Key elements and identification of demand for the future use of spectrum in the 450 MHz band;
Key elements and identification of demand subject to a decision by the federal government

A. Introduction

The rights of use in the 450 MHz band (451.0 - 455.74 MHz / 461.00 - 465.74 MHz) expire on 31 December 2020; it is intended to make the spectrum available in future primarily for critical infrastructure applications within the framework of the designation for mobile/fixed communications networks (MFCN). If the federal government decides instead to make the spectrum available for public safety authorities and organisations and the federal armed forces, the proceedings already initiated would have no legal consequence.

Three rights of use 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.

The Bundesnetzagentur is currently in favour of making the spectrum available primarily for critical infrastructure applications. The Bundesnetzagentur also takes the view that critical infrastructures are of vital importance to a nation's society and economy. There is concern that the failure or degradation of critical infrastructures would result in sustained supply shortages and significant disruption to public safety and security. In particular, water and energy shortages can lead to exceptional circumstances with noticeable consequences for the population.

Failure of the supply networks could lead to transport chaos as a result of the failure of traffic management systems (such as traffic lights). Transport (for example trains) would come to a halt en route or at stations. In addition, heating, air conditioning and water pump systems would stop working, production facilities would come to a standstill, and in the health service necessary operations would not be able to be carried out. An electricity power cut would result in the failure of telecommunications infrastructure. As a result, it would be almost impossible to make emergency calls and get help or coordinate the restoration of the electricity networks. It is therefore important to be able to respond adequately to events in the supply networks in future and for the telecommunications infrastructure to be "blackout-resilient" in these circumstances. The nationwide availability of adequate telecommunications infrastructure is crucial for a reliable energy supply. Moreover, it is important – in particular in light of the energy transition – to integrate fluctuating electricity generation and demand from the field of critical infrastructure into the supply networks intelligently. This requires efficient and reliable communications infrastructure.

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.

In particular in the event of system restoration, distribution system operators play a decisive role as they are upstream from the transmission system operators, which therefore largely depend on the distribution system operators. Distribution system operators will need to connect operating resources, renewable and combined heat and power (CHP) installations, storage facilities and new loads (in particular e-mobility charging infrastructure) bidirectionally, while taking account of the technical communication requirements for a resilient workforce management (emergency management). This includes voice communication.

To shape the future approach, it is first necessary to identify the demand among critical infrastructure applications. At the same time, interested parties are being invited to comment on the key elements. However, the Bundesnetzagentur would like to point out that both the identification of demand and the key elements are subject to a decision by the federal government. If the federal government decides instead to make the spectrum available for public safety authorities and organisations and the federal armed forces, this identification of demand and the key elements will no longer be relevant and thus have no legal consequence.

I. Key elements

The Bundesnetzagentur is inviting interested parties to comment on the key elements (for more details see Point C).

Responses are to be submitted by **28 February 2020** in German, in writing, to the postal address below

Bundesnetzagentur
Referat 212
Tulpenfeld 4
53113 Bonn

and

electronically in Word (or 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 and to submit a version for publication and a version in which the trading and operating secrets have been blacked out, together with a list justifying the blacked-out parts.

II. Identification of demand

The Bundesnetzagentur is issuing a call to interested companies for **notification of their forecast requirements** in the 450 MHz band available nationwide (for more details see Point E).

Notifications are to be submitted by **28 February 2020** in German, in writing, to the postal address below

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electronically in Word (or Word-compatible) or PDF format (copying and printing must be enabled) to the email address below

referat212@bnetza.de.

The notifications of demand will not be published.

B. Steps

The Bundesnetzagentur, in light of the expiry of the rights of use 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.

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. However, the user group comprising public safety authorities and organisations and the federal armed forces also called and continue to call for exclusive use of this spectrum.

The comments on the framework for the spectrum demand survey were essentially as follows:

In addition to critical infrastructure operators, public safety authorities and organisations and the federal armed forces also notified spectrum requirements in this band and called for the spectrum to be exclusively designated for public safety authorities and organisations and the federal armed forces.

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-resistant 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.

The responses calling for provision of the spectrum on a regional basis argued that the spectrum was needed in particular for applications of local and regional electricity network operators in order to meet their supplier-specific needs and accommodate security requirements. Local and regional use of the 450 MHz spectrum would enable the needs of decentralised critical infrastructure applications to be met and the network to be effectively expanded where required. In addition, communication data would remain within one region, which would save resources and increase data security. Furthermore, rolling out regional networks was generally considerably quicker and more efficient than rolling out a nationwide network.

The respondents in favour of provision of the spectrum on a nationwide basis put forward favourable economies of scale and the spectrum's propagation characteristics as arguments. In addition, provision on a nationwide basis would avoid a high level of coordination and minimise potential disruptions from interference.

In September 2019, the Advisory Council 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*."

In light of the responses received and expiry of the rights of use on 31 December 2020, the Bundesnetzagentur has drawn up and is putting out for consultation key elements for the needs-oriented provision of the spectrum for critical infrastructure applications, subject to a decision by the federal government. At the same time, interested companies are invited to set out their requirements for critical infrastructure applications.

If the federal government decides instead to make the spectrum available for public safety authorities and organisations, the proceedings already initiated would have no legal consequence.

C. Key elements

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.

Considerations:

- In the 450 MHz band, three rights of use each with a channel bandwidth of 2 x 1.25 MHz (paired) are currently assigned until 31 December 2020 as follows:
    - 451.2 - 452.45 MHz / 461.2 - 462.45 MHz;
    - 452.7 - 453.95 MHz / 462.7 - 463.95 MHz;
    - 454.2 - 455.45 MHz / 464.2 - 465.45 MHz.
- 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. The Bundesnetzagentur is therefore seeking to take a decision on provision of the above-mentioned expiring spectrum assignments in the 450 MHz band in the course of 2020.
- In light of the usage scenarios presented in the spectrum demand survey, it appears expedient to combine the above-mentioned frequencies from the current assignments into one paired block. It is not intended to provide the spectrum as currently assigned in several blocks of 2 x 1.25 MHz. First, one single block of spectrum enables the transmission of higher data rates and thus the realisation of different services. Second, guard bands between different users within the same band will not be necessary.
- The spectrum is to be provided in an objective, transparent and non-discriminatory procedure.
- Provision of the 450 MHz spectrum for critical infrastructure applications is supported by the fact that the spectrum has good propagation characteristics that enable high building penetration, among other things. Furthermore, 450 MHz spectrum is being used for critical infrastructures in several European countries.

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.

Considerations:

- In compliance with the Frequency Plan, the use to which the spectrum to be provided in the 450 MHz band may be put is MFCN. The general section of the Frequency Plan describes MFCN as follows: "*This frequency usage serves to connect terminal equipment to wireless networks via fixed stations. This is usually for the purpose of providing telecommunications services.*"
- However, the designation for MFCN also enables other applications such as infrastructure links to be realised.

- The technology-neutral designation enables all technologies to be used in the 450 MHz band.

3. Nationwide use

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

Considerations:

- The spectrum is to be provided for assignment on a nationwide basis. Even though the spectrum demand survey showed a demand for local and regional use of the 450 MHz spectrum, the Bundesnetzagentur believes that provision of the spectrum on a nationwide basis serves the regulatory objectives of the TKG – in particular efficient and interference-free spectrum use – to the greatest possible extent.
- Award on a nationwide basis is supported by the fact that the 450 MHz spectrum has very good propagation characteristics. Achieving good area coverage and good building penetration, thereby achieving nationwide coverage cost-effectively, is therefore much less problematic compared to higher frequency bands.
- Provision on a nationwide basis also promotes interference-free use of the spectrum. Local and regional assignments would require a high level of coordination with the networks operated in parallel in order to minimise potential disruptions from interference. Separation distances or frequency guard bands might therefore be necessary, which would not support efficient and interference-free spectrum use.
- The Bundesnetzagentur acknowledges that there was also a call for regional assignments. In the spectrum demand survey conducted in December 2017, a large number of respondents notified a demand for regional use of the 450 MHz spectrum. It was said that regional use would enable the needs of decentralised critical infrastructure applications to be met and the network to be effectively expanded where required. In addition, communication data would remain within one region, which would save resources and increase data security. Furthermore, rolling out regional networks was generally considerably quicker and more efficient than rolling out a nationwide network.

  The Bundesnetzagentur believes that these local and regional requirements can, however, also be accommodated within the framework of a nationwide network (see also Key element 5).

4. Purpose of use

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

Considerations:

- The spectrum in the 450 MHz band is to be provided primarily for critical infrastructure applications. Resilient telecommunications networks that are available nationwide are crucial for critical infrastructures such as energy and water supply. Here, supply and demand need to be integrated intelligently into the networks. This requires efficient and reliable network infrastructures. The Bundesnetzagentur sees a need here in particular within the energy and water industries. The 450 MHz spectrum is particularly suited to cost-effectively making installations and network controls crisis-resilient and thus managing blackout situations.
- The Bundesnetzagentur believes that the nationwide wireless network should fulfil the following functions in light of the above-mentioned applications and in particular to ensure communication in the event of a blackout:
    - It is to be ensured that means of communication are maintained in the event of failure of a line and communication is thus possible. This could be achieved using redundant data connections for all major network infrastructure elements via two separate lines/transmission media.
    - It is to be possible to continue operating the 450 MHz network even without an external power supply for a certain period of time (still to be specified). This is to ensure that in exceptional situations the basic communication to be specified (for example voice calls and control of network elements) is still possible in order to prevent greater damage and restore normal system operation.
    - 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.
    - 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 security-critical applications is of crucial importance. In this context, the Bundesnetzagentur believes that industry-related and security-related issues are of equal importance. 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.
- This does not rule out the use of other telecommunications applications, however. In areas where the 450 MHz spectrum is not used for critical infrastructure applications, other spectrum applications will be possible (such as smart meter communications). In addition, the use of temporarily unused capacity is also to be possible. It is important to ensure, however, that sufficient capacity is made available, if required, for the originally intended critical infrastructure applications.

5. Local and regional requirements

Assignment holders are to provide relevant coverage or lease spectrum upon request by critical infrastructure operators.

Considerations:

- A nationwide assignment holder is to swiftly meet local and regional demand to connect critical infrastructures under non-discriminatory and reasonable market conditions. To do so, the assignment holder can:
  - realise provision in line with demand using the spectrum assigned; or
  - lease to other users spectrum assigned; or
  - build network infrastructures in cooperation with interested users.
- This makes it possible to meet local and regional demand to connect critical infrastructures and thus to connect areas in accordance with demand.
- Here, the Bundesnetzagentur assumes that the 450 MHz spectrum will be used so that the network is rolled out and operated in line with demand with respect to both location and quality. This serves to promote efficient spectrum use and create the necessary usage conditions in the network for critical infrastructure applications.
- A condition to this effect will be attached to the assignment to ensure efficient and interference-free spectrum use and achieve other regulatory objectives specified in section 2 TKG.

6. Time limit

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

Considerations:

- According to section 55(9) TKG spectrum is typically assigned for a limited period. The limited period for the 450 MHz spectrum will end on 31 December 2040. Limiting the period to the close of 2040 means an assignment duration of up to 20 years.
- The applications primarily envisaged require long-term planning and usage security. A duration of up to 20 years therefore appears to be reasonable. A longer duration does not appear to be appropriate in light of a possible reorganisation of the spectrum for MFCN.
- A duration of up to 20 years is in accordance with Article 49 of Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 (OJ L 321/138, 17 December 2018), taking due account of the need to ensure competition as well as, in particular, effective and efficient use of the radio spectrum and to promote innovation and efficient investments, including by allowing for an appropriate period for investment amortisation. Regulatory predictability for the holders of the rights over a period of at least 20 years as required by Article 49(2) is thus ensured.

7. Costs

Fees and contributions will be imposed for assignment.

Considerations:

- 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. 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.
- The fees are to be kept at a moderate level. This enables a negative impact on network rollout costs and investment behaviour to be avoided.

D. Further action

The Bundesnetzagentur has drawn up the above key elements representing the framework conditions for spectrum provision proceedings and thus creating the basis for the formal demand identification proceedings. The Bundesnetzagentur is issuing a call for notification of forecast demand for the spectrum in the 450 MHz band to be provided on a nationwide basis.

E. Demand identification proceedings

To guarantee an objective, transparent and non-discriminatory procedure the Bundesnetzagentur is issuing a call prior to carrying out specific proceedings for assigning the spectrum in the 450 MHz band for a qualified account of spectrum requirements (see Annex).

Interested companies are requested to notify their interest in specific use of the spectrum by 28 February 2020.

Participation in the proceedings to identify demand is not restricted.

Considerations:

- The notifications of demand are to be based on the key elements described above.
- The spectrum will be assigned in accordance with section 55 et seq TKG. Each spectrum usage requires prior assignment. The spectrum will be assigned for a particular purpose and in a non-discriminatory manner on the basis of transparent and objective procedures (section 55(1) TKG).
- 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 according to section 61 TKG as determined by the President's Chamber, 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 2nd alternative) or the forecast of an insufficient amount of spectrum being available (section 55(10) sentence 1 1st alternative). An order for award proceedings as per section 55(10) TKG is at the discretion of the President's Chamber.
- Demand identification proceedings – in which the Chamber, paving the way for a decision on issuing an order for award proceedings, makes a public call for requirements for particular spectrum to be notified within a suitable period – is a tried and tested, informative, multi-stage procedure that takes proper account of the criteria of objectivity, transparency and non-discrimination and grants applicants equal opportunity to spectrum.
- The purpose of identifying demand is to establish whether demand is likely to exceed supply as the basis for forecasting whether the number of applications is likely to exceed the spectrum available (section 55(10) sentence 1 1st alternative TKG).
- 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 (for more details see Annex).
- For efficient use of this spectrum, an objective to which the TKG is committed, applicants are required to provide such accounts with reference to the key elements.

This is especially relevant in light of the critical infrastructure applications that are primarily to be implemented.

- The notified requirements serve to identify whether demand will likely exceed supply and thus how to proceed in accordance with the law. The spectrum will be assigned by the Bundesnetzagentur as individual assignments only upon written application or, as the case may be, only after participation in award proceedings. The Bundesnetzagentur will issue a call to apply for rights of use shortly before holding proceedings for assigning the spectrum.
- The Bundesnetzagentur will examine in this context whether, in light of the regulatory objectives and the primary designation for critical infrastructure applications, it would be appropriate to deviate from the general rule laid down in the TKG of conducting auction proceedings. It will be examined whether tendering proceedings in accordance with section 61(1) TKG could be the appropriate award proceedings.

The Bundesnetzagentur is now issuing a call to interested companies for notification of their forecast requirements in the 450 MHz band available nationwide.

Notifications are to be submitted by **28 February 2020** in German, in writing, to the postal address below

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electronically in Word (or Word-compatible) or PDF format (copying and printing must be enabled) to the email address below

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A draft President's Chamber decision on provision of the above-mentioned spectrum will be drawn up on the basis of the spectrum requirements identified. We should point out, however, that it will not be possible to begin carrying out award proceedings directly should spectrum resources be found to be scarce. Carrying out award proceedings presupposes that further decisions the President's Chamber is required by law to take (on award conditions and award rules) have been issued, for which consultation with the Advisory Council is also needed. As stated above, award proceedings, if necessary, will be carried out in good time, that is to say in the course of 2020.

Annex – Account of spectrum requirements

1. Interested companies are called upon to state and give an account of their spectrum requirements in the 450 MHz band (paired) on the basis of the key elements.
2. Participation in the proceedings to identify demand is not restricted.
3. Each interested company is called upon to state its requirements 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.
4. Each interested company is asked to show, in its notification of requirements, that it meets the legal requirements for a possible assignment of spectrum. A legal requirement for assignment is compatibility with other spectrum usages and that efficient and interference-free use of the spectrum is guaranteed by the applicant (see section 55(5) sentence 1 paras 3 and 4 TKG).

   Of particular importance for this is an account of the applicant's reliability, specialist knowledge and, most notably, financial capability, including an account of the spectrum usage concept; this also applies in cases in which companies already have suitable spectrum.

A notification of requirements must include the following information:

A. Details of the undertaking

- Name and address
- Legal form
- Seat
- Financial interests

B. Information on reliability

A declaration whether:

- a frequency assignment has been revoked in the past;
- conditions have been imposed on account of failing to honour obligations from a frequency assignment;
- legal action has been taken on account of having breached telecommunications or data protection regulations; or
- proceedings in the above cases are pending and, if so, with which public authority.

C. Information on financial capability

Declarations that there will always be sufficient financial means:

- for assignment and use of the spectrum; and
- for the build and rollout investments set out in the spectrum usage concept and for operation of the wireless network; and
- how financing is to be secured.

D. Information on specialist knowledge

Declarations that the persons engaged in building and operating the wireless network have the necessary knowledge, experience and skills.

E. Spectrum usage concept

Presentation of a spectrum usage concept showing, in particular, how efficient use of the spectrum will be secured. Details should be given of the following, in particular:

- the supply and connection plans that primarily take account of the critical infrastructure applications;
- spectrum requirements with reference to the business model

  (presentation of a spectrum usage concept; statement on the planned business model and its implementation);
- the planned services concept

  (information on the kind of services based on the wireless technology chosen); and
- business planning and its implementation

  (presentation of business planning and its technical implementation; detailed statements on rollout planning and the timescale for the network build, for instance the planned dimensioning of the wireless access network, the network structure, the technical systems deployed, availability in terms of location and time).