2 para 1 TKG, is not restricted.

III.1.2 Competitive independence

Undertakings may be admitted once only. This also applies in respect of consortia. Undertakings that have merged under section 37 of the German Competition Act (GWB) are deemed to be one undertaking.

III.1.3 Admission to the tendering proceedings

In their application, applicants must state how the minimum objective and subjective specialist requirements for admission to the tendering proceedings pursuant to section 61(3) sentence 2 para 1 in conjunction with section 55(4) and (5) TKG are met (see section IV.2).

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In their written application, applicants must apply for admission to the tendering proceedings.

Admission to the tendering proceedings is made in an official notice and is granted provided that the application was received by the deadline and includes information on the following points:

- applicant
- competitive independence
- reliability
- financial capacity
- specialist knowledge
- spectrum usage concept.

Applications are to be submitted in German

by [DATE]

in writing, in triplicate, to
Bundesnetzagentur
Referat 212
Kennwort: 450 MHz
Tulpenfeld 4
53113 Bonn

and

electronically in Microsoft Word (or Microsoft Word-compatible) or PDF format (copying and printing must be enabled) by email to referat212@bnetza.de or on data media.

A blacked-out version in which any business and trade secrets have been blacked out, together with a list justifying the blacked-out parts, is also to be submitted.

Only applicants providing the above information in full will be admitted.

III.2 Determination of the purpose for which the spectrum to be awarded may be used in compliance with the Frequency Plan (section 61(3) sentence 2 para 2 TKG)

III.2.1 Purpose of use of the spectrum

The spectrum to be awarded may be used for MFCN in compliance with the Frequency Plan. The spectrum is to be used primarily for critical infrastructure applications.

III.2.2 Nationwide use

The spectrum at 451.00 - 455.74 MHz and 461.00 - 465.74 MHz will be made available for nationwide use.

III.3 Spectrum usage conditions, including the degree of coverage with the spectrum usage, section 61(3) sentence 2 para 4 TKG

1. The usage conditions in this Decision and in Annex 1 apply to the use of the spectrum in the 450 MHz band.

The assignment holder may diverge from these conditions if mutual arrangements to this effect have been made and divergence is without detriment to the spectrum usage rights of third parties. The Bundesnetzagentur must be informed of this in writing beforehand.

The spectrum usage conditions can be modified subsequently, particularly if this is necessary to secure efficient and interference-free spectrum use or as a result of international harmonisation agreements.

2. The spectrum assignment will be valid until 31 December 2040.
3. The assignment holder must negotiate with critical infrastructure operators upon request about coverage with wireless applications and must submit offers for coverage to meet operators' requirements within a reasonable period (negotiation and offer requirement).
4. The assignment holder must report to the Bundesnetzagentur twice a year and upon request on progress in building and rolling out the network and on compliance with all obligations entered into in connection with the tendering.

III.4 Fees and contributions

Fees will be imposed for spectrum assignment in accordance with section 142 TKG. In addition, spectrum usage contribution charges in accordance with section 143(1) TKG and contributions in accordance with section 31 of the Electromagnetic Compatibility of Equipment Act (EMVG) and section 35 of the Radio Equipment Act (FUAG) will be imposed.

IV. Tendering rules

Under section 61(5) sentence 1 TKG, the Chamber must determine the criteria against which applicants' eligibility will be assessed prior to the award proceedings.

IV.1 Eligibility criteria

Applications will be assessed against the criteria as prescribed by law in section 61(5) sentence 2 TKG. These are:

- reliability
- specialist knowledge
- financial capacity
- suitability of the plans to be submitted for using the spectrum for tender
- promotion of a sustainable competitive market
- degree of geographic coverage.

IV.2 Contents of applications

IV.2.1 Applicant details

Applicants must provide information about themselves and their authorised agents.

IV.2.2 Applicant's financial interests

In their application, applicants must include details and proof of the ownership structure – including indirect ownership – of their undertaking.

IV.2.3 Reliability

Applicants must include details and proof of their reliability. Applicants must declare their compliance with the relevant security requirements.

IV.2.4 Specialist knowledge

Applicants must include clear and conclusive details of their specialist knowledge. Applicants must include proof that the persons engaged in building and operating the wireless network have the necessary knowledge, experience and skills.

IV.2.5 Financial capacity

Applicants must include details and proof of permanent and sufficient financial resources for the build and roll-out investments set out in the spectrum usage concept and for operation of the wireless network or of how financing is to be secured.

IV.2.6 Spectrum usage concept

Applicants must present a spectrum usage concept to demonstrate the suitability of their plans for using the spectrum. This applies in particular with respect to the purpose of use of providing coverage primarily for critical infrastructure applications.

IV.2.7 Promotion of a sustainable competitive market

Applicants must include details and proof of how they will promote a sustainable competitive market within the meaning of section 2(2) para 2 TKG.

IV.2.8 Degree of geographic coverage

Applicants must include details of how they will provide coverage with wireless applications to critical infrastructure operators in order to achieve coverage in line with demand and the purpose of use.

IV.3 Binding effect of the application

The contents of the applications submitted are binding and cannot be changed up until the award is made.

IV.4 Exclusion from the proceedings

Applicants may not disclose or publish any information relating to their application.

Applicants not complying with the tendering rules can be excluded from the proceedings. If non-compliance is not found until after the tendering proceedings, the award and spectrum assignment can be revoked.

IV.5 Award decision and assignment

The award will be made to the most eligible applicant based on the criteria specified in section IV.2.

In the case of equal eligibility, the award will be made to the applicant guaranteeing a higher degree of geographic coverage with the relevant telecommunications services. If two or more applicants with equal eligibility also guarantee the same degree of geographic coverage, the award will be made by drawing lots.

The award decision will be based on an assessment of each bid against the specified criteria. The Chamber's decision will take the form of an official notice. The award decision will be published.

The award decision will form the basis for assignment of the spectrum, which is made upon application.

IV.6 Application documents, application costs

Applicants that are not selected will receive an official notice that their application was not successful after the award decision has been made.

Application documents will not be returned even after the proceedings have been completed. Costs incurred by applicants in connection with preparing and submitting their applications will not be reimbursed by the Bundesnetzagentur.

RATIONALE

- 1 The following considerations and grounds prompted the Chamber's decision on the order and choice of proceedings for award, the determinations and rules in detail (award rules) and the determinations and rules for conduct of the proceedings (tendering rules) for spectrum in the 450 MHz band for mobile/fixed communications networks (MFCN), in particular for critical infrastructure applications.

Circumstances and steps

- 2 These decisions are based on the following circumstances:
- 3 Three usage rights each with a channel bandwidth of 2 x 1.25 MHz (paired) are currently assigned in the 450 MHz band (451.00 - 455.74 MHz / 461.00 - 465.74 MHz). The current assignments, which expire on 31 December 2020, enable use of the spectrum for MFCN.

Spectrum demand survey

- 4 The Bundesnetzagentur, in light of the expiry of the usage rights on 31 December 2020, conducted a spectrum demand survey (see Official Gazette No 24/2017 of 20 December 2017, Order No 700/2017) to obtain information in particular about the specific requirements for critical infrastructure applications.
- 5 Approximately 50 notifications of demand and submissions were received in response to the spectrum demand survey. Responses were received primarily from energy, water and telecommunications companies, but also from associations and manufacturers.
- 6 The energy sector representatives called for spectrum in the 450 MHz band for a reliable energy supply. They argued that the spectrum should be used for a reliable and blackout-resilient network. They said that the spectrum's propagation characteristics made it very well suited to the security-critical applications. In this context, demand was expressed for use for critical infrastructure applications on both a regional and a nationwide basis.
- 7 However, the user groups comprising public safety authorities and organisations and the federal armed forces called for exclusive use of this spectrum.

Key elements and identification of demand in January 2020

- 8 In September 2019, the Advisory Council of the Bundesnetzagentur adopted the following resolution on the 450 MHz spectrum:

"The Advisory Council notes that the energy industry has an urgent and long-term need for a secure, blackout-resilient and nationally available communications solution in order to safeguard energy supply and successfully implement the energy transition.

The energy transition and decentralisation are leading to considerably more complex structures in our future energy supply system. Millions of electricity producers and consumers need to be connected digitally to enable secure management. The use of a secure communications platform is a key prerequisite for a long-term secure energy supply.

Of the communications solutions currently available and market-ready for use in critical infrastructures such as the energy sector, the use of a wireless solution on the basis of the 450 MHz spectrum shows the best results.

However, the user groups comprising public safety authorities and organisations and the federal armed forces have also called for exclusive use of this spectrum.

The Advisory Council considers it absolutely necessary that the field of energy supply should be recognised as an essential service of general interest and thus also as a critical infrastructure.

The Advisory Council strongly advocates that the tried and tested secure communications solution on the basis of 450 MHz wireless technology should continue to be available to the energy industry after 2020."

- 9 In light of the responses received and the expiry of the usage rights on 31 December 2020, the Bundesnetzagentur drew up key elements for the needs-oriented provision of the spectrum for use primarily for critical infrastructure applications and published these key elements for consultation on 30 January 2020 (Communication No 39/2020, Bundesnetzagentur Official Gazette No 3/2020 of 19 February 2020, page 204 et seq). The key elements set out, as the basis for consultation, the initial framework conditions for a procedure for the provision of spectrum.
- 10 At the same time, interested companies were invited to set out their spectrum requirements for critical infrastructure applications.
- 11 In the demand identification proceedings, specific nationwide demand was notified for spectrum in the 450 MHz band – primarily for critical infrastructure applications.
- 12 The requirements notified and specified primarily for critical infrastructure applications all cover the whole of the nationally available spectrum comprising 2 x 4.74 MHz (paired). In addition, a large number of companies declared a demand for spectrum for regional business models to implement primarily critical infrastructure applications, with some also notifying these spectrum requirements. Some of these companies with regional business models stated that nationwide models with cooperation partners were also conceivable.
- 13 Essentially, respondents made the following comments during the course of the consultation:

- **Re key element 1 – available spectrum**

"At present, 2 x 4.74 MHz (451.00 - 455.74 MHz / 461.00 - 465.74 MHz) will be available for MFCN from 1 January 2021. The 450 MHz spectrum is to be provided in one paired block."

- **[Block size]**

The majority of the respondents were in favour of the proposed block size, adding that the requirements of critical infrastructures could only be fully met by providing all the 2 x 4.74 MHz of spectrum.

It was also said, however, that efforts should be made to provide spectrum as a block of 2 x 5 MHz.

- **[Timing of award decision]**

Many respondents were in favour of objective, transparent and non-discriminatory award proceedings. In light of this, a swift decision in the course of 2020 was essential.

By contrast, it was also said that it would be possible to extend the usage rights of current assignment holders until new assignment proceedings had been completed and thus conduct a multi-stage procedure.

- **[Protection requirements]**

It was said that the 460 - 470 MHz band was used by weather satellites on a secondary basis and by earth observation satellites in accordance with No 5.289 of the Radio Regulations. There were currently no plans for this service to use the 451.00 - 455.74 MHz and 461.00 - 465.74 MHz bands.

- **Re key element 2 – designation**

"In the 450 MHz band, the frequencies 451.00 - 455.74 MHz and 461.00 - 465.75 MHz are designated in accordance with the Frequency Plan (entry nos 248029 and 248067) for use for MFCN."

- **[Changes to the Frequency Plan]**

The majority of the respondents were in favour of providing the spectrum as designated for MFCN, adding that the intended purpose of use could be implemented by attaching conditions to the spectrum assignment.

Some respondents said that if the spectrum were designated for MFCN, it should also be provided for MFCN without any restrictions.

Other respondents said that the purpose of use should be changed/supplemented in the Frequency Plan. It was said that the designation for MFCN was questionable in connection with providing the spectrum for critical infrastructures.

- **Re key element 3 – nationwide use**

"The spectrum in the 450 MHz band is to be provided in one block on a nationwide basis."

- **[Roll-out obligation/nationwide assignment]**

The majority of the respondents were in favour of the key element on nationwide use, saying that this was in line with the approach of basic service provision. Local and regional requirements could be met through a nationwide roll-out obligation and currently identifiable deficits could be eliminated. Provision on a nationwide basis would enable the spectrum to be used more economically and efficiently than provision on a regional basis. In addition, having one nationwide provider would guarantee timely and appropriate use.

By contrast, it was said that numerous critical infrastructure operators were only active locally or regionally. A critical view was therefore taken of provision on a nationwide basis in light of security concerns. In addition, regional assignments would make it possible for independent communications systems to be established efficiently, operated and used cost-effectively and made available to third parties on an application-specific basis.

- **Re key element 4 – purpose of use**

"The spectrum in the 450 MHz band is to be provided primarily for critical infrastructure applications."

- **[Use of the spectrum and extension of the "critical infrastructures" user group]**

Very many respondents pointed to the fact that critical infrastructures urgently needed a secure, highly available and above all nationwide communications solution. In addition, attention was drawn to the fact that spectrum was also needed for the water, wastewater, district heating and transport sectors, including the associated metering services.

By contrast, it was said that the spectrum should be provided for public mobile communications to ensure that sufficient spectrum was available for nationwide coverage. It was also said that provision for critical infrastructure applications should not be allowed to lead to a distortion of competition or monopoly of use.

- **[Specification of the purpose of use]**

A large number of respondents said that the purpose of use should be specified in more detail in order to give priority to critical applications and lay down the necessary minimum requirements.

- **[Use of free capacity]**

A number of respondents called for elaboration on the possibility to use free capacity. No applications should be excluded per se and free capacity should be made available for other use (such as for smart metering systems).

However, it was also said that special consideration should be given to public safety authorities and organisations and shared use should be guaranteed through a binding condition. In addition, it was said that the offer of shared use made to the Federal Agency for Public Safety Digital Radio (BDBOS) still held good.

- **[Network design]**

Respondents commented on the proposed application-specific security requirements.

On the one hand, it was said that the security requirements were too restrictive. On the other hand, it was pointed out that, in order to safeguard supply, an emergency power supply lasting for at least 72 hours for the components of the 450 MHz network that were required in the event of a blackout was absolutely necessary and should be made mandatory.

Furthermore, it was pointed out that, with respect to critical infrastructure-compliant applications in the field of public mobile communications, technological approaches that supported critical infrastructures and that were also based on other bands (for example 700, 800, 900 MHz) were under development. In the absence of limiting conditions and restrictions, a guarantee was needed that the services mentioned would still be able to prove themselves in the market with fair competition between technologies and business models if changes were made to the use of the 450 MHz band.

- **[Technical characteristics of smart meter gateways]**

It was said that all metering systems currently being rolled out served both critical and non-security critical applications. In addition, connecting smart metering systems via two communications technologies raised a new problem with respect to the smart meter gateways certified by the Federal Office for Information Security (BSI) and could not be implemented with a reasonable amount of technical and economic effort.

- **Re key element 5 – local and regional requirements**

"The assignment holder is to provide relevant coverage or lease spectrum upon request by critical infrastructure operators."

- **[Spectrum leasing]**

Many respondents welcomed the Bundesnetzagentur's proposal.

Some respondents said that the possibility of leasing spectrum could not replace a roll-out obligation. The requirements of the energy and water industries should be met as a matter of priority in any case.

Furthermore, some network operators said that leasing spectrum was difficult with respect to using the spectrum as efficiently as possible and in light of the frequency coordination needed in the event of leasing.

- **[Roll-out obligation]**

Many respondents said that an obligation should be imposed for a reasonable minimum nationwide roll-out, possibly within four years or in conjunction with milestones. The respondents also considered implementation by one nationwide operator to be appropriate for reasons of spectrum efficiency, economic efficiency and technical competence.

By contrast, a small number of respondents opposed a roll-out obligation or called for further elaboration.

- **[Network access/possible monopoly position]**

It was said that access to the wireless network should be available under non-discriminatory market conditions. Individual respondents took the view that monopoly pricing should be prevented by giving an exact definition of "market".

- **Re key element 6 – time limit**

"The spectrum is to be awarded with an expiry date of 31 December 2040."

The majority of the respondents considered the duration of 20 years to be expedient. Some respondents even called for a longer duration (such as 30 years).

- **Re key element 7 – costs**

"Fees and contributions will be imposed for assignment."

The view was put forward that the fees should be set appropriately in light of the purpose of use and the public interest and should take sufficient account of the special circumstances of the provision of general interest services.

By contrast, it was said that it was not clear why particularly moderate fees should be charged for critical infrastructures. Discrimination against nationwide mobile operators should be avoided.

14 Respondents also commented on the following points:

- **Award proceedings:**

Many respondents favoured the award by tendering with criteria based on the requirements of the energy industry. Tendering would enable financial resources to be better invested in a swift roll-out of the necessary infrastructure.

Some respondents said that a tendering process should enable implementation of a commercial model.

By contrast, some respondents criticised the fact that the Bundesnetzagentur excluded the possibility of auction proceedings in advance. If the designation for MFCN were kept, regulatory consequences needed to be considered. Some respondents also opposed awarding scarce spectrum for MFCN by tendering because of the consequent distortion of competition to the detriment of mobile operators. Furthermore, it was suggested that the key elements should be laid down first and the demand identification proceedings should not initially be conducted. There was therefore opposition to a tendering process because of concerns about a massive distortion of competition in the market for MFCN.

15 The responses received – as far as they do not contain any business or trade secrets – can be viewed on the Bundesnetzagentur website (www.bundesnetzagentur.de/450MHz).

Detailed reasoning

Re I. Order for award proceedings

16 In accordance with section 55(10), section 61(1), section 55(4) and (5) and section 2(2) and (3) TKG, the order for award proceedings is made in such a way that the nationwide assignment of spectrum in the 450 MHz band must be preceded by award proceedings.

17 Under section 55(10) sentence 1 TKG it may be ordered, without prejudice to section 55(5) TKG, that the assignment of spectrum be preceded by award proceedings based on conditions determined by the Bundesnetzagentur in accordance with section 61 TKG. Award proceedings can be ordered where an insufficient amount of spectrum is available for assignment or where more than one application is made for particular spectrum. This order as per section 55(10) TKG is at the discretion of the Bundesnetzagentur.

Re I.1 Timing of the order

18 The Chamber considers it appropriate to order award proceedings for the spectrum in the 450 MHz band at the present time. The key elements published in Official Gazette No 3/2020 of 19 February 2020 (Communication No 39) provide the basis in these proceedings. It is therefore not necessary to explicitly publish these key elements again as requested by respondents.

19 The current spectrum usage rights expire on 31 December 2020 and will therefore be available from 1 January 2021 primarily for critical infrastructure applications within the framework of the designation for MFCN. The steps up to conducting award proceedings in accordance with section 61 TKG and subsequently assigning spectrum usually take a considerable amount of time, which is why it is necessary to order award proceedings at the latest at the present time. Ordering the award proceedings at the present time is thus consistent with the regulatory aim of securing efficient spectrum use as envisaged in section 2(2) para 7 TKG.

- 20 Ordering proceedings at the present time also takes account of the regulatory aim set out in section 2(2) para 2 TKG. Ordering proceedings at the present time provides all interested companies with equal access to the spectrum available nationwide. The Bundesnetzagentur's aim is to give all interested companies the necessary planning and investment certainty with respect to the future use of the spectrum and to conclude the proceedings for awarding this spectrum at a reasonable point in time.
- 21 The required planning framework for the provision of the 450 MHz spectrum in the Frequency Ordinance (FreqV) and the Frequency Plan is already in place. The 440 - 470 MHz band is allocated to the mobile service and is designated for MFCN in the Frequency Plan (entry nos 248029 and 248067).
- 22 Ordering award proceedings at the present time is consistent with the regulatory approach set out in section 2(3) para 1 TKG, namely that the Bundesnetzagentur, in following the aims set out in section 2(2) para 2 TKG, applies objective, transparent, non-discriminatory and proportionate regulatory principles by promoting regulatory predictability through ensuring a consistent regulatory approach over appropriate review periods.
- 23 In 2017 the Bundesnetzagentur, in light of the expiry of the usage rights on 31 December 2020, conducted a spectrum demand survey (see Official Gazette No 24/2017 of 20 December 2017, Order No 700/2017) to obtain information in particular about the specific requirements for critical infrastructure applications. The results indicated a high demand for critical infrastructure applications on a regional and nationwide basis, in particular from the energy sector.
- 24 In September 2019, the Advisory Council of the Bundesnetzagentur adopted a resolution on the 450 MHz spectrum and strongly advocated "[...] that the tried and tested secure communications solution on the basis of 450 MHz wireless technology should continue to be available to the energy industry after 2020."
- 25 In the key elements and identification of demand paper of 30 January 2020 (loc cit), the Bundesnetzagentur stated that it was seeking to make the spectrum available for critical infrastructure applications and to take a decision on provision of the above-mentioned expiring spectrum assignments in the 450 MHz band in the course of 2020.
- 26 In this respect, ordering award proceedings for the provision of the 450 MHz spectrum primarily for critical infrastructure applications is consistent with the regulatory approach adopted so far by the Bundesnetzagentur. The regulatory approach provides for the 450 MHz spectrum to be made available primarily for critical infrastructure applications in objective, transparent and non-discriminatory proceedings before the current usage rights expire. Ordering award proceedings at the present time implements the Bundesnetzagentur's regulatory approach for the 450 MHz spectrum. This promotes the above-mentioned regulatory aims and takes account of the regulatory principles within the meaning of section 2(3) TKG.

Re I.2 Availability

- 27 Spectrum is available when it is not encumbered by other usage rights and when the other assignment criteria pursuant to section 55(5) TKG are met, that is when the spectrum is designated for the planned usage in the Frequency Plan, there is compatibility with other spectrum usages, and efficient and interference-free use of the spectrum by the applicant can be secured.
- 28 The spectrum at 450.00 - 455.74 MHz and 460.00 - 465.74 MHz is designated for MFCN in the Frequency Plan of October 2019 in entry nos 248029 and 248067. Entry nos 248028 and 248030 and 248066 and 248068 also enable use of the bands at 450.00 - 451.00 MHz and 460.00 - 461.00 MHz for private mobile radio (PMR).

- 29 The current usage rights for the spectrum at 451.00 - 455.74 MHz and 461.00 - 465.74 MHz expire on 31 December 2020. Thus 2 x 4.74 MHz (paired) of spectrum will be available on a nationwide basis from 1 January 2021.
- 30 As explained in the key elements of 30 January 2020 (published at <https://www.bundesnetzagentur.de/EN/Areas/Telecommunications/Companies/FrequencyManagement/450MHz/450MHz-node.html><https://www.bundesnetzagentur.de/EN/Areas/Telecommunications/Companies/FrequencyManagement/450MHz/450MHz-node.html><https://www.bundesnetzagentur.de/EN/Areas/Telecommunications/Companies/FrequencyManagement/450MHz/450MHz-node.html>), it appears expedient, also in light of the usage scenarios presented in the demand identification proceedings, to combine the spectrum at 451.00 - 455.74 MHz / 461.00 - 465.74 MHz into one paired block comprising 2 x 4.74 MHz. It is not intended to retain the current division of three blocks each with a system bandwidth of 2 x 1.25 MHz (paired) – see Annex 2 (diagram of current and future spectrum provision). Because there will be no individual channel division between different users within the band, a block of contiguous spectrum will be available to deploy new broadband technologies with the highest possible data rates, which will enable the implementation of various different services.
- 31 With respect to the concerns of individual respondents about the emergence of a monopoly for applications in the 450 MHz band, the Chamber is convinced that this can be effectively countered by the determinations in section III.3.3. Requiring the future assignment holder to provide interested critical infrastructure operators with the necessary applications on reasonable terms will ensure that the requirements of local and regional critical infrastructure operators will be met.
- 32 Regarding comments that spectrum should be provided as a block of 2 x 5 MHz (paired), attention should be drawn first and foremost to the current designations in the Frequency Plan. In addition to the spectrum at 450.00 - 455.74 MHz (entry no 248029) and 460 - 465.74 MHz (entry no 248067) being designated for MFCN, spectrum at 450 - 451 MHz and above 455.74 MHz and at 460 - 461 MHz and above 465.74 MHz is designated for PMR applications. In order to provide spectrum as a block of 2 x 5 MHz (paired) for use solely for MFCN, the designations in the Frequency Plan for the spectrum at 455.74 - 456.00 MHz and 465.74 - 466.00 MHz would need to be changed for MFCN. It is not intended to do this because of the time needed, taking special consideration of the existing assignments.
- 33 Attention is also drawn to the current assignment and usage situation in adjacent bands. There are currently still a large number of assignments in the adjacent bands, which rules out providing additional spectrum in the short term from 1 January 2021. It should also be noted that the applications operated in the adjacent bands may require additional measures at technical level (see Annex 1 – spectrum usage conditions).
- 34 The Chamber acknowledges that a paired 5 MHz block would enable the use of an unrestricted 5 MHz carrier as soon as the whole block of spectrum was available for harmonised and standardised use. The Bundesnetzagentur will therefore examine the possibility of expanding the 2 x 4.74 MHz block into a complete 2 x 5 MHz block in the medium to long term. If it is possible to expand the block by 2 x 0.26 MHz during the term of the future assignment, the possibility of assigning this additional spectrum at 455.74 - 456.00 MHz and 465.74 - 466.00 MHz to the assignment holder will be considered. The assignment holder would then be able to use a block of 2 x 5 MHz (paired) following a possible expansion of the spectrum in the medium to long term. However, this may not be able to be guaranteed, depending on the results of the examination to be made.

- 35 Spectrum between 450 MHz and 470 MHz is also designated in the Frequency Plan for public paging (nationwide assignment), analogue railway radio communications (nationwide, regional and local assignments) and maritime mobile radio on board ships at sea and on inland waterways. The future assignment holder will be required to provide protection for these – generally narrowband – spectrum usages, especially given the intended broadband usages.
- 36 Alongside critical infrastructure applications, spectrum in the 450 MHz band is required on a local basis to train soldiers on military training areas and on a regional basis and for strictly limited periods for large-scale military training exercises. The use of the spectrum is based on usage provision 3 of the Frequency Ordinance of 27 August 2013 (Federal Law Gazette I page 3326), as last amended by Article 1 of the Act of 27 November 2018 (Federal Law Gazette I page 2026). This usage provision allows individual frequencies in the 410 - 862 MHz band to be used for military purposes. The assignment holder will be required to make spectrum in this band available to military users as required for local use as well as time and geographically limited use.
- 37 The future assignment holder will be informed during the assignment process of the geographic location of the military training areas concerned in order to guarantee efficient and interference-free spectrum use to the greatest possible extent.
- 38 The Chamber assumes that the federal armed forces will give the assignment holder sufficient notice of the strictly limited large-scale military exercises. The Chamber expects that sufficient spectrum will be made available for military use in such a way that spectrum resources will still be available for critical infrastructures in these cases.
- 39 The restrictions from military use are limited in terms of area, time and frequencies and therefore do not preclude nationwide assignment.

Re I.3 Scarcity

- 40 Based on the qualified notified requirements submitted in response to the key elements and identification of demand for the future use of spectrum in the 450 MHz band (loc cit), the Chamber is convinced that the demand for spectrum in the band at 450 MHz exceeds the available spectrum and that the spectrum is therefore scarce within the meaning of section 55(10) sentence 1 first alternative TKG.
- 41 Under section 55(10) sentence 1 TKG it may be ordered, without prejudice to section 55(5) TKG, that the assignment of spectrum be preceded by award proceedings based on conditions determined by the Chamber in accordance with section 61 TKG when spectrum is scarce. The scarcity posited in the two alternatives set out in section 55(10) sentence 1 TKG can result from either the established fact of a surplus of applications (section 55(10) sentence 1, second alternative) or the forecast of an insufficient amount of spectrum being available (section 55(10) sentence 1, first alternative). In consideration of the wording of the law and of the connection between the two possible alternatives, the forecast mentioned in the first alternative refers to a greater number of applications being made than spectrum is available at the time of assignment. This forecast is based on the Chamber's determination that the demand for spectrum exceeds supply.
- 42 A regulatory decision on which spectrum is to be made available for a specified purpose at a given time is usually required for spectrum scarcity to be established. This decision can be based on section 55(5) sentence 2 TKG and therefore depends on the use being compatible with the regulatory aims set out in section 2(2) TKG. The Bundesnetzagentur has scope for interpretation in its decision-making and must fill this scope by weighing up all the interests (Federal Administrative Court (BVerwG) ruling 6 C 3.19 of 24 June 2020).

- 43 Providing the 450 MHz spectrum on a nationwide basis primarily for critical infrastructures serves the regulatory aim of securing efficient and interference-free spectrum use, section 2(2) para 7 TKG.
- 44 The 450 MHz spectrum has favourable propagation characteristics and is suited to providing wireless applications within a relatively large radius around a base station. Because of these propagation characteristics, providing the spectrum on a nationwide basis also serves the aim of efficient and interference-free spectrum use as it avoids the need for complex coordination and facilitates network planning.
- 45 At the same time, the suitability of the spectrum for broadband MFCN applications (with high data rates) is only very limited because of the small channel bandwidth of less than 5 MHz. Rather, the spectrum is particularly suitable for narrowband critical infrastructure applications. The propagation characteristics also make the spectrum to be awarded very suitable for indoor coverage and thus also potentially for controlling smart metering systems. These systems are often installed in basements and so connecting the systems using higher frequencies could involve a substantial amount of additional work in network planning and a considerable increase in the number of base stations.
- 46 An adequate and nationwide wireless network infrastructure is crucial for a reliable energy supply and the digitisation of the energy transition. The fluctuations in renewable electricity generation represent one of the biggest challenges of the energy transition. Fluctuating generation and demand need to be integrated intelligently into the electricity networks. This requires a highly available and blackout-resilient nationwide wireless network infrastructure in order to maintain the provision of general interest services in the event of a crisis. This concerns the electricity, gas, wastewater, water and district heating sectors. A reinforced wireless network is required in particular in the event of a crisis in order to guarantee the functionality and/or restoration of critical infrastructure networks. In principle, any network infrastructure can be made blackout-resilient.
- 47 In particular, the fact should be taken into account that no alternative broadband spectrum and no exclusive bands are currently available for critical infrastructure operators. The provision of the spectrum can therefore make a significant contribution to the energy transition. The expert opinion on the digitisation of the energy transition commissioned by the Federal Ministry for Economic Affairs and Energy also reaches this conclusion. According to the expert opinion, a dedicated mobile network for critical infrastructures in the 450 MHz band can meet the specific requirements comprehensively and at the lowest cost. (For details see "Digitalisierung der Energiewende", https://www.bmwi.de/Redaktion/DE/Publikationen/Studien/digitalisierung-der-energie-wende-thema-3.pdf?__blob=publicationFile&v=10, as at 2 July 2020).
- 48 The Advisory Council of the Bundesnetzagentur noted the following in its resolution on the 450 MHz spectrum of 23 September 2019:
- "[...] the energy industry has an urgent and long-term need for a secure, blackout-resilient and nationally available communications solution in order to safeguard energy supply and successfully implement the energy transition. The energy transition and decentralisation are leading to considerably more complex structures in our future energy supply system. Millions of electricity producers and consumers need to be connected digitally to enable secure management. The use of a secure communications platform is a key prerequisite for a long-term secure energy supply. Of the communications solutions currently available and market-ready for use in critical infrastructures such as the energy sector, the use of a wireless solution on the basis of the 450 MHz spectrum shows the best results.*

[...]

The Advisory Council considers it absolutely necessary that the field of energy supply should be recognised as an essential service of general interest and thus also as a critical infrastructure. The Advisory Council strongly advocates that the tried and tested secure communications solution on the basis of 450 MHz wireless technology should continue to be available to the energy industry after 2020."

- 49 The Chamber was guided by these deliberations in specifying the purpose of use within the limits of its scope for establishing spectrum scarcity. On this basis, the Chamber examined whether an insufficient amount of spectrum was available for such spectrum assignments (section 55(5) in conjunction with section 60 TKG), section 55(10) TKG. Excess demand or a surplus of demand for spectrum can be established on the basis of various findings, including demand surveys, demand notifications and the authority's own demand estimates (see BVerwG ruling 6 C 6.10 of 23 March 2011, margin no 22).
- 50 The Bundesnetzagentur held that it is appropriate and efficient to initiate demand identification proceedings to determine spectrum requirements in the 450 MHz band in order to ensure that spectrum is assigned in open, objective, transparent and non-discriminatory proceedings (for details see key elements and identification of demand paper of 30 January 2020, loc cit). Demand identification proceedings are a tried and tested, informative, multi-stage procedure. With the demand identification proceedings the Chamber makes a public call for requirements for particular spectrum to be notified within a reasonable period, paving the way for its decision on issuing an order for award proceedings. The possibility of providing the spectrum on a nationwide basis and primarily for critical infrastructure applications within the framework of the designation in the Frequency Plan for MFCN was considered in connection with the key elements and identification of demand (section 55(5) TKG in conjunction with section 60 TKG). Demand is identified in accordance with section 55 TKG in non-discriminatory, transparent and objective proceedings. It is essential that the Chamber can act on the basis of spectrum requirements that are rooted in objective fact and reflect the actual requirements of the interested companies. The information from the companies expressing their interest in specific use of the spectrum in spectrum demand surveys or requirement notifications is of crucial importance (see Cologne Administrative Court (VG Köln) ruling 21 K 4413/11 of 3 September 2014, margin no 82 et seq).
- 51 The starting point for identifying demand is always the demand notified by the market participants themselves, which primarily depends on the companies' individual positions and options in the competitive market, for instance the design of their networks and other technical equipment, their plans for products and services in terms of quality and quantity, their own forecasts of market developments and traffic and their strategic and competitive objectives (see BVerwG ruling 6 B 43.13 of 21 January 2014 , margin no 13).
- 52 In the demand identification proceedings, at least six companies or consortia notified specific nationwide demand for spectrum in the 450 MHz band – primarily for critical infrastructure applications.
- 53 The requirements notified and specified primarily for critical infrastructure applications all cover the whole of the nationally available spectrum comprising 2 x 4.74 MHz (paired). These notified requirements alone result in a surplus of demand for spectrum in the 450 MHz band. In addition, a large number of companies declared a demand for spectrum for regional business models to implement primarily critical infrastructure applications, with some also notifying these spectrum requirements. Some of these companies with regional business models stated that nationwide models with cooperation partners were also conceivable.

- 54 Following thorough verification of the facts of the case, the Chamber has based its forecast decision in accordance with section 55(10) sentence 1, first alternative TKG on all the circumstances that are relevant for clarifying the availability of sufficient spectrum at the time of award.
- 55 On the basis of the notified requirements for the spectrum comprising 2 x 4.74 MHz (paired) in the 450 MHz band, the Chamber assumes that an insufficient amount of suitable spectrum will be available for assignment. The Chamber considers the qualified notified requirements to be sufficiently informative for the purpose of forecasting that there will not be sufficient spectrum available for the requested assignments (see section 55(10) sentence 1, first alternative TKG). The Chamber's forecast decision has taken the qualified notified requirements for nationwide use of this spectrum and the resulting excess demand as a sound factual basis.
- 56 In assessing the demand for spectrum, the Chamber took those requirements into special account where the interested companies had demonstrated that their demand for spectrum for critical infrastructure applications was plausible and serious in accordance with qualified demand identification proceedings.
- 57 The Chamber laid down stringent criteria for the notification of requirements in the demand identification proceedings in order to ensure that the notifications were serious. The requirements to be met by notifications in the demand identification proceedings were essentially based on the requirements for assignment pursuant to section 55(4) and (5) TKG without the need, however, to present relevant documentary evidence. The following was stated in the key elements (see key elements, loc cit, page 10):
- "Particularly convincing, in line with the purpose of identifying demand, are notified requirements that also cover the objective and subjective criteria for future spectrum assignment (section 55 subsections (3), (4) and (5) TKG) in setting out interest in a particular use, in particular for critical infrastructure applications. Preconditions for assigning spectrum are that "efficient and interference-free use by the applicant [is] secured" and "compatibility with other frequency usages [is given]" (section 55(5) sentence 1 paras 3 and 4 TKG). Interested companies are thus called upon to set out clearly and conclusively that efficient and interference-free use by them will be secured at the time of assignment. This clear and conclusive account must cover both the subjective requirements of reliability, financial capability and specialist knowledge and presentation of a convincing concept for the intended use of the spectrum for assignment (...)."*
- 58 Therefore the Chamber's determination regarding the potential scarcity of spectrum was only based on notifications for which the interested companies clearly and conclusively demonstrated that they can secure efficient and interference-free use of the spectrum within the meaning of section 55(5) sentence 1 para 4 TKG. This clear and conclusive account must cover both the subjective requirements of reliability, financial capacity and specialist knowledge and the presentation of a convincing concept for the intended use of the spectrum for assignment. Mere declarations of interest or the announcement of requirements are not sufficient for inclusion when demand is identified.
- 59 The Chamber notes, however, that the notified requirements have not been subject to a definitive technical and efficiency assessment at the stage of establishing a surplus of demand in accordance with section 55(10) TKG. In particular, the notified requirements as a basis for establishing spectrum scarcity have not been subject to an assessment as required for the assignment of spectrum pursuant to section 55(5) TKG. The forecast to be made according to section 55(10) sentence 1 first alternative TKG relates (only) to whether there will be insufficient spectrum available for the requested assignments at the time of assignment, but not also to whether the assignment requests can be readily granted (see BVerwG ruling 6 C 3.10 of 22 June

2011, margin no 25; VG Köln ruling 21 K 4413/11 of 3 September 2014, margin no 88).

- 60 Consequently, companies notifying requirements are not required to provide evidence (such as financing commitments) in addition to plausible spectrum requirements. This would place an unreasonable burden on the companies at this stage of the proceedings – not least because of the associated costs – and would therefore not be proportionate.
- 61 Having examined the notified requirements for nationwide business models that would use the spectrum primarily for critical infrastructures, the Chamber has reached the conclusion that the total requirements exceed the spectrum available in the 450 MHz band. The interested companies have, as required in the demand identification proceedings (see key elements paper of 30 January 2020, loc cit), shown that they meet the requirements for assignment and presented clear and conclusive concepts for the use of the spectrum primarily for critical infrastructure applications. The specific notified requirements received therefore exceed the amount of nationally available spectrum in the 450 MHz band comprising 2 x 4.74 MHz (paired).

Re I.4 Order for award proceedings

- 62 In accordance with section 55(10), section 61, section 2(2) and (3), section 55(4) and (5) TKG, the order for award proceedings is made in such a way that the assignment of spectrum in the 450 MHz band must be preceded by award proceedings.
- 63 Section 55(10) TKG states that the Bundesnetzagentur may order, without prejudice to section 55(5) TKG, that spectrum assignment be preceded by award proceedings according to section 61 TKG. The law makes provision for award proceedings to be ordered in the event of a scarcity of spectrum.
- There will not be sufficient spectrum available in the 450 MHz band for the requested assignments. On account of the spectrum scarcity identified in this band, the legislation makes provision in section 55(10) TKG for award proceedings to be ordered. Only by way of exception may an order for award proceedings not be issued despite spectrum scarcity, taking into consideration the regulatory aims. However, there are no reasons of sufficient nature or sufficient weight that justify deviating from the standard procedure as provided for by legislation.
- 64 Award proceedings are suited to ensuring fulfilment of the Bundesnetzagentur's statutory task. Extending the spectrum usage rights would not be equally suited to securing the regulatory aims as set out in section 2(2) TKG. In any case, the President's Chamber does not consider there to be any reasons of sufficient nature or weight to justify not conducting award proceedings for the spectrum in the 450 MHz band.
- 65 Conducting award proceedings takes account of the regulatory aims concerning user and consumer interests as set out in section 2(2) para 1 TKG. Award proceedings make it possible to determine who can use the spectrum most efficiently. The propagation characteristics of the nationally available spectrum at 450 MHz make the spectrum particularly suitable for providing applications primarily for critical infrastructures such as electricity, gas, water and district heating with a nationwide wireless network. This enables the provision of general interest services to be maintained in the event of a crisis. Inefficient use of the spectrum could at worst lead to failure of the supply networks and would therefore have a considerable impact on consumers. Award proceedings make it possible to determine who is best placed to establish such a wireless network efficiently and therefore also taking account of the criteria of coverage area, quality and price. These criteria have decisive effects on

users and consumers. This enables maximum account to be taken of consumer interests. Extending the spectrum usage rights would not be equally suited to taking account of user and consumer interests because it would not involve comparing several potential assignment holders.

- 66 Ordering award proceedings serves the regulatory aim of securing fair competition and promoting sustainable competitive markets for telecommunications services and networks and for associated facilities and services, in rural areas as well, as set out in section 2(2) para 2 TKG. Award proceedings are objective, open, transparent and non-discriminatory proceedings that will provide both the current assignment holders and other interested companies with equal access to spectrum resources. Open, objective, transparent and non-discriminatory award proceedings provide an impetus that can stimulate competition and thus also network roll-out. Unlike the option of extending spectrum usage rights, award proceedings will also enable existing assignment holders to review their spectrum packages with respect to the changing regulatory and competitive conditions and adapt their business models.
- 67 Award proceedings are also suited to securing efficient spectrum use as envisaged in section 2(2) para 7 TKG. Award proceedings can serve to determine which of the parties seeking assignment are best placed to make efficient use of the spectrum to be assigned. How the suitability of these parties can be determined depends on the type of proceedings and the award rules in each individual case.

Re I. Choice of award proceedings as provided for by section 61(1) and (2) TKG

- 68 The Chamber hereby orders that assignment of the spectrum in the 450 MHz band be preceded by tendering proceedings, section 61(1) and (2) TKG.
- 69 Under section 61(1) sentence 1 TKG, award proceedings may take the form of auction or tendering proceedings. According to section 61(2) sentence 1 TKG, as a general rule auction proceedings as laid down in section 61(4) TKG are to be conducted except where an auction is not suitable to secure the regulatory aims as set out in section 2(2) TKG. Apart from an auction, it is also possible to order the award by tendering.
- 70 Under the regime framed by the statutory regulations, section 61(2) sentence 1 TKG establishes auction proceedings as the rule to which exceptions may be made. The wording of the law expressly states that "as a general rule" auction proceedings are to be conducted, except where such proceedings are not suitable to secure the regulatory aims according to section 2(2) TKG.
- 71 According to section 61(2) sentence 2 TKG, auction proceedings may not be suited to securing the regulatory aims where spectrum has already been assigned without auction proceedings for the usage designated in the Frequency Plan or where an applicant can demonstrate a preference on the basis of statutory provisions for the spectrum to be assigned. While the two cases given as examples are not exhaustive ("in particular"), they are also not obligatory ("may").
- 72 On the decision that has to be taken, the Federal Administrative Court (BVerwG) has stated the following (see BVerwG ruling 6 C 13/11 of 10 October 2012, margin no 33):
- "The Bundesnetzagentur does not have any discretionary powers in determining the proceedings given that, under section 61(2) sentence 1 TKG, auction proceedings are to be conducted as a general rule except where such proceedings are not suitable to secure the regulatory aims. In this respect, however, the Bundesnetzagentur does have certain scope for interpretation as far as the factual elements of the provision are concerned. This is justified by the need for a complex process of weighing up the regulatory aims and balancing*

conflicting public and private interests to determine the suitability or lack of suitability of auction proceedings."

- 73 Only those interests relating to the question of suitability of auction proceedings are to be taken into account in this process.
- 74 In an abstract sense, both types of proceedings, tendering and auction, enable objective, open, transparent and non-discriminatory proceedings for the reallocation of spectrum under competitive conditions.
- 75 In this specific case, however, auction proceedings are not suited to securing the regulatory aims as set out in section 2(2) TKG, whereas tendering proceedings are particularly suited to securing the regulatory aims.
- 76 Specifically:
- 77 No preference as to the choice of proceedings arises from the specific – non-exhaustive – examples given in section 61(2) sentence 2 TKG.
- 78 With regard to the designation of the 450 MHz spectrum, there is no reason why auction proceedings must be ordered. This is the case even in view of the fact that, according to the Frequency Plan, the spectrum in the 450 MHz band has been designated for MFCN and all spectrum designated for this purpose up to now has been awarded in auction proceedings.
- 79 Section 61(2) sentence 2 TKG explicitly mentions the case when "spectrum has already been assigned without auction proceedings" but an auction comes into consideration. In the present case, however, all spectrum for MFCN has been awarded via auction proceedings, yet for the award of the 450 MHz spectrum tendering comes into consideration. The connection to previous award proceedings of spectrum with the same designation in accordance with section 61(2) sentence 2 TKG is due to the intention of avoiding differing market entry conditions (see. VG Köln, 21 K 7172/09, margin no. 70). However, in the specific case of the provision of 450 MHz spectrum, there is no concern about distortion of competition from differing market entry conditions because this spectrum, in contrast to the other spectrum of MFCN, is to serve a more specific purpose of use (see section III.2.1). Even though the spectrum is also designated for MFCN and assigned on a technology-neutral basis, it cannot be deployed to a competitively significant extent as it is only a small amount of spectrum and its purpose of use is more specific.
- 80 Unlike the conditions in previous auction proceedings, the purpose of use does not directly address the roll-out of the networks to the benefit of consumers, because creating blackout-resistant infrastructure does not generally directly affect people's ability to access networks and services themselves. Rather, consumers will benefit indirectly from the spectrum usage because it will maintain the provision of vital services such as water and electricity supply as part of a crisis management process.
- 81 There is therefore no need to be concerned about market asymmetries caused by heterogeneous market entry conditions. Apart from the particular purpose of spectrum use in the 450 MHz band, it should also be noted that participation in the award proceedings is not restricted (see. section III.1.1). With regard to the concerns expressed about differing access to spectrum resources caused by the proceedings leading to distortion of competition, it should be noted that a successful participant in the tender for 450 MHz spectrum can only enter into competition with the established network operators to a limited extent, if at all. Although the spectrum that is the subject of these proceedings has physical propagation conditions that are necessary for an economical network roll-out, the amount of spectrum is very small, particularly in comparison to the spectrum portfolio of the mobile network operators. The spectrum being awarded is less than 2 x 5 MHz. Moreover, the purpose of use of the spectrum is limited primarily to critical infrastructure applications, so it may not be

used freely for MFCN applications. There is still no risk of distortion of competition if the spectrum is acquired by an established, national mobile network operator, because this spectrum is subject to the restricted purpose of use.

- 82 With regard to the suitability of the spectrum use in the 450 MHz band for Machine-to-Machine applications (M2M) or the nationwide introduction of smart metering systems, the following should be noted: this usage can be implemented in principle using either the public mobile communications networks or a dedicated 450 MHz wireless network. The designation for MFCN is flexible, so a variety of applications is basically possible, but the offer of a 450-MHz user is only likely to enter into competition with the offers of public networks partially, if at all.
- 83 The 450 MHz spectrum is to be prioritised for critical infrastructure applications at all times, so only any capacity left over could be available for other MFCN uses. The Chamber does not therefore expect such use to occur to a competitively significant extent.
- 84 This applies even if one of the established, national mobile network operators were to be successful in the tender and combine the 450 MHz spectrum with its existing spectrum portfolio. It would still be required to use the 450 MHz spectrum primarily for the above-mentioned purposes.
- 85 The origin of the law gives no other assessment of the auction proceedings taking priority. The explanatory notes to section 61(4) TKG (section 59(5) TKG of the government draft of 2004, Bundesrat printed paper 755/03, page 109) state the following in this context:
- "The successful bid typically demonstrates the willingness and ability to make optimal use of the spectrum to be assigned in providing services in a competitive environment and to strive for efficient and economical use of the spectrum."*
- 86 This explanation applies in particular to the use of spectrum for supplying broadband to the population in a competitive environment. In that case, the spectrum is one of the resources enabling broadband services to be offered directly in a mass market and thus to generate revenue. It is in the commercial interests of an auction participant to recover its investment in the spectrum via its use.
- 87 By contrast, the purpose of use in the 450 MHz band is restricted and primarily focuses on the implementation of critical infrastructure applications and their availability in the event of a crisis. In the award of the 450 MHz spectrum, it is therefore necessary to choose the type of proceedings suitable to identify the user that will use the spectrum as efficiently as possible in this particular usage scenario in order to secure the regulatory aims of section 2(2) TKG.
- 88 For the spectrum that is the subject of these proceedings, it is not possible to demonstrate a preference on the basis of statutory provisions within the meaning of section 61(2) sentence 2 TKG for tendering proceedings. The provision of the spectrum at 450 MHz that is the subject of these proceedings does not affect the interests of broadcasting within the meaning of section 61(2) sentence 3 nor can the Chamber identify any other relevant criteria that would justify a statutory preference for the spectrum being assigned.
- 89 However, the lack of a preference on the basis of statutory provisions does not prevent tendering proceedings from being chosen. In fact, according to the wording of the law, such a preference "may" support "in particular" the choice of such proceedings. The wording of the law therefore does not show that the lack of a preference affects the choice of proceedings. Even if there is no preference on the basis of statutory provisions, the Bundesnetzagentur is still free to choose tendering proceedings if an auction is not suitable to secure the regulatory aims in accordance with section 2 TKG.

Translation*

- 90 With this in mind, the Chamber stands by its view that auction proceedings are not suitable in this case to secure the regulatory aims.
- 91 The Chamber takes the view that in this case, it is best possible to secure the regulatory aims in accordance with section 61(2) sentence 1 TKG and section 2(2) TKG with tendering proceedings. Auction proceedings would not be equally suitable.
- 92 Auction proceedings are not equally suitable to securing efficient and interference-free use of the spectrum pursuant to section (2) para 7 TKG, because in an auction no selection can be made on the basis of an assessment of the usage concepts or additional offers.
- 93 The previous proceedings for the provision of the 450 MHz spectrum showed that a network for critical infrastructure can in principle be set up by different operators. The various interested parties obviously base their plans on different concepts, which may vary significantly, unlike those for the previous provision of spectrum for mobile broadband.
- 94 Insofar as spectrum usage concepts are presented in the course of auction proceedings, they are only used to ensure that the requirements for assignment are fulfilled as the minimum requirements for the admission process. They are thus used to decide on admission to participate in the auction but are not the subject of a further, specific assessment that can be used to weigh up different factors in the course of a selection procedure. Rather, the pricing mechanism of the auction serves to select the efficient user.
- 95 By contrast, tendering allows the different concepts to be assessed so that the concept that best fulfils – or even exceeds – the specified criteria can be chosen. Under section 61(5) TKG, in the event of tendering proceedings the Bundesnetzagentur determines the criteria against which applicants' eligibility will be assessed prior to the award proceedings. One criterion may be the suitability of the plans to be submitted for using the tendered spectrum. Tendering proceedings thus allow for competition as to which of the different concepts presented ensures the efficient use of spectrum to the greatest extent. This includes the fact that participants in tendering proceedings can often offer conditions that go beyond the (minimum) conditions specified in the award decision. If the application is successful, these conditions become part of the assignment (section 61(6) TKG) and are thus binding. They can serve to further promote the efficient use of spectrum.
- 96 As shown above, the provision of the 450 MHz spectrum is based on the special purpose of use of setting up network infrastructure for critical infrastructure applications. The use of spectrum should therefore be regarded as particularly efficient if this purpose is fulfilled. For the efficient use of spectrum, the selection procedure thus needs to identify which concept is most suitable for this purpose. It is conducive to the securing of the regulatory aims and, in particular, the efficient use of spectrum if the specific implementation of the purpose of use can be subject to assessment. In tendering proceedings, it can, while in an auction it cannot.
- 97 In this context, security concerns take particular priority. The primary purpose of the spectrum provision is to set up network infrastructure for critical infrastructure applications and enable general interest services to be maintained in the event of a crisis. For this reason, the physical and software-related security and resilience of the network are subject to higher standards. As shown above, tendering is particularly suitable for assessing the respective concepts of the potential assignment holders on the basis of specified criteria. This relates especially to the aspects of security and blackout resilience, which were not necessary to the same extent in previous proceedings for the provision of spectrum.
- 98 In this regard, tendering proceedings are particularly suited to ensuring efficient, interference-free spectrum use as envisaged in section 2(2) para 7 TKG.

Translation*

- 99 With regard to the regulatory aim of section 2(2) para 2 TKG, auction proceedings are not the appropriate award proceedings in this case in terms of securing fair competition and promoting sustainable competitive markets for telecommunications services and networks and for associated facilities and services, including in rural areas.
- 100 In particular, auction proceedings are not suitable for securing fair competition in this case. This form of award proceedings would not sufficiently ensure that all interested parties had a non-discriminatory chance of access to the scarce resource of spectrum.
- 101 Auction proceedings would make the selection of the applicant dependent on successive auction rounds and the use of financial resources. There would be no comparative assessment of the concepts for the intended purpose of use for critical infrastructure beyond the decision about admission to the auction. Interested parties that might have great expertise in the field of critical infrastructure would not have the opportunity to display this strength in such a selection procedure. As well as the effects on the efficient use of spectrum discussed above, in this case this could also distort the competition to identify the most efficient user.
- 102 Tendering proceedings, on the other hand, are suitable for securing the regulatory aim of section 2(2) para 2 TKG. Tendering proceedings enable non-discriminatory access to scarce spectrum by giving all interested participants equal opportunity to compete with their implementation concepts for the scarce resource. In particular, they allow undertakings both from the telecommunications sector and from other sectors to present their concepts for detailed assessment.
- 103 The potential distortion of competition mentioned by respondents is not a concern, including with a view to the fact that other spectrum usage rights for MFCN were acquired in an auction but the 450 MHz spectrum will be provided in tendering proceedings. Regarding the fact that access to spectrum resources will require less financial outlay from a fee for the assignment of spectrum than in an auction, the following should be noted: the costs for network use are largely incurred from acquiring the spectrum, rolling out the network and operating the network. From an economic point of view, these costs must be weighed against the potential profit from spectrum use. The costs of acquiring spectrum by tender may be lower, but the costs of network roll-out and operation are likely to be comparatively high due to the high demands placed on security-critical networks, even given the smaller number of necessary base stations. Moreover, all interested undertakings are free to take part in tendering proceedings for the 450 MHz spectrum.
- 104 Auction proceedings are not suitable for securing the regulatory aim set out in section 2(2) para 1 TKG of safeguarding the interests of users, particularly those of consumers. User interests are primarily affected here. Users may be undertakings or bodies that benefit from the infrastructure to be set up without being consumers. There is great interest in security-related, resilient infrastructure. With this in mind, the proceedings must ensure that the recipient of the spectrum is the one that presents the best usage concept for these applications as regards the demand indicated. The previous proceedings indicated great interest from local/regional operators of critical infrastructure that need access to such infrastructure to provide general interest services at a local level. The fact that the amount of spectrum is limited and its provision on a nationwide basis make it particularly necessary to examine the usage concepts closely and assess them.
- 105 Tendering proceedings are suitable for securing the regulatory aim of safeguarding the interests of users, particularly those of consumers, under section 2(2) para 1 TKG. The coverage for local and regional interested parties can be better assessed in the course of the award decision using the specified criteria. Moreover, additional commitments made by applicants with their bids can be taken into account.

- 106 As far as safeguarding the interests of users is concerned, an auction also does not seem suitable for securing the regulatory aim of promoting telecommunications services in public institutions in accordance with section 2(2) para 6 TKG. Tendering proceedings, meanwhile, do secure this regulatory aim. "Public institutions" is a term with a broad meaning taking in community services such as swimming pools, community halls, square and streets as well as commercial enterprises of the municipality. Within this broad term, public institutions may include general interest services, which would benefit from crisis-resilient infrastructure based on 450 MHz. As already explained with reference to the safeguarding of user interests, tendering proceedings are suitable for promoting the provision of wireless services for local and regional users by taking into account usage concepts in the selection procedure, in contrast to an auction.
- 107 When the regulatory aims and the interests affected in the specific proceedings are weighed up, therefore, auction proceedings are not suitable for securing the regulatory aims. Tendering proceedings offer the greatest possible suitability and this method is therefore ordered to be carried out.

Re II. Determinations and rules of the award proceedings

Re II.1 Requirements for admission to the tendering proceedings, section 61(3) sentence 2 para 1 TKG

Re II.1.1 No restriction on participation

- 108 The right to take part in the tendering proceedings within the meaning of section 61(3) sentence 2 para 1 TKG is not restricted. The Chamber does not consider it necessary to place any restrictions on participation provided the undertakings meet the minimum specialist and other requirements and present a coherent spectrum usage concept.

Re II.1.2 Competitive independence

- 109 If insufficient spectrum is available to cover all assignment demands, current standard regulatory practice is to assign spectrum to undertakings that are independent from a competition standpoint. The regulatory aim of safeguarding fair, fully functioning competition (section 2(2) para 2 TKG) requires the assignment holders/network operators to be competitively independent from one another. This rules out the possibility of multiple applications being filed. As such, applicants must confirm in their application that there are no grounds for concern under the German Competition Act (GWB). In the event of anti-competitive conduct, however, the applicant in question may be excluded from the proceedings, including retroactively.
- 110 The exclusion of multiple applications also applies to the case of an interested undertaking also applying as part of a cooperation with another undertaking. Otherwise, it would be possible to apply for the spectrum assignment with multiple alternative applications. However, the proceedings should afford all applicants an equal chance of access with a view to the regulatory aims, in particular the aspect of competition as set out in section 2(2) para 2 TKG.

Re II.1.3 Admission to the tendering proceedings

- 111 In their written application, applicants must apply for admission to the tendering proceedings. The admission process does not constitute separate proceedings but is part of the application.
- 112 In their application, applicants must state how the minimum subjective specialist and other requirements for admission to the tendering proceedings pursuant to section 61(3) sentence 2 para 1 in conjunction with section 55(4) and (5) TKG are met.

- 113 In order to meet the minimum specialist and other requirements for admission to the tendering proceedings within the meaning of section 61(3) sentence 2 para 1 TKG, the applicant must show
- that it meets the legal conditions for assignment within the meaning of section 55(4) and (5) TKG;
 - that it can safeguard the efficient and interference-free use of spectrum as per section 55(5) sentence 1 para 4 TKG;
 - that it has access to the financial resources necessary to pay for building and rolling out the network;
 - details of the investment and ownership structures at its undertaking and where relevant its parent undertaking and, if applicable, with which undertaking a cooperation is planned to roll out the network.
- 114 Applicants have a duty to demonstrate more than the personal characteristics of reliability, financial capacity and specialist knowledge within the meaning of section 61(3) sentence 2 para 1 TKG. In accordance with section 55(5) sentence 1 para 4 TKG, the applicant must ensure the efficient and interference-free use of spectrum in line with the conditions of assignment. This must be shown in the application for admission to the tendering proceedings. To this end, every applicant must submit a spectrum usage concept detailing how it plans to safeguard the efficient use of spectrum (for the requirements of a spectrum usage concept, see section IV.2.6).
- 115 Admission to the tendering proceedings is made in an official notice and is granted provided that the application was received by the deadline and includes information on the following points:
- applicant
 - competitive independence
 - reliability
 - financial capability
 - specialist knowledge
 - spectrum usage concept.
- 116 Only applicants providing the above information in full will be admitted.

Re II.2 Determination of the purpose for which the spectrum to be awarded may be used in compliance with the Frequency Plan (section 61(3) sentence 2 para 2 TKG)

Re II.2.1 Purpose of use of the spectrum

- 117 The spectrum to be awarded may be used for MFCN in compliance with the Frequency Plan. The spectrum is to be used primarily for critical infrastructure applications.
- 118 The general section of the Frequency Plan describes MFCN as follows:
- "This spectrum usage serves to connect terminal equipment to wireless networks via fixed base stations. This is usually for the purpose of providing telecommunications services."*

- 119 The current Frequency Plan (page 4) contains the following more detailed information:
- "An example is the use of spectrum for MFCN. The technology-neutral designation will enable the deployment of different technologies and systems without restriction to particular standards. Further, spectrum usage is structured so broadly that, within the scope of the allocations in the Frequency Ordinance (FreqV), it covers all services consisting in, or having as their principal feature, the conveyance of signals by means of telecommunications networks. The allocation for mobile services can be used for mobile, nomadic or fixed applications provided the stipulated mobile service parameters are complied with. The spectrum usage designated for MFCN connects terminal equipment to wireless networks via fixed base stations. This is usually for the purpose of providing telecommunications services. Other applications outside of telecommunications services are also possible, such as in-house applications or infrastructure applications."*
- 120 According to the Frequency Plan, the broad designation for MFCN enables mobile, nomadic and fixed applications to be realised in compliance with the spectrum usage conditions. In-house and infrastructure applications are specifically mentioned as part of the designation. The Chamber is therefore convinced that there is no need to alter the designation in the Frequency Plan to enable critical infrastructure applications, as some respondents had maintained.
- 121 The purpose of use of the spectrum is further specified to the effect that the spectrum is to be used primarily for critical infrastructure applications. The legal basis of this specification is section 61(3) sentence 2 para 2 TKG in conjunction with section 60(1) sentence 1, section 55(5) sentence 2 and (10) TKG. The Bundesnetzagentur specifies the type and extent of the spectrum usage, insofar as is necessary to secure efficient and interference-free use of spectrum (section 60(1) sentence 1 TKG). In accordance with section 55(5) sentence 2 TKG, specification of the permissible usage can mean ensuring the future use is compatible with the regulatory aims set out in section 2 TKG (see BVerwG ruling 6 C 3.19 of 24 June 2020).
- 122 As the use is for critical infrastructure, the spectrum provided can be used for applications in the sectors of energy, water, wastewater, district heating and transport, among other things. For energy, for example, all applications that the applicable legal and regulatory framework requires or wishes to enable can be provided via the spectrum, including applications coming under the Metering Act (MsbG).
- 123 Free capacity can also be used for other MFCN applications in addition to critical infrastructure applications, as respondents had requested.
- 124 Regarding the calls for the spectrum to be made available for "public mobile communications" and that this would provide sufficient spectrum for nationwide coverage, it should be remembered that only 2 x 4.74 MHz of spectrum is available. Larger amounts of spectrum are needed to provide mobile broadband coverage for the public, such as those available in the bands at 700 MHz, 800 MHz and 900 MHz. Moreover, the provision of spectrum for mobile broadband is already under discussion at an international level. As decided at the World Radiocommunication Conference 2019 under Resolution 811 (WRC-19) in conjunction with Resolution 235 (WRC-15), the future spectrum use in the band 470-960 MHz in the ITU-R Region 1 is already an item on the agenda for WRC-23. For critical infrastructure, on the other hand, there is no other suitable dedicated spectrum available.
- 125 In determining the permissible uses, the Chamber was guided in particular by the following considerations:

- 126 An efficient and highly reliable provision of essential infrastructure services for the population in Germany is a general interest service that is a fundamental prerequisite for a functioning society. The demands placed on the efficiency and flexibility of the underlying infrastructure systems are continually increasing. Meanwhile, new scenarios that show the growing vulnerability of basic community institutions from a rising number of threats place great demands on protection from disruption to or the failure of critical infrastructure. In the case of coverage for critical infrastructure, the technical aspects of the reliability and security of communications networks are of particular importance. The exceptional resilience of critical infrastructural services thus forms a fundamental basis for the functioning of modern society.
- 127 In a time of rapid digital transformation and comprehensive networking, critical infrastructure is more dependent than ever on powerful background applications controlling and overcoming crises within systems. In this framework, wireless applications play a decisive role as they are particularly flexible to implement and can be adjusted quickly as needed.
- 128 Even away from crisis scenarios, rapid developments are placing increasing demands on the provision of adequate spectrum resources for critical infrastructure as the basis for wireless applications. A functioning energy supply forms the basis for more and more areas of community life as digital change progresses. For example, the energy transition is leading to increasing reliance on renewable energy sources that are often weather-dependent, causing greater variability in electricity generation, which supply infrastructure must be able to deal with in a flexible and smart way. There is a similar situation with the growing trend of e-mobility in the field of transport. The infrastructure needs to be able to respond flexibly to expected peaks in demand, such as when many electric vehicles are being charged at the same time across the country.
- 129 The Bundesnetzagentur's role is to manage these aspects at the level of spectrum regulation. The Chamber's aim is to provide the market with the scarce resource of spectrum as the basis for such wireless applications in open, transparent, objective and non-discriminatory proceedings. The Chamber thus believes that in these proceedings it is particularly important to appropriately take account of the common interest in reliable infrastructure coverage, which cannot merely be reduced to economic interest.
- 130 The Chamber is therefore working on the assumption that wireless network infrastructure needs to fulfil the following requirements in particular:
1. Communications are to be maintained in the event of a failure of a data line. This could be achieved using redundant data connections for all major network infrastructure elements via two separate lines/transmission media.
 2. It is to be possible to maintain coverage for a certain period of time even if the primary external power supply fails. This is to ensure that in exceptional situations a basic level of communication (for example voice calls and control of network elements) is still possible in order to prevent greater damage and restore normal system operation.
 3. There is to be a high level of network stability and availability. This is to ensure that virtually uninterrupted communication and data transmission is possible as required even in the event of critical operation. Disruptions to network operation are to be promptly remedied so as to promptly restore the high level of network stability and availability.
 4. To protect the 450 MHz network against threats, it is necessary to apply the latest security requirements for telecommunications networks and services. Constructing networks for applications in the field of (security) critical infrastructure is of crucial importance. In this context, the Bundesnetzagentur

believes that industry-related and security-related issues are equally significant. With a view to security and the latest technology for telecommunications networks and services, the Bundesnetzagentur revised its catalogue of security requirements, in cooperation with the Federal Office for Information Security (BSI) and the Federal Commissioner for Data Protection and Freedom of Information (BfDI), and published its draft in October 2019.

- 131 This specification of use will in particular achieve the regulatory aims of ensuring efficient and interference-free use of spectrum (section 52 in conjunction with section 2(2) para 7 TKG), safeguarding the interests of telecommunications users, particularly those of consumers (section 2(2) para 1 TKG) and securing fair competition (section 2(2) para 2 TKG).
- 132 The restriction of the permissible purpose of use by the President's Chamber of the Bundesnetzagentur is a sovereign act and thus subject to the principles of the rule of law and, in particular, the principle of proportionality. The specification of the purpose of use must serve to achieve the regulatory aims and be suitable, necessary and reasonable for this purpose.
- 133 Specifying the permissible use of spectrum for providing coverage primarily for critical infrastructure wireless applications on the basis of the spectrum that is the subject of these proceedings is a suitable means of ensuring efficient and interference-free use of spectrum within the meaning of section 2(2) para 7 TKG.
- 134 Providing this spectrum for coverage for critical infrastructure will lead to the most efficient use of it. The Chamber sees an urgent need for critical infrastructure applications and therefore strong demand for suitable wireless solutions. The 450 MHz band represents the best possible solution for this and leads to the optimum allocation of resources.
- 135 An efficient and reliable communications infrastructure is necessary to meet the requirements of the reliability of critical infrastructure described above, which will increase further in the future. In view of these developments, the Chamber considers the provision of spectrum resources to the operators of critical infrastructure as the basis for corresponding wireless applications to be urgently needed.
- 136 Of the spectrum that will become available in a suitable time frame, the Chamber is convinced that the 450 MHz band that is the subject of these proceedings is the best to meet the requirements for coverage for critical infrastructure wireless applications and represents the optimum allocation of spectrum as regards the efficient and interference-free use of spectrum.
- 137 Assignment holders are already providing coverage for wireless applications for critical infrastructure on the basis of the existing spectrum usage rights in the 450 MHz band. The industry called for expansion in its comments on the key elements and identification of demand for the future use of spectrum in the 450 MHz band, partly on the basis of this existing experience. The Chamber considers that this spectrum is well suited as a basis for critical infrastructure applications. Moreover, experience with existing uses enable use to continue in a comparatively efficient manner in which loss of experience is minimised and longer transitional phases with idle spectrum can be avoided as far as possible.
- 138 The physical propagation characteristics of this spectrum have also been shown to be particularly suitable for coverage for critical infrastructure and thus for the efficient allocation of spectrum.
- 139 The 450 MHz band has very good propagation conditions. It is able to provide better area coverage than higher spectrum bands as well as the necessary building penetration. In view of the need for communication in the event of a blackout, it is essential to ensure good coverage inside buildings and in cellars. Longer radio waves

- are subject to weaker attenuation characteristics. If this kind of coverage were to be achieved in higher bands of spectrum, many times the number of sites would be needed to reach the same level of coverage (outdoor and indoor) due to the physical propagation characteristics. The planned coverage primarily for critical infrastructure in the 450 MHz band can be achieved in a cost-effective manner.
- 140 Specifying the use of the 450 MHz spectrum primarily for coverage for critical infrastructure is necessary and appropriate to promote the efficient and interference-free use of spectrum.
- 141 The Chamber is convinced that without this specification, it could not be ensured that the use of spectrum would be efficient and interference-free, in particular with regard to the needs of critical infrastructure operators.
- 142 As the Chamber has shown, there are no equally appropriate alternatives to the 450 MHz band to meet these needs in a suitable time frame.
- 143 The primary purpose of use of coverage for critical infrastructure with wireless applications on the basis of the 450 MHz spectrum is further suited to safeguarding user interests in telecommunications within the meaning of section 2(2) para 1 TKG.
- 144 The term "user" within the meaning of section 2(2) para 1 TKG has a broad meaning that is not restricted to the group of end-users. The interests of undertakings and bodies also fall under the protection of section 2(2) para 1 TKG. The regulatory aim thus also includes the operators of critical infrastructure.
- 145 As already stated, the Chamber is convinced that there is an urgent need for wireless applications among operators of critical infrastructure. To reflect this need, the future assignment holder will be required to enable primarily critical infrastructure applications with the 450 MHz spectrum. The specification of permissible use thus also serves to safeguard user interests in telecommunications.
- 146 The Chamber is convinced that the specification of the purpose of use for providing coverage primarily for critical infrastructure applications on the basis of the spectrum at 450 MHz is further suited to securing fair competition for telecommunications services and networks and for associated facilities and services in accordance with section 2(2) para 2 sentence 1 TKG. In particular, it will ensure the avoidance of distortion of competition within the meaning of section 2(2) para 2 sentence 3 TKG.
- 147 As previously stated, the Chamber is convinced that the provision of the spectrum at 450 MHz that is the subject of these proceedings for critical infrastructure applications by way of tendering proceedings is urgently needed with a view to the efficient use of spectrum and user interests.
- 148 However, the Chamber is also aware that the 450 MHz spectrum consists of valuable nationwide spectrum with favourable propagation conditions that could in principle develop competitive relevance, especially in relation to the established mobile network operators. Without measures to secure competition, the spectrum at 450 MHz could start to compete in particular with spectrum auctioned off in previous award proceedings for MFCN. In comparison to this auctioned spectrum, a future assignment holder could receive comparatively cheap access to valuable nationwide spectrum with the 450 MHz spectrum and use it for competing applications.
- 149 The Chamber takes the view that the specification of use primarily for coverage for critical infrastructure, along with the relatively small amount of spectrum, is appropriate to avoid this potential distortion of competition. The fact that the spectrum has to be made available primarily for critical infrastructure applications nationwide at any time ensures that the future assignment holder will not enter into a competitive relationship with existing assignment holders. The assignment holder will only be able to use any capacity that may be left over for other MFCN applications. Given the need

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- in the field of critical infrastructure, the Chamber does not expect this to have relevance in terms of competition.
- 150 The specification of the purpose of use primarily for coverage for critical infrastructure is necessary and appropriate to avoid negative effects on competition.
- 151 The specification of the purpose of use does not exceed what is appropriate. The obligation only takes effect to the extent absolutely necessary to secure sufficient coverage for critical infrastructure. The Chamber is aware that any capacity left over when critical infrastructure has been covered will in practice only be a small amount. Nevertheless, the future assignment holder will be free to use this remaining capacity within the framework of the designation without stronger legal restrictions than are appropriate to secure the regulatory aims. Simply determining that critical infrastructure applications should take priority over other permissible applications is the least intrusive measure for this purpose, in the view of the Chamber.
- 152 Even though the purpose of use has been specified as primarily for coverage for critical infrastructure, MFCN applications are still possible. Beyond ensuring coverage for critical infrastructure as a priority, the assignment holder remains free to choose other uses within the framework of the planned designation. According to the Frequency Plan, any usage that connects terminal equipment to wireless networks via fixed base stations is conceivable. The spectrum can be used on a technology and service-neutral basis and there are no restrictions on the technologies that may be used. The Chamber has therefore taken account of the calls by some respondents not to further restrict the use of any remaining capacity.
- 153 On the basis of the identified demand, the Chamber assumes that other applications will be able to be covered as well as the priority coverage for critical infrastructure applications (specified by the applicable legal and regulatory framework). For example, in accordance with the applicable legal framework (sections 21, 25 and 51 MsbG), smart meters must primarily be available for necessary energy-related applications and may further be used for value-added services.
- 154 Regarding comments that the 450 MHz rules must not have a negative impact on business models in the field of public mobile communications, the Chamber would like to point out that in this spectrum band, too, the technology-neutral and service-neutral use and the further development of the available technological approaches to support critical infrastructure will not be affected and thus there is no need for concern about a negative impact on fair competition.

Re II.2.2 Nationwide use

- 155 The 450 MHz spectrum will be provided for nationwide use.
- 156 The Chamber takes the view that a nationwide assignment corresponds to the provisions of section 55(5) sentence 2 TKG and the regulatory aims set out in section 2 TKG. In particular, it will secure the efficient and interference-free use of spectrum in accordance with section 2(2) para 7 TKG.
- 157 The 450 MHz band's propagation conditions mean that it can achieve a large range, but this is also associated with large interference ranges, which is an argument against a regional or local assignment in the interests of efficient spectrum use. By contrast, a nationwide assignment can achieve cost-effective coverage in line with requirements.
- 158 As intended by the Bundesnetzagentur in the key elements and welcomed by the majority of respondents, local and regional requirements can be met with a roll-out obligation and possible spectrum leasing.
- 159 Regarding comments that many critical infrastructure operators are only locally or regionally active, the Chamber would like to point to the planned coverage obligation

and the possibility of spectrum leasing. These will allow existing local/regional operators of critical infrastructure to continue their network operation.

- 160 Regarding comments about specific requirements, eg for security, the Chamber would like to point out the following: the future assignment holder is required to enter into negotiations with local and regional operators of critical infrastructure about their particular requirements. There is also the possibility of spectrum leasing to local and regional operators of critical infrastructure. Moreover, the Chamber points out that there are also other spectrum bands (eg PMR, PTMR, 3.7 – 3.8 GHz) for autonomous local networks with particularly high security requirements.
- 161 Alongside critical infrastructure applications, spectrum in the 450 MHz band is required on a local basis to train soldiers on military training areas and on a regional basis and for strictly limited periods for large-scale military training exercises. The use of the spectrum is based on usage provision 3 of the Frequency Ordinance of 27 August 2013 (Federal Law Gazette I page 3326), as last amended by Article 1 of the Act of 27 November 2018 (Federal Law Gazette I page 2026). This usage provision allows individual frequencies in the 410 - 862 MHz band to be used for military purposes. The assignment holder will be required to make spectrum in this band available to military users as required for local as well as time and geographically limited use.

Re II.3 Spectrum usage conditions, section 61(3) sentence 2 para 4 TKG

- 162 In accordance with section 61(3) sentence 2 para 4 TKG, prior to award proceedings the Chamber determines the spectrum usage conditions, including the degree of coverage with the spectrum usage and the time limit for achieving such coverage. These spectrum usage conditions cover the technical requirements and the type and scope (eg location in the band, size of the blocks) of the spectrum to be assigned.

Re II.3.1 Spectrum usage conditions

- 163 The spectrum usage conditions are determined on the basis of international recommendations and decisions, among other things.
- 164 Key framework conditions of the relevant CEPT and European Commission decisions form the basis for deploying the spectrum available in a manner that is efficient and interference-free, including across national borders. The spectrum usage conditions can be modified subsequently, particularly if this is necessary to secure efficient and interference-free use or as a result of international harmonisation agreements.
- 165 The spectrum usage conditions in Annex 1 for 450 MHz spectrum also aim to safeguard the interference-free coexistence of different applications in adjacent bands. This is of particular relevance when determining site-related spectrum usage parameters for base stations.
- 166 The Bundesnetzagentur specifies block edge masks (BEM) as part of the spectrum usage conditions. These masks relate to the borders of the assigned frequency blocks. The BEMs use technical parameters to describe both permissible in-block emissions and out-of-block emissions (with in-block and out-of-block power limits). These regulatory requirements aim to reduce the likelihood of harmful interference occurring between adjacent spectrum usages.
- 167 The assignment holder may diverge from these conditions if mutual arrangements to this effect have been made with adjacent assignment holders (operator arrangements) and divergence is without detriment to the spectrum usage rights of third parties. This gives the assignment holder a high degree of flexibility when using spectrum for specific applications. In order to ensure the rapid and proper resolution of reports of interference, the Bundesnetzagentur must be informed of this in writing.

- 168 The onus is on the operator to decide how it restricts out-of-block emissions (eg by using special filter technology) in its block. As a result, there is no need to apply a general restriction on radiated power for base stations.
- 169 With out-of-block emissions, a distinction is made between general and specific requirements. Since the minimum requirements are defined via the BEMs, additional local or regional measures may be necessary to enable coexistence with other spectrum users. This must then be assessed taking the exact locations and prevailing local or regional framework conditions into consideration when determining site-related frequency usage parameters.
- 170 Alongside critical infrastructure applications, spectrum in the 450 MHz band is required on a local basis to train soldiers on military training areas and on a regional basis and for strictly limited periods for large-scale military training exercises. The use of the spectrum is based on usage provision 3 of the Frequency Ordinance of 27 August 2013 (Federal Law Gazette I page 3326), as last amended by Article 1 of the Act of 27 November 2018 (Federal Law Gazette I page 2026). This usage provision allows individual frequencies in the 410 - 862 MHz band to be used for military purposes. The assignment holder will be required to make spectrum in this band available to military users as required for local as well as time and geographically limited use.
- 171 The military must use the spectrum in such a way that any protection areas can be kept as small as possible. While the military has to reduce its spectrum usages to the minimum transmitter power necessary, the necessary protection radius for efficient use of spectrum has to be maintained by the original assignment holder. The Bundesnetzagentur assumes that efficient spectrum usages will be organised by the two sides bilaterally. It is assumed that talks will be held between the assignment holder and the federal armed forces. The aim is to make the spectrum available nationwide.
- 172 Regarding comments that weather and earth observation satellites should also be protected, it should be noted that these are located in the band 468.075 – 468.125 MHz, which is not the subject of these proceedings.

Cross-border coordination

- 173 In the border areas of the Federal Republic of Germany and some other exposed areas near the borders, only a limited amount of spectrum is available because of the need for coordination with neighbouring countries.
- 174 The possible restrictions with respect to the usable bandwidth of the spectrum will vary from area to area, depending on whether one, two or possibly three neighbouring countries need to be included in the coordination process.
- 175 Since the whole band from 450 MHz to 470 MHz is not yet harmonised at European level, the possible restrictions will also depend on the transmission methods and bandwidths in use either side of the borders.

Small-cell wireless network planning is therefore recommended especially in Germany's border areas in order to minimise the restrictions from the cross-border coordination of mobile systems.

Protection of the radio monitoring stations of the radio monitoring and inspection service

- 176 To secure the aims of frequency regulation in accordance with section 64 TKG, spectrum usages cannot cause interference to the Bundesnetzagentur's radio monitoring stations. Electromagnetic fields from transmitters operated in the vicinity of the Bundesnetzagentur's receivers can lead to desensitisation and overloading, thus impairing the reception of the Bundesnetzagentur's measuring equipment (see Bundesnetzagentur Official Gazette No 17/2012, Communication No 613/2012).

- 177 The Bundesnetzagentur has evolved its administrative practice for setting MFCN parameters in line with the above regulation and feels that it will continue to offer a fair framework for balancing the individual interests of mobile network operators as regards their network roll-out efforts with the Bundesnetzagentur's legal mandate.
- 178 In order to protect the fixed radio monitoring stations operated and planned by the Bundesnetzagentur's radio monitoring and inspection service in Germany, the field strength from emissions in the band below 694 MHz at these sites may not exceed 80 dBµV/m (see Bundesnetzagentur Official Gazette No 23/2019, Communication No 646/2019).

Re II.3.2 Expiry of usage rights

- 179 The spectrum assignment will be valid until 31 December 2040. In accordance with section 55(9) sentence 1 TKG, spectrum is, as a rule, assigned for a limited period. Under section 55(9) sentence 2 TKG, time limits must be reasonable with respect to the service in question and must take reasonable account of the associated investment costs to be recouped.
- 180 When setting the time limit the Chamber considered on the one hand the interests of potential frequency assignment holders in keeping the spectrum for a period of time that is reasonably sufficient for recouping the investment costs involved.
- 181 On the other hand it also gave due consideration to ensuring that the Bundesnetzagentur's decision-making leeway with respect to frequency planning was not restricted to an unreasonable degree, ie that the time limit as a control mechanism did not exceed a reasonable period of time.
- 182 The time limit of 31 December 2040 will fulfil the requirements of the European Electronic Communications Code (Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code, EECC). In accordance with Article 49(2) EECC, individual rights of use for radio spectrum for which harmonised conditions have been set in order to enable its use for wireless broadband services are to be assigned for a period of at least 15 years. The provision envisages an adequate extension for the assignment to ensure regulatory predictability for the holders of the rights over a period of at least 20 years regarding conditions for investment in infrastructure which relies on the use of such radio spectrum. Setting a duration until 31 December 2040 fulfils these requirements. At this point, the Chamber wishes to highlight the fact that the TKG may be amended to transpose the EECC before the spectrum is assigned.
- 183 The duration of 20 years arising from the time limit of the end of 2040 thus corresponds both to the European legal provisions and to the previous administrative practice in the provision of spectrum for MFCN applications, for which the spectrum usage rights were awarded with durations of between 15 and 20 years.
- 184 In view of the need to give assignment holders a period of time considered reasonable for recouping the investment costs involved, the expiry date set of 31 December 2040 seems to be both reasonable and necessary. Assignment holders will have enough time to establish and roll out the network, implement their business model and recoup the investment volume. It was taken into consideration that establishing and rolling out a telecommunications network with security-related requirements is particularly expensive and it correspondingly takes time to recoup the investment. It was not possible to accede to respondents' calls for even longer durations.

Re II.3.3 Negotiation and offer requirement to ensure coverage for critical infrastructure operators in line with demand

- 185 The assignment holder must negotiate with critical infrastructure operators upon request about coverage with wireless applications and must submit offers for coverage to meet operators' requirements within a reasonable period.
- 186 The determination of a negotiation and offer requirement is based on section 61(3) sentence 2 para 4 TKG in conjunction with section 60(2) sentence 1 TKG and section 2 TKG.
- 187 Prior to award proceedings the President's Chamber determines the spectrum usage conditions, including the degree of coverage with the spectrum usage and the time limit for achieving such coverage, section 61(3) sentence 2 para 4 TKG. In accordance with section 60(2) sentence 1 TKG, secondary conditions may be attached to spectrum assignments in order to secure efficient and interference-free use of spectrum and pursue the regulatory objectives stated in section 2 TKG. In the 450 MHz band, the assignment holder is required to negotiate with critical infrastructure operators upon request about coverage with wireless applications and must submit offers for coverage to meet operators' requirements within a reasonable period.
- 188 Determining a negotiation and offer requirement will serve the regulatory aims of ensuring efficient and interference-free use of spectrum (section 52 in conjunction with section 2(2) para 7 TKG), safeguarding the interests of telecommunications users, particularly those of consumers (section 2(2) para 1 TKG) and securing fair competition (section 2(2) para 2 TKG).
- 189 Imposing a negotiation and offer requirement will serve the regulatory aim of safeguarding the interests of telecommunications users, particularly those of consumers (section 2(2) para 1 TKG).
- 190 Determining a negotiation and offer requirement serves the practical implementation of the abstract specification of use particularly from the perspective of the critical infrastructure operators acting as requesting parties, ie it particularly serves the safeguarding of user interests. The a negotiation and offer requirement to ensure coverage for critical infrastructure operators in line with demand thus serves the aim of expansion in line with demand. The Chamber is of the view that this is the best way to take account of the different demands of critical infrastructure operators. For example, it is conceivable that there might be a demand for ready-to-use applications including the setting up of underlying network infrastructure. There might also be demand to integrate applications in existing structures, to build on existing structures or to implement them in cooperation with the assignment holder. This sort of demand could include the regional/local leasing of spectrum, even if this may be technically demanding, as respondents noted. The a negotiation and offer requirement is addressed to the future assignment holder. The assignment holder must negotiate with critical infrastructure operators and make an offer for the requested mobile coverage.
- 191 The intention is to meet demand from critical infrastructure operators for special mobile coverage as a matter of priority. The Chamber expects there to be particular demand for a highly available and blackout-resilient wireless network infrastructure to maintain the provision of general interest services in the event of a crisis. This concerns the electricity, gas, wastewater, water and district heating sectors. A reinforced wireless network is required in particular in the event of a crisis in order to guarantee the restoration and/or functionality of critical infrastructure networks.
- 192 The Chamber is therefore working on the assumption that wireless network infrastructure needs to fulfil the following requirements in particular:

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1. Communications are to be maintained in the event of a failure of a data line. This could be achieved using redundant data connections for all major network infrastructure elements via two separate lines/transmission media.
2. It is to be possible to maintain coverage for a certain period of time even if the primary external power supply fails. This is to ensure that in exceptional situations a basic level of communication (for example voice calls and control of network elements) is still possible in order to prevent greater damage and restore normal system operation.
3. There is to be a high level of network stability and availability. This is to ensure that virtually uninterrupted communication and data transmission is possible as required even in the event of critical operation. Disruptions to network operation are to be promptly remedied so as to promptly restore the high level of network stability and availability.

193 These requirements are covered by the negotiation and offer requirement.

194 Moreover, the determination of a negotiation and offer requirement serves to achieve section 2(2) para 2 TKG, which sets out the aims of regulation of fair competition and the promotion of sustainable competitive markets for telecommunications services and networks and for associated facilities and services, including in rural areas, and the Bundesnetzagentur thus also ensures that users will receive the greatest possible benefits in terms of selection, prices and quality.

195 This applies particularly with regard to the fact that there is only limited availability of the underlying spectrum resources and they can only be assigned to one undertaking. Market entry is thus not free but heavily restricted by the limiting resource of spectrum. It is therefore also justified in this case to impose not merely an instruction to negotiate but a negotiation and offer requirement. For the sake of clarity the Chamber would like to point out that this requirement is not an obligation to grant access (section 21 TKG), which is conditional on the network operator having significant market power, something that has not been identified by either the Bundeskartellamt or the Bundesnetzagentur.

196 The intention of the negotiation and offer requirement is to ensure in accordance with section 2(2) para 2 sentence 2 TKG that users – ie critical infrastructure operators – will receive the greatest possible benefits in terms of selection, prices and quality. To achieve this, it is necessary that critical infrastructure operators are not disadvantaged by the nationwide assignment holder in negotiations about offers for wireless applications. Negotiations between the assignment holder and the critical infrastructure operators are to be non-discriminatory. To that end, the assignment holder is not to adopt arbitrary positions during the negotiations and, on request, is to provide the Bundesnetzagentur with transparent information on the course the negotiations take (section 127 TKG). Non-discriminatory negotiations are intended to result in agreement between the two parties on reasonable terms that are not detrimental to either side. It must be prevented, for example, that negotiations on wireless applications are simply refused, that negotiations are held in an abusive way or unreasonable terms are applied to services.

197 The imposition of a negotiation and offer requirement serves the regulatory aim of securing efficient and interference-free spectrum use (section 2(2) para 7 TKG).

198 The determined negotiation and offer requirement is intended to meet demand from critical infrastructure operators at all levels. Local and regional critical infrastructure operators, in particular, should be able to approach the future assignment holder as requesting parties and achieve coverage from these negotiations and offers. The Chamber takes the view that this will be able to ensure that, even given the fact that the valuable resource of spectrum will be assigned nationwide, the largest possible

- group of users will be able to benefit from it and the greatest added value for the critical infrastructure operators will be generated.
- 199 The Chamber agrees with the argument put forward by respondents that the possibility of spectrum leasing should not replace the assignment holder's other obligations. The aim of the negotiation and offer requirement is to ensure that the future assignment holder cannot merely restrict itself to leasing spectrum. The requirement to enter into negotiations and make corresponding offers for mobile coverage is focused on demand, with the scope of services offered by the assignment holder being primarily based on those requested by operators of critical infrastructure in each individual case. The Chamber considers that this will be able to take account of the strongly diverging demand from critical infrastructure operators. For example, it is conceivable that there might be a demand for ready-to-use applications including the setting up of underlying network infrastructure. There might also be demand to integrate applications in existing structures, to build on existing structures or to implement them in cooperation with the assignment holder. Finally, requesting parties could turn to existing applications and infrastructure and only need local or regional leasing of spectrum usage rights.
- 200 The Chamber assumes that it is in the interest of both the assignment holder and requesting parties to develop solutions that are in line with demands and can be tailored to individual cases.
- 201 At the same time, it acknowledges that an offer requirement solely based on demand might not take sufficient account of the needs of the assignment holder in individual cases.
- 202 In this context, the Chamber assumes that requesting parties will also play their part in the setting up and operating of infrastructure as far as is reasonable. For example, requesting parties should make suitable sites for wireless infrastructure available on their premises where applicable and contribute by making a power supply available. Where this is a possibility, the assignment holder can take appropriate cooperation by the requesting party into account when making its offer.
- 203 The offer to the requesting party is to include the main bases for calculation used by the assignment holder. The Chamber is certain that disclosing the main bases for calculation will lead to greater transparency in offers, promoting the application of fair and appropriate terms between the potential contracting parties. The aim is to make it easier to compare offers to different requesting parties and thus ensure to a sufficient extent that non-discriminatory contract terms and conditions are applied equally.
- 204 The Chamber is convinced that it is appropriate to leave it mainly up to the parties to come to an agreement on this basis. The Chamber assumes that the parties concerned will find their way to balanced contract terms and conditions through fair and non-discriminatory negotiations and by making use of any potential for cooperation. There is no compulsion here to enter into and conclude a contract or agreement. Assignment holders cannot be forced to enter into a contract with any interested party or under any terms. However, the requirement includes the aim of negotiating and concluding a contract within the freedom of contract. Without the intention to conclude a contract, the negotiation and offer requirement would be devoid of purpose and hence not suitable to promote the regulatory objectives laid down in the TKG.
- 205 At the same time, the Chamber is aware that conflicts arising in individual cases could make it necessary for a third party to act as intermediary. The Bundesnetzagentur is therefore prepared to arbitrate in a subsidiary role in the event of a dispute in order to ensure that an appropriate solution is found to implement the determined requirements.

- 206 The Bundesnetzagentur is therefore entitled, in the event of infringements of the negotiation requirement, to intervene in order to ensure the regulatory aims, ie by acting as an arbitrator. What is needed in such a case is a comprehensive balancing of the interests of the parties in question along the lines indicated above.
- 207 The Chamber is aware of the fact that any potential breaches of the negotiation and offer requirement can only be effectively combated by an effective form of this arbitrator role. At the same time, in a market economy, agreements between parties in line with their interests should primarily be based on private sector contractual negotiations. The Bundesnetzagentur will therefore only play a role if negotiations fail. The Chamber assumes that it will only be necessary for the authority to intervene in exceptional cases and in a subsidiary manner, not as part of the ongoing monitoring of anti-competitive practices.
- 208 If, despite all efforts, the negotiations conducted under the freedom of contract do not lead to the conclusion of a contract governing coverage for critical infrastructure operators in line with demand, the Chamber considers that an appropriate solution may be the assignment holder leasing the critical infrastructure operators the spectrum with which to implement their business model on non-discriminatory, objective, appropriate and fair terms, insofar as this spectrum is not already being used efficiently or will be so in the foreseeable future.
- 209 In this context, the Chamber wishes to highlight that, in accordance with section 61(5) sentence 2 TKG, in the case of otherwise equal eligibility, the applicant guaranteeing a higher degree of geographic coverage with the relevant telecommunications services is to be selected. This higher degree of coverage could also be achieved through spectrum leasing if negotiations about the coverage provided by the assignment holder were not promising. This is based on the idea that spectrum leasing can lead to efficient use by the critical infrastructure operators (requesting parties) of spectrum that would otherwise be unused. Therefore, when making the selection in accordance with section 61(5) TKG, the voluntary commitments made by an undertaking in the course of the comparative selection procedure will also be taken into account. At the same time, it should be noted that each individual case of spectrum leasing requires the consent of the Bundesnetzagentur.

Re II.3.4 Reporting requirement

- 210 The assignment holder must report to the Bundesnetzagentur twice a year and upon request on progress in building and rolling out the network and on compliance with all obligations entered into in connection with the tendering.
- 211 The imposition of a reporting requirement will serve to ensure that critical infrastructure receives priority coverage from the assignment holder, as determined. As the reports will be presented twice a year and upon request, the Bundesnetzagentur will be able to keep up to date on the progress of network roll-out and on the use of spectrum in the 450 MHz band and, where necessary, to use regulatory means to deal with developments. It will be able to respond early to any undesirable developments in the interests of all concerned, without having to wait for a conflict to occur.

Re II.4 Fees and contributions

- 212 Fees will be imposed for spectrum assignment in accordance with section 142 TKG.
- 213 In addition, spectrum usage contribution charges in accordance with section 143(1) TKG and contributions in accordance with section 31 of the Electromagnetic Compatibility of Equipment Act (EMVG) and section 35 of the Radio Equipment Act (FUAG) will be imposed. The spectrum usage contribution charges and the EMVG and FUAG contributions will be recalculated annually. The contributions will be

calculated in accordance with the Frequency Protection Contributions Ordinance (FSBeitrV), as amended.

- 214 It was said that it was not clear why particularly moderate fees should be charged for critical infrastructures. Discrimination against nationwide mobile operators should be avoided. The Chamber points out that spectrum to be awarded may be used for MFCN in compliance with the Frequency Plan. However, the spectrum is to be used primarily for critical infrastructure applications (see section III.2.1). The 450 MHz spectrum is therefore not directly comparable with other spectrum for MFCN. The assignment holder cannot decide freely to use the spectrum for certain offers or business models. First, it needs to meet demand from the primary purpose of use. It can only offer other applications if and for as long as the primary purpose of use is not negatively affected. This restriction justifies a special determination for the fees that will enable a negative impact on network roll-out costs and investment behaviour to be avoided.

Re III. Tendering rules

- 215 Under section 61(5) sentence 1 TKG, the Chamber must determine the criteria against which applicants' eligibility will be assessed prior to the award proceedings.

Re III.1 Eligibility criteria

- 216 Applications will be assessed against the criteria as prescribed by law in section 61(5) sentence 2 TKG. These are:
- reliability
 - specialist knowledge
 - financial capacity
 - suitability of the plans to be submitted for using the spectrum for tender
 - promotion of a sustainable competitive market
 - degree of geographic coverage.

Re III.2 Contents of applications

Re III.2.1 Applicant details

- 217 The applicant must provide the following information:
1. name and address
 2. legal form
 3. seat
 4. extract from the commercial register
 5. name of authorised agent with telephone and fax numbers and email address
 6. name of a person authorised to take delivery, with an address enabling service (street, house number, place)

Re III.2.2 Applicant's financial interests

- 218 In their application, applicants must include details of the ownership structure – including indirect ownership – of their undertaking. This applies in particular to the description of the participation structure and any voting rights of an undertaking that has a controlling influence on the applicant. In the event that an application is filed by

Translation*

a consortium, the obligation to present the facts applies to all members of the consortium. The description must include the shares in the consortium.

- 219 The applicant must confirm in its application that there are no grounds for concern under the German Competition Act (GWB).

Re III.2.3 Reliability

220 Applicants must state whether

- a frequency assignment has been revoked in the past;
- conditions have been imposed on them for failure to comply with obligations arising from frequency assignments;
- legal action has been taken on account of having breached telecommunications or data protection regulations;
- proceedings in the above cases are pending and, if so, with which public authority; and
- the relevant security requirements within the meaning of section 109(6) TKG are met.

Re III.2.4 Specialist knowledge

221 Applicants must include proof that the persons engaged in building and operating the wireless network have the necessary knowledge, experience and skills. Applicants must include clear and conclusive details of their specialist knowledge.

222 In this regard, applicants can submit CVs along with certificates and final certificates or evidence of previous activities (references) in the field of telecommunications. With regard to the planned technology, applicants must demonstrate that the persons operating the transmission paths have the required knowledge, experience and skills.

223 If a consortium submits an application, corresponding information about the relevant expertise of the members of the consortium must be provided. In addition, it must be explained how the expertise of the members of the consortium is to be transferred to the applicant.

224 Applicants must demonstrate their knowledge, experience and skills for the establishment and operation of a mobile network, in particular with regard to the purpose of use for critical infrastructure and how they intend to meet the required coverage for critical infrastructure operators.

Re III.2.5 Financial capacity

225 Applicants must include details and proof of permanent and sufficient financial resources for the build and roll-out investments set out in the spectrum usage concept and for operation of the wireless network or of how financing is to be secured.

226 Proof that financing is in place must be furnished by supporting documents, eg written financing declarations of the parent undertaking, other affiliated undertakings or credit institutions. Mere declarations of intent or commitments to undertake efforts are not recognised as evidence of security. Where financing commitments are given by parent undertakings or other affiliated undertakings, they must be made in the form of "hard letters of comfort". Such letters of comfort must in particular contain declarations by the parent company that it accepts an unlimited obligation to ensure that all investments in the build, roll-out and operation of the mobile network will be permanently available. The submission of a balance sheet does not release the applicant from its obligation to present the facts.

227 Applicants are required to present a conclusive and comprehensible statement of their financial capacity in relation to their business plan (medium-term business planning). Proof of the financial resources required for network build must be based on the planning and construction costs and on the costs of ongoing operation.

Re III.2.6 Spectrum usage concept

- 228 Applicants must describe how they intend to ensure efficient and interference-free spectrum usage by submitting a spectrum usage concept. In particular, they must describe how they intend to meet the needs of critical infrastructure applications.
- 229 The spectrum usage concept must be conclusive and comprehensible. Assumptions and forecasts must be based on verifiable facts. In addition, details of network roll-out with respect to resilience and software-related and physical security must also be provided in light of the purpose of use pursuant to section III.2.1 of this Decision and the criteria laid down there.
- 230 In particular, applicants must show in their spectrum usage concept how they can meet the requirements of critical infrastructure. The spectrum is to be used for applications in the field of critical infrastructure, to enable general interest services to be maintained, to avoid crises and to manage crisis situations. For this reason, the physical and software-related security and resilience of the network are subject to higher standards. Applicants must show these in their offer so that they can be taken into account on the basis of the determined criteria. The information on the technical planning should demonstrate that applicants are familiar with the planned procedure and are able to use the planning instruments at their disposal. Applicants must provide details of the specific procedure (for example system concept, network structure), of the planning (for example detailed statements on network roll-out planning and the timescale for the network build), of the optimisation of the network, of user and traffic forecasts and of the operating and maintenance concept (eg network performance, reliability, network and fault management). The assumptions on which the technical planning is based must be conclusive and comprehensible.
- 231 Applicants must further show:
- how crisis-resilient communications will be secured in the event of a blackout and how long the network will remain functional without electricity supply;
 - how redundant data connections for all major network infrastructure elements will be secured;
 - how a high level of network stability and availability will be achieved and how disruptions to network operation will be promptly remedied.
- 232 Details must also be provided of how the requirements of the federal armed forces mentioned in the explanation to section I.2 will be taken into account and how this will be implemented within the framework of the specific wireless network planning.

Re III.2.7 Promotion of a sustainable competitive market

- 233 Applicants must include details and proof of how they will promote a sustainable competitive market within the meaning of section 2(2) para 2 sentence 1 TKG. Here, applicants must show how they will permanently support the market by expanding the mobile network and associated facilities and services.
- 234 They must also provide details of how, in light of the negotiation and offer requirement determined in section III.3.3, non-discriminatory negotiations will be guaranteed and the possibility will be ruled out of negotiations about wireless applications being refused outright or being held in an abusive way or of unfair terms being attached to services.

Re III.2.8 Degree of geographic coverage

- 235 Applicants must particularly give details of the extent to which demand from critical infrastructure operators will be met in line with the purpose of use and in a timely manner. This must not be based solely on area coverage but especially on the extent

to which they intend to meet the required coverage for critical infrastructure operators. This demand might include the regional/local leasing of spectrum. Applicants must show how coverage will be provided in line with demand and in a timely manner and how the relevant degree of geographic coverage is plausible.

Re III.3 Binding effect of the application

- 236 To ensure that the proceedings are objective, the contents of the applications submitted cannot be changed up until the award is made. This is to ensure that all applicants are subject to the same conditions because their applications are assessed on this basis.
- 237 Applicants may withdraw their application at any time up to when the award is made. Applications must be withdrawn by the applicant in writing.

Re III.4 Exclusion from the proceedings

- 238 Applicants not complying with the tendering rules can be excluded from the proceedings to ensure that the tendering can proceed swiftly and smoothly. Reasons for exclusion include any irregular conduct that jeopardises the tendering proceedings, contravenes the rules or is unlawful.
- 239 If the rule-breaking or unlawful conduct is discovered only after the end of the tendering proceedings, the award and/or spectrum assignment can be revoked.

Re III.5 Award decision and assignment

- 240 The award will be based on an assessment of each bid against the specified criteria. The Chamber's decision will take the form of an official notice. The award decision will be published. The award decision will form the basis for assignment of the spectrum, which is made upon application.
- 241 In the case of equal eligibility, the applicant guaranteeing a higher degree of geographic coverage (see section IV.2.8) with the relevant telecommunications services is to be selected. If in the case of equal eligibility more than one applicant guarantees the same degree of geographic coverage, the award will be made by drawing lots.

Re III.6 Application documents, application costs

- 242 Applicants that are not selected will receive an official notice that their application was not successful after the award decision has been made.
- 243 Application documents will not be returned even after the proceedings have been completed. The application documents form part of the file and will be needed later in order to be able to understand the selection decision.
- 244 Costs incurred by applicants in connection with preparing and submitting their applications will not be reimbursed by the Bundesnetzagentur.

Information on legal remedies

Actions against this notice may be filed with the administrative court in Cologne, Appellhofplatz, 50667 Köln, Federal Republic of Germany, within one month of its announcement. Under section 137(1) TKG legal actions do not have suspensory effect.

Translation*

Bundesnetzagentur für Elektrizität, Gas,
Telekommunikation, Post und Eisenbahnen

The President's Chamber

Bonn, date

Dr Eschweiler
Vice Chair

Homann
Chair

Franke
Vice Chair

List of abbreviations

BDBOS	Federal Agency for Public Safety Digital Radio (Bundesanstalt für den Digitalfunk der Behörden und Organisationen mit Sicherheitsaufgaben)
BEM	block edge mask
BfDI	Federal Commissioner for Data Protection and Freedom of Information (Bundesbeauftragter für den Datenschutz und die Informationsfreiheit)
BS	base station
BSI	Federal Office for Information Security (Bundesamt für Sicherheit in der Informationstechnik)
BSI-KritisV	BSI Critical Infrastructure Ordinance
BVerwG	Federal Administrative Court (Bundesverwaltungsgericht)
CEPT	European Conference of Postal and Telecommunications Administrations
CV	curriculum vitae
dBm	decibel milliwatt
dB μ V/m	decibel microvolts per metre
ECC	Electronic Communications Committee
EECC	European Electronic Communications Code
EIRP	equivalent isotropically radiated power
EMVG	Electromagnetic Compatibility of Equipment Act (Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln)
ERC	European Radiocommunications Committee
EU	European Union
FreqV	Frequency Ordinance (Frequenzverordnung)
FSBeitrV	Frequency Protection Contributions Ordinance (Frequenzschutzbeitragsverordnung)
FUAG	Radio Equipment Act (Funkanlagen-gesetz)
GHz	gigahertz (unit of frequency)
GWB	Competition Act (Gesetz gegen Wettbewerbsbeschränkungen)

Translation*

ITU/ITU-R	International Telecommunication Union (ITU's Radiocommunication Sector – abbreviated to ITU-R – discusses technical trends in all areas of radio and wireless technology, prepares reports and issues recommendations to administrative bodies.)
kHz	kilohertz (unit of frequency)
MFCN	mobile/fixed communications networks
MHz	megahertz (unit of frequency)
MNO	mobile network operator
MsbG	Metering Act (Messstellenbetriebsgesetz)
OOBE	out-of-block emission
PMR	private mobile radio
PTMR	private trunked mobile radio
TKG	Telecommunications Act (Telekommunikationsgesetz)
UE	user equipment
VG Köln	Cologne Administrative Court (Verwaltungsgericht Köln)
WRC	World Radiocommunication Conference

Annex 1: Spectrum usage conditions

Spectrum usage conditions for mobile/fixed communications networks (MFCN) primarily for critical infrastructure applications in the 450 MHz band (451 - 455.74 MHz and 461 - 465.74 MHz)

The following spectrum usage conditions apply to the use of the radio spectrum for mobile/fixed communications networks (MFCN) primarily for critical infrastructure applications in the 450 MHz band (451 - 455.74 MHz and 461 - 465.74 MHz). The spectrum usage conditions are technology-neutral and are not tied to particular standards/specifications. The spectrum usage conditions set out below take account of applications with channel bandwidths larger than or equal to 1.25 MHz.

The spectrum usage conditions are based on ECC Report 283 and ECC Decision (19)02.

It should be noted that, in comparison to ECC Decision (19)02, a maximum bandwidth of only 2 x 4.74 MHz is available at present. The following technical conditions therefore apply accordingly to the relevant band edges 455.74 MHz and 465.74 MHz.

Depending on the further development of ECC decisions, ECC reports, standards and specifications, it may be necessary to modify or supplement these spectrum usage conditions in the course of the application and/or assignment proceedings or even after spectrum has been assigned.

Technical conditions for channel bandwidths larger than or equal to 1.25 MHz

User equipment (UE) transmit band (uplink): 451 - 455.74 MHz

Base station (BS) transmit band (downlink): 461 - 465.74 MHz

1) Limits/transmitter masks

a) Base station (BS)

Table 1: BS in-block EIRP (dBm/cell; 1.4 MHz, 3 MHz and 5 MHz channel bandwidth)

Parameter	Value (dBm/cell)
Maximum in-block EIRP	56 (optionally: no mandatory limit)

Table 2: BS frequency range of out-of-block emissions (OOBE) (1.4 MHz, 3 MHz and 5 MHz channel bandwidth)

Channel bandwidth	Delta F _c (MHz) from centre frequency	Out-of-band-emissions (transmitter output power)	Measurement bandwidth
1.4 MHz	0.7 to 2.1	-1 dBm -10/1.4 * (Delta F _c - 0.7) dB	100 kHz
	2.1 to 3.5	-11 dBm	100 kHz
	3.5 to 9.95	-16 dBm	100 kHz
3 MHz	1.5 to 4.5	-5 dBm -10/3 * (Delta F _c - 1.5) dB	100 kHz
	4.5 to 7.5	-15 dBm	100 kHz
	7.5 to 9.995	-16 dBm	100 kHz
5 MHz	2.5 to 7.5	-7 dBm -7/5 * (Delta F _c - 2.5) dB	100 kHz
	7.5 to 9.95	-14 dBm	100 kHz

Note 1: For the maximum mean out-of-block EIRP the antenna gain and cable losses are to be considered.
 Note 2: An additional out-of-band emission reduction may be necessary for the protection of other land mobile systems in the adjacent bands (see ECC Report 283). For the protection of the uplink frequencies of land mobile systems within 450 - 460 MHz, a maximum mean out-of-block EIRP of -43 dBm/100 kHz may be needed.

Table 3: BS frequency range of out-of-block emissions (OOBE) (1.25 MHz channel bandwidth)

Frequency offset from centre frequency (MHz)	Channel bandwidth 1.25 MHz	Measurement bandwidth
±0.885-1.98	-17 dBm	30 kHz
±1.98-4	-22 dBm	30 kHz

In addition to the values in Tables 2 and 3, BS operating in the 461 - 465.74 MHz band must meet the maximum out-of-block emission (OOBE) levels specified in Table 8 for the protection of the broadcasting service.

b) User equipment (UE)

Table 4: UE transmitter characteristics

Parameter	Value
Channel bandwidth	1.25 MHz, 1.4 MHz, 3 MHz or 5 MHz
Maximum mean in-block power	23 dBm (Note)

Note: A higher UE maximum mean in-block power up to 31 dBm can be used for special scenarios provided that the protection of other services is not compromised. Vice-versa, the maximum mean in-block power of UEs for the protection of other services may be limited on a cell-by-cell basis.

Table 5: UE maximum unwanted emission levels (1.4 MHz, 3 MHz and 5 MHz channel bandwidth)

Frequency offset from channel edge (MHz)	Channel bandwidth			Measurement bandwidth
	1.4 MHz	3 MHz	5 MHz	
±0-1	-10 dBm	-13 dBm	-15 dBm	30 kHz
± 1-2.5	-10 dBm	-10 dBm	-10 dBm	1 MHz
± 2.5-2.8	-25 dBm	-10 dBm	-10 dBm	1 MHz
± 2.8-5		-10 dBm	-10 dBm	1 MHz
± 5-6		-25 dBm	-13 dBm	1 MHz
± 6-10			-25 dBm	1 MHz

Table 6: UE maximum unwanted emission levels (1.25 MHz channel bandwidth)

Frequency offset from centre frequency (MHz)	Channel bandwidth 1.25 MHz	Measurement bandwidth
±0.885-1.98	-24 dBm	30 kHz
±1.98-4	-44 dBm	30 kHz

In addition to the UE masks in Tables 5 and 6, UE operating in the 451 - 455.74 MHz band must meet the maximum out-of-block emission (OOBE) levels specified in Table 7 for the protection of the broadcasting service.

c) Protection of the broadcasting service above 470 MHz

The risk of interference between MFCN and the broadcasting service above 470 MHz can be reduced by a set of technical measures, for example an appropriate limit of the corresponding MFCN BS out-of-band emissions.

MFCN UE with a channel bandwidth of 1.25 MHz, 1.4 MHz, 3 MHz or 5 MHz must meet the maximum out-of-block emission (OOBE) levels specified in Table 7 for the protection of the broadcasting service.

Table 7: UE maximum out-of-block emission (OOBE) levels for the protection of the broadcasting service above 470 MHz

Frequency range	UE maximum mean OOBE	Measurement bandwidth
Above 470 MHz	-42 dBm	8 MHz

MFCN BS with a channel bandwidth of 1.25 MHz, 1.4 MHz, 3 MHz or 5 MHz must meet the out-of-block emission (OOBE) EIRP levels specified in Table 8 for the protection of the broadcasting service above 470 MHz.

Table 8: BS maximum out-of-block emission (OOBE) levels for the protection of the broadcasting service above 470 MHz

Frequency range	In-block EIRP conditions P (dBm/cell)	Maximum mean OOBE EIRP (dBm/cell)	Measurement bandwidth
Above 470 MHz where broadcasting is protected	$P \geq 60$	-7	8 MHz
	$P \geq 60$	$(P - 67)$	8 MHz
Above 470 MHz where broadcasting is subject to an intermediate level of protection or when mitigation techniques are used; at a national level depending on the type of mobile network deployment	$P \geq 56$	-4	8 MHz
	$P < 56$	$(P - 60)$	8 MHz

2) Unwanted emissions (spurious domain)

The unwanted emissions (spurious domain) during operation may not exceed -36 dBm for frequencies up to 1 GHz and -30 dBm for frequencies above 1 GHz. In standby mode, the unwanted emissions may not exceed -57 dBm for frequencies up to 1 GHz and -47 dBm for frequencies above 1 GHz. See also ERC Recommendation 74-01.

3) Protection of the radio monitoring stations of the Bundesnetzagentur's radio monitoring and inspection service

To secure the aims of frequency regulation in accordance with section 64 TKG, spectrum usages must not cause interference to the Bundesnetzagentur's radio monitoring stations. Electromagnetic fields from transmitters operated in the vicinity of the Bundesnetzagentur's receivers can lead to desensitisation and overloading, thus impairing the reception of the Bundesnetzagentur's measuring equipment (see Bundesnetzagentur Official Gazette No 17/2012, Communication No 613/2012).

In order to protect the fixed radio monitoring stations operated and planned by the Bundesnetzagentur's radio monitoring and inspection service in Germany, the field strength from emissions in the band below 694 MHz may not exceed 80 dB μ V/m at these sites (cf Bundesnetzagentur Official Gazette No 23/2019, Communication No 646/2019).

4) Frequency coordination for radio stations in border areas

The availability of spectrum is limited in border areas of the Federal Republic of Germany and some other exposed areas near the borders due to the need for coordination with neighbouring countries.

The possible restrictions with respect to the usable bandwidth of the spectrum will vary from area to area, depending on whether one, two or possibly three neighbouring countries need to be included in the coordination process.

Since the whole band from 450 MHz to 470 MHz is not yet harmonised at European level, the possible restrictions will also depend on the transmission methods and bandwidths in use either side of the borders.

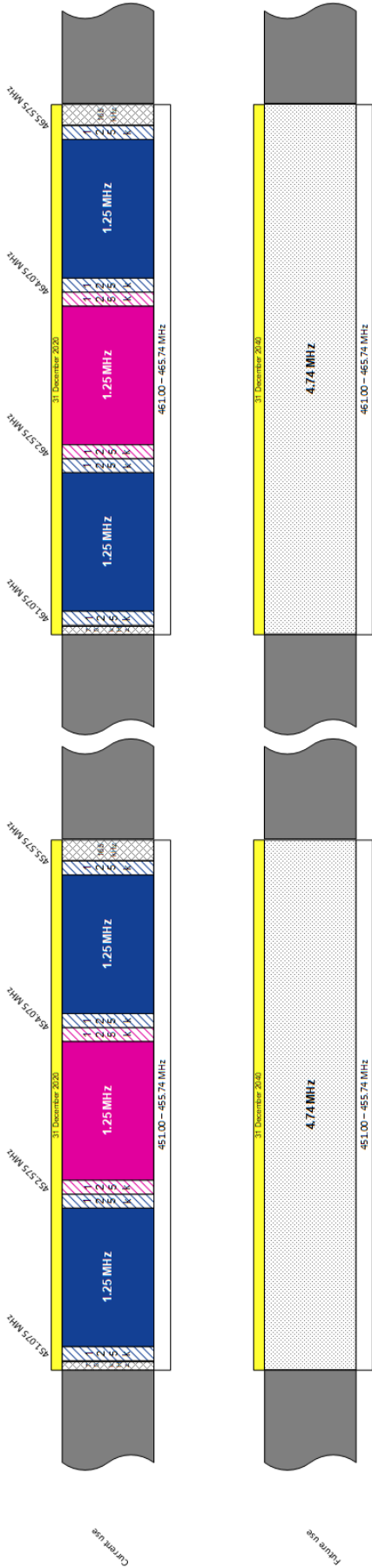
Small-cell wireless network planning is therefore recommended especially in Germany's border areas in order to minimise restrictions from the cross-border coordination of mobile systems.

Translation*

Cross-border coordination is based on ECC Decision (19)02 with the referenced planning criteria set out in ECC Recommendation T/R 25-08. These criteria are specified in more detail through bilateral or multilateral frequency coordination agreements with the neighbouring countries.

Annex 2: Current and future use in the 450 MHz band

Spectrum overview 450 MHz



Annex 3: Application structure

In their written application, applicants must apply for admission to the tendering proceedings.

Applications are to be submitted in German

by [DATE]

in writing, in triplicate, to

Bundesnetzagentur

Referat 212

Kennwort: 450 MHz

Tulpenfeld 4

53113 Bonn

and

electronically in Microsoft Word (or Microsoft Word-compatible) or PDF format (copying and printing must be enabled) by email to referat212@bnetza.de or on data media.

A blacked-out version in which any business and trade secrets have been blacked out, together with a list justifying the blacked-out parts, is also to be submitted.

Only applicants providing the above information in full will be admitted.

Applications should be structured as set out in the template below.

If necessary, applications can provide a greater level of detail than that of the template. Applicants considering it necessary to give more details that do not fit the categories of the template can add sections and subsections.

The template is the basis on which applications will be assessed. That is why the information required must be given in the place intended. Supporting documents – in particular proof of the applicant's specialist knowledge and financial capacity – should be provided in a form that enables a simple check.

Applications must be summarised. The summary should reflect the entire application.

I. Application for admission

II. Application

1. Applicant details

- 1.1. Name and address
- 1.2. Legal form
- 1.3. Seat
- 1.4. Extract from the commercial register
- 1.5. Name of authorised agent with telephone and fax numbers and email address
- 1.6. Name of a person authorised to take delivery, with an address enabling service (street, house number, place)

2. Applicant's financial interests

- 2.1. Ownership structure
- 2.2. No grounds for concern under the German Competition Act (GWB)

3. Reliability

Applicants must state whether

- 3.1. a frequency assignment has been revoked in the past;
- 3.2. conditions have been imposed on account of failing to honour obligations from frequency assignments;
- 3.3. legal action has been taken on account of having breached telecommunications or data protection regulations;
- 3.4. proceedings in the above cases are pending and, if so, with which public authority; and
- 3.5. the relevant security requirements within the meaning of section 109(6) TKG are met.

4. Specialist knowledge

- 4.1. Proof that the persons engaged in building and operating the wireless network have the necessary knowledge, experience and skills
- 4.2. Details of knowledge, experience and skills relating to building and operating a wireless network, in particular with respect to use for critical infrastructures
- 4.3. Details of how coverage meeting critical infrastructure operators' requirements will be secured

5. Financial capacity

- 5.1. Details and proof of permanent and sufficient financial resources for the build and roll-out investments set out in the spectrum usage concept and for operation of the wireless network or of how financing is to be secured
- 5.2. Details of business projects (medium-term business planning)

6. Spectrum usage concept

- 6.1. Details of how efficient and interference-free spectrum use will be secured
- 6.2. Details of how the requirements for critical infrastructure applications will be met
- 6.3. Details of network roll-out with respect to resilience and software-related and physical security
- 6.4. Details of the specific procedure (for example system concept, network structure)
- 6.5. Details of the planning (for example detailed statements on network roll-out planning and the timescale for the network build)
- 6.6. Details of network optimisation
- 6.7. Details of user and traffic forecasts
- 6.8. Details of the operating and maintenance plan (for example network performance, resilience, network and error management)
- 6.9. Details of how crisis-resilient communications will be secured in the event of a blackout
- 6.10. Details of how long the network will remain functional without electricity supply
- 6.11. Details of how redundant data connections for all major network infrastructure elements will be secured
- 6.12. Details of how a high level of network stability and availability will be achieved and how disruptions to network operation will be promptly remedied
- 6.13. Details of how the requirements of the federal armed forces will be taken into account and how this will be implemented within the framework of the specific wireless network planning

7. Promotion of a sustainable competitive market

- 7.1. Details of how a sustainable competitive market within the meaning of section 2(2) para 2 sentence 1 TKG will be promoted
- 7.2. Details of how, in light of the negotiation and offer requirement, non-discriminatory negotiations will be guaranteed and the possibility will be ruled out of negotiations about wireless applications being refused outright or being held in an abusive way or of unfair terms being attached to services

8. Degree of geographic coverage

- 8.1. Details of the extent to which demand from critical infrastructure operators will be met in line with the purpose of use and in a timely manner
- 8.2. Details of local leasing
- 8.3. Details of how coverage will be provided in line with demand and in a timely manner