Body of European Regulators for Electronic Communications
BEREC

BoR (20) 164

BEREC Report on the outcome of the public consultation on draft BEREC Guidelines on Very High Capacity Networks

01 October 2020

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1 Executive summary

BEREC published the draft Guidelines on very high capacity networks ('the draft Guidelines') on 10 March 2020. At the same time, a public consultation was opened, running until 30 April 2020 17:00 (CET). In a virtual meeting with stakeholders on 17 March 2020, BEREC presented the draft Guidelines to the stakeholders and answered questions from stakeholders in order to facilitate the preparation of written responses to the public consultation.

The draft Guidelines and public consultation are in accordance with Article 82 of the European Electronic Communications Code (EECC).[1] In particular, Article 82 stipulated that '*By 21 December 2020, BEREC shall, after consulting stakeholders and in close cooperation with the Commission, issue guidelines on the criteria that a network is to fulfil in order to be considered a very high capacity network, in particular in terms of down- and uplink bandwidth, resilience, error-related parameters, and latency and its variation*.'

BEREC received 34 responses to the public consultation from 11 network operators, nine associations of network operators at national level, seven associations of network operators at European or international level, four vendors, two authorities and one other type of stakeholder (see Table 1). Please refer to the list of stakeholders in the annex for a thorough overview. Stakeholders who have requested confidentiality are referred to as 'Confidential contribution'.

Table 1: Overview on the type of stakeholders who responded to the public consultation

Type of stakeholder	Number of stakeholders
Network operators	11
Association of network operators at national level	9
Association of network operators at European/international level	7
Vendors	4
Authorities	2
Other	1
Total	34

Source: BEREC

This report provides an overview of the responses BEREC received and the BEREC response to each topic addressed by stakeholders in particular with regard to the need to adapt the draft Guidelines.[2]

The overview of the responses BEREC received is structured according to the structure of the draft Guidelines as follows:

- Introduction

[1] Directive (EU) 2018/72 of the European Parliament and the Council establishing the European Electronic Communications Code, OJ L 321/36 of 17 Dec. 2018

[2] The paragraphs the stakeholders refer to are the paragraphs in the consultation document (see https://berec.europa.eu/eng/document_register/subject_matter/berec/public_consultations/9037-draft-berec-guidelines-on-very-high-capacity-networks)

- Definition of the term ‘very high capacity network’ in the EECC
- Criteria for the definition of ‘very high capacity networks’
- Determination of the performance thresholds 1 and 2
- Application of the criteria 1 to 4
- Annexes of the draft Guidelines

In addition, BEREC published all non-confidential stakeholder responses received.

2 Comments to the introduction

2.1 Stakeholder responses

NLconnect supports the draft Guidelines and does not see any reason to deviate from the proposed definition

The Dutch broadband trade association (NLconnect), compliments BEREC for the given comprehensive definition and expresses its support for the draft Guidelines. NLconnect does not see any reason to make any proposals that deviate from the proposed definition.

ELFA and BUGLAS agree with BEREC’s general approach and with the results laid down in the draft Guidelines

The European Local Fibre Alliance (ELFA) and the German Federal Association of Fiber Access Operators (BUGLAS) agree with BEREC’s general approach and with the results laid down in the draft Guidelines. The draft Guidelines correctly reflect the rules set down in the EECC regarding BEREC’s task (Art. 82) as well as the abstract definition of very high capacity networks (Art. 2 (2)).

VKU welcomes the approach taken by BEREC

Overall, the German Association of Local Public Utilities (VKU) welcomes the approach taken by BEREC in setting out such high quality-of-service parameters as proposed in the draft Guidelines. It is of utmost importance that the Guidelines and parameters as proposed in BEREC’s draft are established in the same manner and are not watered down. In the view of VKU, the quality of service parameters are well-chosen.

The availability of common definitions is essential for taking policy decisions

The Austrian Federal Ministry for Agriculture, Regions and Tourism (BMLRT) welcomes the steps taken by the European Commission and BEREC to create a common definition for VHC/NGA networks across Europe. Especially in light of implementing the new European legal framework into national law as well as reaching the strategic objectives for 2025, the availability of common definitions is essential for taking policy decisions.

The role that very high capacity networks are assigned in the EECC needs to be stated with greater clarity and purposiveness

Ecta urges BEREC to state, with greater clarity and purposiveness, the role that very high capacity networks are assigned in the EECC. Such statement should notably bring out the partial, and to a significant extent prospective, role that these networks play relative to

current market reality. The Guidelines should, upon adoption, contain an unequivocal statement of their scope of application within the EECC. While examples as set out in para. 4 of the draft Guidelines provide some orientation in this regard, ecta believes that the Guidelines should e.g. clearly and prominently state early on their non-application to co-investment situations according Article 76.

2.2 BEREC response

BEREC welcomes the compliment from NLconnect and that NLconnect supports the draft Guidelines and does not see any reason to deviate from the proposed definition.

BEREC also welcomes that ELFA and BUGLAS agree with BEREC's general approach and with the results laid down in the draft Guidelines.

BEREC welcomes also that the VKU agrees with the approach taken by BEREC as well as the supportive comment from the BMLRT.

BEREC's response to ecta's proposal to state in the Guidelines the role that very high capacity networks are assigned in the EECC with greater clarity and purposiveness is that, according to Article 82 of the EECC, the Guidelines have to define the criteria that a network has to fulfil in order to be considered a very high capacity network and not the role that very high capacity networks are assigned in the EECC. Annex 1 of the draft Guidelines already contain a comprehensive list of articles and recitals of the EECC which refer to very high capacity networks and para. 92 explicitly makes clear that the Guidelines are not relevant for Article 76. Therefore, there is no need to adapt the Guidelines.

3 Definition of the term 'very high capacity network' in the EECC

3.1 Stakeholder responses

Para. 7 and 12.d: It is not clear against which performance parameters or fibre-optic-terminated base stations the comparison should be made

Javier Aracil et. al point out that the performance that can be provided by base stations that are fibre optic terminated can still have very large differences due to technology and the environment where they operate. Thus if the regulator or the state aid organisation had to make such a performance comparison between non-fibre-optic part of the network and fibre-optic-terminated network, it is not clear against which performance parameters, or even against what kind of fibre-optic-terminated base stations, such a comparison should be made. Javier Aracil et. al also emphasize that 'different characteristics' of the wireless medium as mentioned in para. 7 are key to the network performance achieved and, therefore, believe that additional conditions must be met in order for a wireless connection to be considered as very high capacity network.

Para. 9, 12 and 13: CMG-AE AGGFA suggests fundamental changes

CMG-AE Action Group Gigabit Fiber Access (AGGFA) proposes a new text for para. 9, 12 and 13 which reflects the following. The serving location, as the term is used in Article 2(2) of the EECC, can only be the end user's location. Although there is a hint in Recital (13) that the serving location could be a 'multi-dwelling building' or a 'base station' it must be the end user's location. Therefore the baseline scenario in the case of a fixed-line connection can only be (i) fibre roll out up to the end user's location (FTTH) or (ii) fibre roll out (at least) up to a multi-dwelling building (FTTB), which is promptly upgradable to FTTH (i.e. an in-building physical infrastructure usable for FTTH). A mobile network cannot be a very high capacity network and a network capable of delivering, under usual peak-time conditions, an equivalent network performance cannot be foreseen for the time being.

Para. 14: Relationship with previous BEREC documents

Javier Aracil et. al argue that in order to determine a network parameter, values of QoS available to the end-user (at the Network Terminal Point) are essential and also fully in line with the BEREC Methodology (BoR Guidelines (16) 127, BoR Methodology (17) 178) but not QoS values which can be achieved/are achievable by the ISP as stated in the draft Guidelines.

3.2 BEREC response

With regards to the comment from Javier Aracil et. al on the performance parameters and fibre-optic-terminated base stations, BEREC would like to clarify that NRAs do not need to make a performance comparison between non-fibre-optic part of a network and fibre-optic-terminated network but instead have to examine whether a network fulfils one of the four criteria defined in para. 16 of the draft Guidelines. The criteria which refer to a network performance (criteria 3 and 4) consider an average QoS and, therefore, different characteristics of the air (e.g. due to different weather conditions) are not taken into account as it is required by Recital 13 of the EECC which is also stated in the draft Guidelines (see footnote 23).

BEREC's response to the more fundamental changes proposed by CMG-AE AGGFA in para. 9 and 12 of the draft Guidelines is that these paragraphs solely inform about what is already defined in the EECC (Art. 2(2), Rec. 13) and, therefore, it is not possible to change these paragraphs. According to the EECC (Art. (2), Rec. 13), the baseline scenario for networks providing a fixed-line connection refer to a fibre roll-out up to the multi-dwelling building, not up to the end-user's location (FTTH) and mobile networks are explicitly included and not excluded from qualifying as a very high capacity network.

Concerning the comment from Javier Aracil et. al on the relationship with previous BEREC documents, BEREC would like to point out that, according to Art. 2(2) of the EECC, the Guidelines have to consider a 'network which is capable of delivering under usual peak-time conditions' a certain end-user QoS and not the QoS currently available to the end-user. For this reason, it is not possible to use one of the speeds defined in BoR (16) 127.

4 Criteria for the definition of ‘very high capacity networks’

4.1 Paragraph 16

4.1.1 Stakeholder responses

Para. 16 criterion 1: Liberty Global agrees with criterion 1

Liberty Global agrees with the introduction of criterion 1, which results in the automatic qualification of FTTB and FTTH networks. This is clearly envisaged by the definition in Article 2(2) of the EECC, which states that a network will be considered a very high capacity network if it consists wholly of optical fibre elements at least up to the distribution point at the serving location. This will enable operators to identify their networks as very high capacity networks quickly without further analysis being required.

Para. 16 criteria 1 and 2: Open Fiber appreciates the distinction between fixed and wireless connections

Open Fiber considers the draft Guidelines as, overall, positive and particularly appreciates the distinction between fixed and wireless connections given in the criteria 1 and 2 and the respective definitions.

Para. 16 criteria 1 and 2: Optical connections to a mobile radio station and to a building in a fixed network should not be considered to be equivalent

BMLRT strongly disagrees with Recital 13 of the EECC that an optical connection to a mobile radio station should be considered equivalent to an optical connection to a building in a fixed network (backhaul vs. access connection). From this follows the definition of criterion 1 and 2 as any network providing with a fibre roll out at least up to the multi-dwelling building (fixed) or base station (wireless). This is according to the EECC, so there is no possibility for a change now.

Para. 16 criteria 1 and 3: BREKO, BUGLAS and ELFA agree with BEREC’s approach

BREKO, BUGLAS and ELFA very much support BEREC’s focus on fibre roll out up to the multi-dwelling building and general approach regarding fixed very high capacity networks. The distinction between ‘fibre-based’ very high capacity networks and ‘QoS’ based very high capacity networks is accurate and reflects the provisions of Art. 2 EECC and Recital 13. The criteria of the current draft Guidelines must be maintained in order to adequately reflect the EECC.

Para. 16 criterion 2: Wireless backhaul should be included in criterion 2

Hutchison Drei Austria (H3A) is of the view that criterion 2 (para. 16) does not follow a technologically neutral approach and wireless connections in specific micro wave connections with very high capacity should be included. Microwave technologies such as E-band microwave are available which provide data rates up to 10 Gbps including high performance QoS-parameters.

The Spanish Association for Digitalization (DigitalES) and Ericsson suggest to include in criterion 2 also fibre-like performance technologies as follows: 'Criterion 2: Any network providing a wireless connection with a fibre or a fibre-like performance technology roll out up to the base station'. DigitalES argues that due to major recent evolution in wireless backhauling, the Guidelines should be written in a way that does not imply differences between the fibre backhaul and other backhauling techniques ensuring a neutral definition of very high capacity network. Ericsson points out that nowadays there are different backhauling technologies used, combined in network deployments, some of which are fibre-based and some of which are wireless, but are equal in terms of capability. These types of alternatives should be acknowledged and recognized by the Guidelines.

Para. 16 criterion 2: Fibre to the base station is not a sufficient condition

The Galician Agency for Technological Modernization (AMTEGA) believes that the fact that the fibre reaches the base station is not a sufficient condition to consider a wireless network as very high capacity network since it does not guarantee the quality of service provided to the end-user. Conditions on the service provided to the end-user must be established in all criteria, also in criterion 2, such as downlink and uplink bandwidth, latency, error related parameters etc. based on the services currently required by end-users, and the objectives of the European Union, such the Gigabit Society.

Para. 16 criterion 2: Satellite earth stations need to be included

The EMEA Satellite Operators Association (ESOA) recommends to add satellite earth stations in criterion 2 as follows: 'Any network providing a wireless connection with a fibre roll out up to the base station or satellite earth station.' ESOA argues that the concept of base station is very wide and, in case of satellite networks, should be understood as a transceiver (or access point) able to receive and transmit by satellite between end-users' terminals and the public telecom network.

Para. 16 criteria 2 and 4: Criteria 2 and 4 are adequate to clarify when a wireless network is considered to be a very high capacity network

A stakeholder considers criteria 2 and 4 adequate to clarify, in a precise and accurate manner, when a wireless network could be considered with a 'very high capacity'. Both criteria (2 and 4) are straightforward and direct without any possibility to misunderstand their meaning and application, circumstance that will help also to harmonize the definition of the term 'very high capacity network' in Europe. With regards to criterion 4, this stakeholder agrees with the necessity of an evaluation concerning the radio network quantitative performance according to the criteria on the general network performance up to the end-users. The ratio between the downlink data rate and the uplink data rate is high compared to the effective ratio registered on the networks and to the real use of the download and upload services by customers. Therefore, this stakeholder wishes that this ratio will be fixed at a lower value.

Para. 16 criteria 2 to 4: Clarification needed that 'wireless network' means mobile services, not fixed services

ADTRAN suggests that the final Guidelines clarify that 'wireless network' for purposes of applying criterion 2 or criterion 4 means mobile services, not fixed services. Thus, a fixed

wireless network would need to meet criterion 3 to qualify as a 'very high capacity network'. This avoids granting the incentives that follow from designation as a 'very high capacity network' to fixed wireless networks that do not actually provide an equivalent level of service to an all fibre network.

Para. 16 criterion 3: ADTRAN agrees with the draft Guidelines proposal

ADTRAN agrees with the draft Guidelines proposal to define the 'equivalent network performance' for a fixed-line connection in terms of speed (1 Gbps/200 Mbps), but also including IP packet error ratio (0.05%), IP packet loss ratio (0.0025%), Round-trip IP packet delay (10 ms), IP packet delay variation (2 ms) and IP service availability (99.9% per year). Establishing comparability across multiple factors, and not just speed, will ensure 'equivalent network performance'. Alternative technologies that can offer such capabilities should also be deemed 'very high capacity networks'.

Para. 16 criterion 3: Cable networks can qualify as very high capacity network

In the view of CableLabs, HFC network technologies have the capabilities to meet the performance thresholds set forth in the draft Guidelines on very high capacity networks. According to CableLabs with DOCSIS 3.1 technology, cable operators are offering services with 1 Gbps downstream speeds. Currently available DOCSIS 3.1 equipment is capable of supporting the 200 Mbps upstream speeds, however, the specifics of any particular deployed HFC network may limit the ability to fully achieve the capability of the technology, without significant reconfiguration of the network. CableLabs released the DOCSIS 4.0 specification in 2019 which will further increase the performance capabilities of HFC networks.

CableLabs further explains that with DOCSIS 3.1 Active Queue Management (AQM) an HFC (access) network, under load, can provide a typical roundtrip latency of 10 ms. With Low Latency DOCSIS (LLD), specified in 2019, the HFC network can reliably achieve 1 ms roundtrip latency performance for latency sensitive traffic.

CableLabs is focused on driving advancements in HFC network technologies that increase the availability and resiliency of cable broadband services. Examples of these advancements are Proactive Network Maintenance (PNM) and Profile Management Application (PMA).

The DOCSIS specifications set a maximum packet error ratio of 10^{-6} for transmissions in both the downstream and the upstream for both cable modems and cable modem termination systems. The packet error requirements within the DOCSIS technology, however, do not include packet errors or losses due to a multitude of causes well beyond the physical medium of transmission.

Para. 16 criterion 3: DOCSIS 3.1 and a mix of DOCSIS 3.0 and 3.1 can qualify as a very high capacity network

A stakeholder overall agrees with the performance data provided for HFC coax networks and believes that DOCSIS 3.1 networks are to be correctly considered very high capacity network and that equally a mix of DOCSIS 3.0 and 3.1 can be deployed in a manner that would qualify the network as a very high capacity network. Both DOCSIS 3.0 and 3.1 are

compliant with the other performance parameters listed under criteria 3 (e.g. delay, jitter, packet loss).

Para. 16 criterion 3: BUGLAS agrees with the 'best in class'-approach

BUGLAS agrees with the 'best in class'-approach chosen by BEREC to determine the QoS parameters that need to be fulfilled by a network to qualify as very high capacity network. It is correct to define the reference network as an FTTB network with the best available in-house transmission technology, which is currently G.fast 212 MHz. The approach correctly reflects the relevant investment, which is the deployment of fibre up to the building.

Para. 16 criterion 3: BEREC's best technology approach is incompatible with technological neutrality

ANGA, GIGAEurope and Liberty Global are of the view that BEREC's approach to limit the performance thresholds 1 to the 'best' technology with regard to the achievable end-user QoS (G.fast, DOCSIS 3.1) is not covered by the provisions of the EECC since the EECC does not define any requirements regarding the in-house access network behind the FTTB serving point. Consequently, all in-house access technologies should be considered when determining the performance of the relevant reference networks (xDSL, G.fast, DOCSIS, Ethernet, fiber etc.). ANGA, GIGAEurope and Liberty Global further point out that a 'stand-alone' FTTB network would not need to meet any QoS thresholds of criterion 3 and therefore the requirements to be met by 'similar' very high capacity networks are stricter. Therefore BEREC should base the benchmark fixed network performance thresholds on the performance of either the lowest performing in-building technologies that exist in the market today, or the most common (such as VDSL over copper and both DOCSIS 3.0/3.1 over coax).

Para 16. criterion 3.a downlink data rate: Liberty Global considers this threshold is broadly in line with the Gigabit Society Strategy and the EECC

Liberty Global's HFC networks that have been upgraded with DOCSIS 3.1 are certainly capable of delivering 1000 Mbps download speeds to end-users. HFC networks are expected to be able to deliver 5 Gbps speeds within the next five years, which will ramp up to 10 Gbps and beyond precisely as demand for high-speed, reliable services grow.

Para 16. criterion 3.a downlink data rate: Add to the threshold '960 Mbps IP rate if downlink is delivered as Gigabit Ethernet)'

Vodafone suggests to add to the threshold '960 Mbps IP rate if downlink is delivered as Gigabit Ethernet' according to the note in the draft Guidelines in annex 5 that the IP data rate will necessarily be lower than the transmission rate, as the packet payloads require preamble and other Frame overheads.

Para 16. criterion 3.a downlink data rate: The threshold should be set closer to 100 Mbps

TIM suggests that the threshold for the downlink data rate should be set closer to 100 Mbps instead of 1 Gbps in order to ensure an alignment with the objectives of the Gigabit society. The Gigabit Society Communication itself states in the glossary (page 55) of the Staff

Working Document that 'VHC - Very high-capacity networks are networks with best-in-class performance in terms of speed (i.e. significantly above 100)'.

Para 16. criterion 3.b uplink data rate: Threshold seems to be based solely on field trials or lab tests and to be arbitrary from the customer demand perspective

Liberty Global argues that it appears that the upload threshold of 200 Mbps is based on the typically achievable speeds of G.fast 212 MHz services, however, most G.fast operators have not yet deployed 212 MHz and will thus have provided the data solely based on field trials or lab tests. In addition, end-users typical upstream data consumption is only 10 per cent of their downstream consumption and, therefore, network operators would be forced to build upstream data rates which are at odds with sound investment principles. Liberty Global also points out that 7 (26%) of the 27 FTTB operators taken into account (8 G.fast (Fig. 1), 19 DOCSIS (Table 4)) would be able to meet the required upload performance threshold of 200 Mbps. Finally, Liberty Global informs that its upgraded DOCSIS 3.1 networks are capable of delivering 200 Mbps upstream, though the majority is not currently configured to offer such services.

Para 16. criterion 3.b uplink data rate: BEREC has ignored the data from cable operators and has adopted 200 Mbps based G.fast 212 MHz

GIGAEurope is of the opinion that BEREC's adoption of median values for the purpose of calculating performance thresholds 1 is overly simplistic. In particular, it is not clear why BEREC has ignored the feedback from (cable) operators in regard achievable upload speeds under realistic conditions. Rather, BEREC has adopted 200 Mbps based on what it considers the typically achievable speeds of G.fast 212 MHz services, which have not been deployed to any significant extent.

Similarly, Vodafone argues that for upstream calculations, BEREC has mixed the technology types and chosen the G.fast value reported on the questionnaires. Vodafone recommends resetting the threshold of the upstream data rate to 160 Mbps which is achievable on extant fibre only DOCSIS 3.1 network when full spectrum is available.

Para 16. criterion 3.b uplink data rate: Threshold should be set to 100 Mbps based on the responses of all operators

ANGA argues that the performance threshold of the uplink data rate is based on the median of the values reported by the network operators and the median of the typically achievable uplink data rate is mathematically 100 Mbps considering all reports. ANGA wonders if BEREC accidently based their calculus on the arithmetic average of 160 Mbps. ANGA proposes that BEREC recognizes all parts of DOCSIS 3.x and sets the threshold to 100 Mbps based on the responses of all operators.

Para. 16 criterion 3.b: Value ranges should not be considered in case of DOCSIS 3.1 as it is the case with LTE Advanced

Ecta argues that in case of DOCSIS 3.1 the median of the typically achievable uplink data rate includes also value ranges reported by two operators, however, value ranges have been excluded in case of the determination of the performance thresholds 2. The median of the typically achievable uplink data rate without considering the value ranges is 342.5 Mbps and,

therefore, the median of the typically achievable aggregated data rate is 1,342.5 Mbps and the data rate thresholds need to be based on DOCSIS 3.1. In the view of ecta a possible revision could retain the downlink data rate threshold of 1,000 Mbps and augment the corresponding uplink threshold to 342.5 Mbps.

Para 16. criterion 3.c-g: Liberty Global's HFC networks are able to meet some of these thresholds, others seem not to be defined appropriately

Liberty Global's HFC networks are able to meet and even exceed the threshold of the IP packet error ratio. With regard to the thresholds for IP packet loss ratio and IP packet delay variation, Liberty Global argues that there is currently no demand for services that would deliver such performance and the costs of providing such a service would far outweigh any benefits to end-users.

In the view of Liberty Global, it is not clear how BEREC intends to verify the round-trip IP packet delay and if BEREC intends to require network operators to ensure that their network meets these thresholds at each sub-area of the network which would not meet the principles of appropriateness and proportionality. At present, such parameters are generally only reported based on performance across the whole network. In addition, actual traffic flows and the latency experienced might be very different since there is no guarantee that the content/application services provider will actually send traffic to the nearest peering point. Liberty Global suggests that BEREC should instead specify that the thresholds for the round-trip IP packet delay and the IP packet delay variation apply only to the access network (i.e. from the end-user network termination point to the access node) and that the round-trip IP packet delay can increase by 1 ms for every 100 km beyond.

Finally Liberty Global informs that its HFC networks are able to meet the threshold for the IP service availability. For example, in 2019, the average IP service availability across the whole of Liberty Global's footprint for the year was 99.9%. Adverse external events can, however, have an effect on its ability to meet this threshold. Liberty Global therefore requests that BEREC clarify that that such events should be excluded, particularly where they are outside of the network operator's control (e.g. in case of power outages or if construction works have resulted in fibre lines being dug up).

Similarly, Vodafone suggests to exclude planned works and impact of third-party works from the threshold value for the IP service availability since uptime is usually stated with planned works removed from the calculation and also with contractual removal of effects caused by third-party failures such as the local power grid.

Para 16. criterion 3.c-g: Suggestions to adapt definitions

ANGA and GIGAEurope propose to drop in the threshold for the IP packet delay variation the reference to RFC 3393 because of the new definition of this parameter in ITU-T Y.1540 in February 2020 or at a minimum to set the IP packet delay variation to be equal to the minimum Round Trip time of 10 ms. Vodafone also suggests to set the threshold for the IP packet delay variation equal to the threshold of the round-trip IP packet delay.

ANGA and GIGAEurope are also of the view that the technical parameters examined by BEREC show interdependencies that seem not to have been considered. With regards to the threshold of the IP service availability ANGA suggests that the Guidelines clearly state

that abnormal operating conditions have not been considered and GIGAEurope proposes that BEREC should clarify that this benchmark can exclude third-party external factors since this threshold can only be achieved in real networks if external factors like power outages are fully excluded.

Para. 16 criterion 3: **The values proposed seem to reflect the maximum achievable performances**

DIGITALEUROPE is of the opinion that the values proposed by BEREC seem to reflect the maximum achievable performances rather than the performances which could be delivered under usual peak-time conditions, as requested by the EECC. The proposed parameters are overestimated, given that nowadays very few wholly fibre networks (which by default meet the criterion 1) provide such speed limits on a commercial basis. DIGITALEUROPE believes that the parameters under criterion 3 are not set sufficiently accurate to serve the purpose of identifying technologies with an equivalent performance to fibre such as G.fast 106 MHz. Also, the performance thresholds of criterion 3 are not in line with Fixed Wireless Access (FWA) technologies. In addition, the methodology uses an isolated approach and considers each individual QoS parameter separately and criterion 3 is then defined by aggregating the seven resulting thresholds into the conditions to be met for criterion 3. In doing so, the very high capacity network qualification conditions are set too strong at an unrealistic level.

Para. 16 criterion 3: More flexibility with regards to FWA would be desirable

In the view of GSMA, it would be desirable for criterion 3 to be more flexible and allow FWA supported by the latest wireless technologies to be included as a very high capacity network fixed-line connection. GSMA argues that FWA solutions based on cellular technologies (4G/5G) can satisfy in the most efficient way the main service requirements of home broadband which can be considered equivalent to the QoS enjoyed today, in practice, by many end-users serviced by optical fibre installations up to a multi-dwelling building. They are also a much more cost-efficient way to reach remote rural areas.

Para. 16 criterion 3: The Guidelines should emphasize the wholesale market of retail and business customers

1&1 Telecom argues that a network that meets the QoS requirements but is not suitable for providing a competitive wholesale offer (e.g. the ‘old’ cable networks) should not be allowed to benefit from the associated (investment) advantages of the very high capacity network category. The use of very high capacity networks must also be considered from a wholesale perspective. Therefore, the Guidelines should emphasize the wholesale market of retail customers and the wholesale market for business customers which means that the definition of a very high capacity network will play an essential role in view of the market definition.

Para. 16 criterion 3: The FTTH questionnaires filled in by operators from Italy and other major EU Member States were not taken into account

Open Fiber points out that no responses submitted by operators from Italy and other major EU Member States to the questionnaire on FTTH were taken into account. According to the virtual meeting with stakeholders on 17 March 2020, it seems the reason is that the data of FTTH GPON was considered to be implausible by BEREC. Open Fiber believes that BEREC should clarify what it considers reliable values for GPON FTTH in terms of performances.

Para. 16 criterion 3: The same sample for each parameter should be considered and each EU country should be represented

TIM is of the view that the definition of criterion 3 has been biased by erroneous choice of the statistical sample. According to Table 2 of the draft Guidelines, no data have been considered for Italy and other large EU countries (e.g. France and Spain), while other countries are represented with numerous questionnaires. Therefore, results may be largely biased. BEREC further reduces the use of data in case of G.fast on the in-building copper twisted pair since it considers only 4 out of 8 data for the data rates parameters, on the ground that only G.fast with 212 MHz was to be considered. Furthermore, only very few of these 4 operators provided data for the other QoS parameters, with the consequence that the statistical sample is not the same for each parameter. BEREC should consider the same sample for each parameter and each EU country should be represented.

Para. 16 criteria 3 and 4: The term 'peak-time condition' shall be defined in order that it can be measured and compared

BMLRT is of the view that the definition of 'peak time condition' is not sufficient. The peak time condition is one of the most critical parameter to assess the quality of a service and end user experience in particular in case of mobile connections. Therefore, this ministry recommends creating a specific definition in order that the peak time condition can be measured and be comparable among EU member states.

Javier Aracil et. al are also of the opinion that it is necessary to include in the Guidelines a clear definition of 'usual peak-time conditions' in order to make unambiguous the definition of the performance thresholds 1 and 2.

Para. 16 criteria 3 and 4: Similarity of criteria 3 and 4 with the baseline scenarios needs to be ensured

TIM is of the opinion that the Guidelines should ensure the similarity of criteria 3 and 4 with the baseline scenarios and the respect of the technology neutrality principle. The thresholds proposed by BEREC for criteria 3 and 4 are so stringent that today they could not even be met by the fibre networks considered in the baseline scenario. Criteria 3 and 4, as presently defined, would unduly limit telco operators in their freedom of selecting the most appropriate technologies, failing to ensure the technology neutrality principle. Contrary to the intentions, the Guidelines risk slowing down the achievement of the Gigabit society targets and/or entailing higher investments for operators, without any additional benefit for final users.

Similarly, Vodafone is of the view that it needs to be ensured that criteria 3 and 4 allow for similar performance and capability as the baseline scenario, and therefore are not stricter as for criteria 1 and 2 in order to respect a technology neutrality approach. Vodafone further suggests that a 'similar' not an 'equivalent' performance should be considered which allows for some flexibility within different networks and to correct that criteria 3 and 4 are not taking into account network capability as required by the EECC.

Para. 16 criteria 3 and 4: An ambition for the level of broadband provisioning consistent with EU broadband targets for 2025 needs to be defined

Javier Aracil et. al believe that the purpose and intention of the definition of very high capacity network in the EECC is to define an ambition for the level of broadband provisioning consistent with EU broadband targets for 2025, 1 Gigabit symmetrical and 5G. Instead, BEREC's approach means that the wireless networks deployed in the EU will readily fulfil the very high capacity network criteria by definition, because this definition is circular in coming from the mobile network operators own statements of what they can already now deliver, rather than a policy-based performance target. In particular as regards to EU targets on 5G connectivity, the best way to take 5G into account is to establish more ambitious performance thresholds that encourage the development of these networks.

Para. 16 criteria 3 and 4: The network performance up to the distribution point at the serving location should be considered

The FTTH Council Europe is of the view that from the EECC follows that the network performance up to the distribution point at the serving location (i.e. to the building) needs to be considered and not the end-user experience. The definition essentially says that a network that is as performant as a network which is 100% fibre (or at least up to the distribution point at the serving location) needs to be considered. Therefore, the relevant question is whether other media (such as copper, coax copper or wireless for instance) are able to deliver comparable performance to fibre at peak-time across the six parameters stated up to the point where they connect to the building or whether wireless backhaul can be as performant as fibre to the base station.

The FTTH Council Europe also does not understand why BEREC, within its interpretation of very high capacity networks, considers G.fast on copper twisted pair and DOCSIS on coax but excludes the wide variety of FTTH solutions.

Para. 16 criterion 4: Additional parameter for indoor coverage should be included to make it more comparable with fixed line connections

BMLRT points out that criterion 4 covers only outdoor coverage and suggests to introduce an additional parameter for indoor coverage (i.e. the common loss – 20 dBm), so it is more comparable to fixed line connections and services.

Para. 16 criterion 4: Suggestion of alternative threshold values

A stakeholder suggests to decrease the threshold of downlink data rate and set it to be 100 Mbps since according the 5G network deployment recommendation of ITU, the end user's target downlink data rate for outdoor wide area network usage is 100 Mbps and 100 Mbps also meets the requirement of the EC DAE broadband targets for 2025.

This stakeholder also proposes to decrease the threshold of uplink data rate and set it to be 30 Mbps since 20 MHz uplink spectrum is the most common configuration for LTE-A networks in Europe, the average date rate in case of 20 MHz uplink spectrum is according to Table 10 of the draft Guidelines 34 Mbps and this stakeholder observes that an average speed of 30 Mbps in uplink is more realistic in live commercial LTE-A networks.

This stakeholder further suggests to set the IP packet error ratio and IP packet loss ratio to 0.1% according to QCI7 of 3GPP TS 23.203 (Table 6.1.79). Finally, this stakeholder proposes to set the Round-trip IP packet delay at 35 ms since 25 to 40 ms is a common value when considering live LTE-A networks and the IP packet delay variation at 10 ms since the average value according to Table 11 of the draft Guidelines is 8.9 ms.

Para. 16 criterion 4: Undesirable tightening is also regarding criterion 4 a fact

DIGITALEUROPE points out that for determining the performance thresholds of criterion 4 for wireless networks BEREC applies the same methodology as in case of criterion 3 (see DIGITALEUROPE's comment above) and consequently, the undesirable tightening is also regarding criterion 4 a fact. Criterion 4 as proposed by BEREC should be clarified to make clear that it does not mean that the network at all times have to provide the speeds and QoS indicated as the speeds in mobile wireless access networks like LTE depend also on the distance between the antenna and the mobile endpoint etc.

Para. 16 criterion 4: Criterion 4 shall focus solely on the transmission network part up to the base station

A stakeholder suggests criterion 4 shall focus solely on the transmission network part up to the base station to determine if microwave can meet the performance threshold of fibre up to the base station and not from an 'end-to-end' QoS standpoint as proposed by BEREC's current methodology. This stakeholder believes that criterion 4 shall be regarded with the same scope as criterion 2 which states that if a wireless network uses fibre technology up to the base station then this network qualifies as very high capacity network. In that case, it would mean that if a microwave backhaul meets fibre performance up to the base station then wireless networks providing services to end-users backhauled by those microwave systems will qualify as very high capacity network which is fully in line with the EECC Recital (13).

GSMA suggests that the methodology used to define the criterion 4 should be replaced by a technological approach based on backhaul performances similar in practice to those of a fibre connection to the base station. In GSMA's view Recital 13 of the EECC is very clear on the fact that variations in the end-user experience due to the wireless access network (i.e. the medium by which the network connects the service point to the network termination point) should not be taken into account. Therefore, the way BEREC is determining criterion 4 is not in line with this provision in the EECC and needs to be changed.

Para. 16 criterion 4: The achievable end-user QoS may have been overestimated due to its focus on fibre to the base station alone

Eir argues that BEREC's performance thresholds may have overestimated the achievable end-user QoS due to its focus on deployment of fibre to the base station alone. In their experience, end-user QoS under normal peak load conditions has very little to do with fibre to the base station, once the backhaul connection is of higher bandwidth than the air interface and the use of wireless backhaul may be more economic.

Para. 16 criterion 4: Criterion 4 needs to allow wireless networks with microwave backhaul to be also considered a very high capacity network

MEO is of the opinion that it is necessary to guarantee that the definition of criterion 4 allows wireless networks with microwave backhaul to be also considered a very high capacity network (according the threshold parameters definition).

Para. 16 criterion 4: The representativeness and consistency of the statistical sample shall be improved

TIM is of the view that the definition of criterion 4 is also affected by the same methodological errors as criterion 3 (see above) and the representativeness and consistency of the statistical sample shall be improved. According to Table 3 of the draft Guidelines, BEREC considers only the data provided by 20 operators from 13 EU countries out of 32 operators from 19 countries which had provided data. As with criterion 3, Italy and some other large EU countries (e.g. Germany) have not been represented, while for some countries (e.g. Denmark and Slovenia) even data from three operators are considered. In addition, for criterion 4 BEREC arbitrarily chose to set performance thresholds at the 90% percentile, instead of using the median. This clearly entails that even the technologies of the baseline scenario (fulfilling criterion 2) do not fulfil criterion 4.

Para. 16 criterion 4.a: To be consistent with the Communication 'Towards a Gigabit Society' the downlink data rate needs to be set to 'at least 100 Mbps'

In ESOA's view, it is necessary that BEREC remain consistent with both the 2016 Commission Communication 'Towards a Gigabit Society' (COM2016/587) and the EECC so that the Guidelines refer to 'at least 100 Mbps' (not 150 Mbps).

Para. 16 criteria 4.a and 4.b: The threshold values shall only be based on the data points which refer to outdoor only

Ecta notes that the determination of the data rate thresholds is based on the data of all mobile operators except those whose value are classed as implausible, although the final threshold value is held to apply only to outdoor locations. Only eight of the thirteen data points considered refer to outdoor locations only and the 90% percentile of these eight data points is 200 Mbps (not 150 Mbps). Ecta considers this a more appropriate and future-proof determination of the threshold value. In case of uplink data rates, the situation is similar. The 90% percentile of the eight data points which refer to outdoor locations only is 51 Mbps (not 50 Mbps). In the view of ecta, also the relation between the downlink and uplink data rates has not been considered appropriately and ecta also has reservations towards the plausibility assessment. The relative share of LTE and LTE-Advanced of the measurements is not clear, the highest values (95% percentile) are considered to be '70 to 100 Mbps' (see para. 193), however, according to Figure 16 it is slightly above 120 Mbps and releases 12 and 13 were developed with the objective of at least a 30-fold increase in capacity and a twelve-fold increase in cell edge throughput.

Para. 16: Energy efficiency targets should be included

A stakeholder strongly recommends including energy efficiency targets for very high capacity networks into the criteria of the Guidelines in order to take into account the European Green Deal.

4.1.2 BEREC response

BEREC welcomes that Liberty Global agrees with criterion 1, that Open Fiber considers the draft Guidelines as, overall, positive and that Open Fiber appreciates the distinction between fixed and wireless connections given in the criteria 1 and 2.

BEREC also welcomes that BREKO, BUGLAS and ELFA very much support BEREC's focus on fibre roll out up to the multi-dwelling building and the general approach regarding fixed very high capacity networks.

BEREC appreciates that ADTRAN agrees with the performance thresholds of criterion 3, that CableLabs is of the view that HFC network technologies have the capabilities to meet the performance thresholds set forth in the draft Guidelines and that another stakeholder is also of the view that DOCSIS 3.1 and a mix of DOCSIS 3.1 and DOCSIS 3.0 can meet the performance thresholds of criterion 3.

BEREC also appreciates that BUGLAS agrees with the 'best in class'-approach chosen by BEREC to determine the QoS thresholds and with the reference network FTTB and G.fast 212 MHz.

BEREC would like to clarify that the comment from BMLRT on para. 16 criteria 1 and 2 is a comment on the EECC itself and not on the draft Guidelines which is also made clear by this ministry.

BEREC's response to the view of Hutchison Drei Austria, DigitalES and Ericsson that fibre-like performance technologies as e.g. wireless backhauling should be included in criterion 2 is that the EECC (Art. 2(2)) defines that a very high capacity network is a network with a fibre roll-out up to a certain point (the base station in case of networks providing a wireless connection) and does not foresee that a network with a roll-out of a different medium or technology (e.g. wireless backhaul) up to a certain point is also a very high capacity network. Therefore, it is not possible to include wireless backhaul in criterion 2. However, since criterion 4 applies technological neutral and, therefore, also to networks based on wireless backhaul, such networks qualify as a very high capacity network in case they fulfil criterion 4.

Concerning AMTEGA's view that fibre to the base station is not a sufficient condition for a network to qualify as very high capacity network, BEREC would like to clarify that the term 'very high capacity network' is already defined in the section 'Definitions' (Art. 2(2)) in the EECC. According to this definition, networks with a fibre roll-out up to a certain point, in networks providing a wireless connection up to the base station, are very high capacity networks and do not need to fulfil any other criteria. The BEREC Guidelines have to respect this definition in the EECC and, therefore, it is not possible to change criterion 2. The Guidelines have been adapted in order to make this clearer.

BEREC's response to the ESOA's proposal to include in criterion 2 also satellite earth stations is that satellite networks are very different from terrestrial wireless networks in terms

of characteristics and architecture and there does not appear to exist an equivalent to the concept of base station as used in terrestrial wireless networks (see para. 64, footnote 20 of the draft Guidelines). With regards to the definition of the term 'very high capacity networks', the EECC states (Rec. 13) that 'the requirements concerning the capabilities of electronic communications networks are constantly increasing' and 'the current response towards that demand is to bring optical fibre closer and closer to the user.' In case of satellite networks fibre is not rolled-out closer and closer to the end-user but instead the end-user may be several hundred kilometres or even more than 1,000 km away from the earth station which is connected with fibre. BEREC, therefore, does not agree with ESOA's proposal.

BEREC welcomes that a stakeholder considers criteria 2 and 4 adequate to clarify when a wireless network is considered to be a very high capacity network. With regard to the view of this stakeholder that the ratio between the uplink and downlink data rate of criterion 4 is rather high, BEREC would like to clarify that the threshold values of criterion 4 are based on data collected from network operators and, therefore, reflect the situation in practice.

Regarding ADTRAN's suggestion to clarify that 'wireless network' means mobile services, not fixed services, BEREC would like to clarify that criteria 2 and 4 clearly refer to networks providing a wireless-connection and a wireless connection can be offered with mobility or at a fixed location, both is possible. Therefore, BEREC does not agree with ADTRAN's proposal.

BEREC does not agree with the view of ANGA, GIGAEurope and Liberty Global that BEREC's best technology approach is not covered by the provisions of the EECC. The EECC (Art. 2(2), Rec. 13) clearly defines the network performance that needs to be considered as 'network performance equivalent to that achievable by an optical fibre installation up to a multi-dwelling building / base station' (see para. 7, 12.c and 12.d of the draft Guidelines). Since this network performance refers to the network performance that is achievable by the reference networks (FTTB, fibre to the base station) the 'best' technology with regards to the achievable network performance needs to be considered (see para. 30 in the draft Guidelines) and not the lowest-performing technology or the most common technology as suggested by these stakeholders.

BEREC's response to Vodafone's suggestion to set the downlink data rate of criterion 3 to 960 Mbps if the service is delivered as Gigabit Ethernet is that this threshold data rate refers to the point where the fixed subscriber access line (e.g. twisted pair, coax cable) ends in the end-user's living space (see para. 18.d in the draft Guidelines). At this point a data rate of 1 Gbps at the level of the IP packet payload is possible even if the user-sided interface of the CPE is a Gigabit Ethernet interface which technically is only capable of delivering a data rate of 960 Mbps at the level of the IP packet payload.

Regarding TIM's suggestion to set the threshold downlink data rate of criterion 3 closer to 100 Mbps in order to ensure an alignment with the objectives of the Gigabit society BEREC's response is that the EECC (Art. 2(2), Rec. 13) already defines the term 'very high capacity network' and also the approach for the determination of the performance thresholds and the draft Guidelines follow exactly this approach.

BEREC's response to Liberty Global's opinion that the uplink data rate threshold of criterion 3 seems to be based solely on field trials or lab tests and to be arbitrary from the customer

demand perspective is that the performance thresholds need to be based on the 'best' technology with regard to the network performance (see above) and as much as possible technologies that will be deployed in 2021-2025, when the Guidelines are in force, need to be considered (see para. 31 of the draft Guidelines). Therefore, the Guidelines also take into account the experiences made by network operators in pilot deployments or field trials. Since for the qualification as a very high capacity network a network needs to be capable of meeting the performance thresholds but not actually offer such a service an operator is not forced to offer services which are not demanded by its customers.

Concerning the view of GIGAEurope and Vodafone that BEREC has ignored the data from cable operators and has adopted 200 Mbps based G.fast 212 MHz, BEREC would like to clarify that the performance thresholds need to be determined based on the 'best' technology with regards to the network performance (as already explained above). The median of the aggregated data rate is 1,200 Mbps for G.fast and 1,160 Mbps for DOCSIS 3.1 (see para. 135, 141 and 147 of the draft Guidelines). Therefore, the threshold data rates need to be based on G.fast 212 MHz (and not DOCSIS 3.1).

BEREC's response to ANGA's opinion that the uplink data rate of criterion 3 should be set to 100 Mbps based on the responses of all operators is that, as already explained above, the performance thresholds need to be based on the 'best' technology and, therefore, it is necessary to consider solely DOCSIS 3.1, either standalone or combined with DOCSIS 3.0 (and not also DOCSIS 3.0), for the uplink threshold data rate.

Regarding ecta's opinion that value ranges should not be considered in case of DOCSIS 3.1 as it is the case with LTE Advanced, BEREC would like to clarify that in case of DOCSIS 3.1 two operators reported value ranges and since they are not very wide it was possible to take them into account. Contrary, in case of LTE Advanced one operator reported a value range and this value range is very wide (0-450 Mbps) and, therefore, it was not possible to take it into account.

BEREC's response to Liberty Global's view that currently there is no demand for services that would deliver the IP packet loss ratio and the IP packet delay variation of criterion 3 is that, in order to qualify as a very high capacity network, a network needs to be capable of meeting the performance thresholds but the operator is not forced to offer services with such a performance as already explained above.

With respect to Liberty Global's suggestion that BEREC should specify that the thresholds for the round-trip packet delay and the IP packet delay variation apply only to the access network, BEREC would like to clarify that the EECC does not limit a very high capacity network to be only an access network but instead the definition of a very high capacity network refer to an entire network without limiting it to a certain part of the network hierarchy (see para. 44 of the draft Guidelines). Therefore, data has been collected for the path from the end-user to the first point in the network where the traffic of the end-user services is handed over to other public networks (see para. 52 and 53 of the draft Guidelines) and the performance thresholds are based on these data.

BEREC's response to the proposal from ANGA, GIGAEurope, Liberty Global and Vodafone to exclude events outside the network operator's control from the IP service availability and from Vodafone to exclude also planned works is that the Guidelines have been adapted in

this respect since it is a common practice to exclude such events (e.g. force majeure) from the calculation of the service availability.

Regarding the suggestion from ANGA and GIGAEurope to drop in the threshold for the IP packet delay variation the reference to RFC 3393 because of the new definition of this parameter in ITU-T Y.1540 in February 2020 or at a minimum to set the IP packet delay variation to be equal to the minimum round-trip time of 10 ms, BEREC would like to clarify that the threshold value has been determined based on the data collected from the network operators and, therefore, BEREC does not see a need to change the threshold value. Since the data has been collected based on RFC3393 also the threshold value needs to be based on this standard. BEREC would like to emphasise that BEREC requested feedback from the network operators on the draft questionnaires in the first phase of the call for initial stakeholder input. Since the network operators did not provide a clear indication that a different standard would be more appropriate, data were collected based on RFC 3393.

With respect to the view of ANGA, DIGITALEUROPE and GIGAEurope that the draft Guidelines seem not to have considered the interdependencies between the QoS parameters, BEREC would like to point out that performance thresholds have been defined based on data collected from network operators and, therefore, the data set of each operator takes interdependencies into account. The data of different operators show that operators who reported high downlink data rates also reported high uplink data rates (see D1, D3, D6 in Table 4 in the draft Guidelines), low round-trip IP packet delay (see D5, D6, D8 in Table 7), low IP packet delay variation (see D8, G1, G3 in Table 7), low IP packet error ratio and low IP packet loss ratio (see D5, D8, G1 in Table 8) as well as high service availability (see D5, D8, G1 in Table 9). Interdependencies between the QoS parameters, therefore, does not seem to be an issue.

Concerning DIGITALEUROPE's view that the threshold values of criterion 3 seem to reflect the maximum achievable performances since nowadays very few wholly fibre networks, which fulfil criterion 1, provide such speeds on a commercial basis, BEREC would like to clarify that, according to the EECC (Art. 2(2), Rec. 13), the performance thresholds reflect the achievable network performance and not the currently offered performance on a commercial basis. The performance thresholds need to be based on the 'best' technology deployed on the in-building infrastructure and not on the average of the current deployed technology as already explained above.

BEREC's response to GSMA's proposal to allow FWA supported by the latest wireless technologies to be included as a very high capacity network fixed-line connection is that the draft Guidelines (para. 20) already foresee the possibility that a wireless network may be considered equivalent to a 'fixed very high capacity network'.

With respect to 1&1 Telecom's view that the Guidelines should emphasize the wholesale market of retail and business customers, BEREC would like to clarify that the EECC (Art. 2(2), Rec. 13) defines how the Guidelines have to define the criteria a network has to fulfil in order to be qualified as a very high capacity network and the draft Guidelines follow this approach.

Concerning the Open Fiber's comment that the FTTH questionnaires filled in by operators from Italy and other major EU Member States were not taken into account, BEREC would

like to clarify that the performance thresholds of criterion 3 are determined, according to the EECC (Art. 2(2), Rec. 13, see also para. 15 of the draft Guidelines), based on the baseline scenario of fibre roll-out up to the multi-dwelling building (and not FTTH). Therefore, no FTTH questionnaire has been taken into account for the determination of the performance thresholds of criterion 3. Data for FTTH networks have been collected for reference purposes only (see para. 98.b and 231 of the draft Guidelines).

BEREC's response to TIM's view that the same sample for each parameter should be considered and each EU country should be represented is that the NRAs sent the questionnaires to the network operators at the national level and all operators had the possibility to fill in the questionnaires. BEREC has only the possibility to take the questionnaires into account it receives and cannot force operators to complete them. In addition, the Guidelines have to follow the approach defined in the EECC (Art. 2(2), Rec. 13) and therefore, the determination of the performance thresholds of criteria 3 and 4 are based on the 'best' technologies, as already explained above, and the corresponding questionnaires and not on all questionnaires BEREC received.

Regarding the suggestion from BMLRT and Javier Aracil et. al that the term 'peak-time condition' should be defined in order that it can be measured and compared, BEREC would like to clarify that the EECC (Art. 2(2)) defines that the performance thresholds of criteria 3 and 4 need to be determined 'under usual peak-time conditions' but the EECC does not define the term 'peak-time condition'. However, since it is common practice by operators in their network dimensioning to consider as peak-time a period of one hour during which the network load is at its maximum the Guidelines have been adapted and now make this clear.

With regard to the opinions of TIM and Vodafone that similarity of criteria 3 and 4 with the baseline scenarios criteria 1 and 2 needs to be ensured according to the technology neutrality principle, BEREC would like to clarify that, according to the EECC (Art. 2(2), Rec. 13) as already explained above, the 'best' technologies need to be considered and not an average of the currently deployed technologies.

BEREC does not agree with the view of Vodafone that the focus on network capability is lost in the construction of criteria 3 and 4 since the performance thresholds of criteria 3 and 4 are based on the 'best' technology which reflects the network capability of the baselines scenarios of criteria 3 and 4.

Concerning the opinion of Javier Aracil et. al that an ambition for the level of broadband provisioning consistent with EU broadband targets for 2025 needs to be defined and ESOA's view that the downlink data rate needs to be set to 'at least 100 Mbps' in order to be consistent with the Communication 'Towards a Gigabit Society', BEREC would like to clarify that the EECC (Art. 2(2), Rec, 13) defines the term 'very high capacity network' and also the baseline scenarios that need to be considered for the determination of the performance thresholds of criteria 3 and 4 and the EECC does not define that these performance thresholds should be set based on EU broadband targets of 2025 or the Communication 'Towards a Gigabit Society'. The Guidelines have been adapted in order to make this clearer.

BEREC does not agree with the opinion of the FTTH Council Europe, GSMA and another stakeholder that the network performance should be considered up to the multi-dwelling building (criterion 3) and up to the base station (criterion 4) without including the access network for the following reasons. Very high capacity networks are of importance since they are capable of providing end-user services with a particularly high quality of service (QoS). The EECC (Art. 3(2)a) promotes the rollout of very high capacity networks to benefit end-users. Therefore, criteria 3 and 4 and also the baseline scenarios of these criteria are of interest with regard to the achievable end-user QoS of very high capacity networks. Moreover, the EECC defines a very high capacity network as a certain type of electronic communications network and not only as a segment of a network. Therefore, for the determination of the performance thresholds of criteria 3 and 4, it is necessary to consider the network up to the end-user (including the access network) where the public network ends (see para. 13 of the draft Guidelines). Given also that the EECC does not provide a definition of the term 'serving location', a different approach might be arbitrary and even technically impossible to implement. In addition, if it would be considered that the baseline scenario does not include the access network this would have the following consequences.

Since the baseline scenario does not include the access network, it would be necessary also not to consider the access network when a network is examined whether it qualifies as very high capacity network. However, for example a network with a fibre roll-out solely up to the local exchange (FTTEx) without considering the access network is built entirely on fibre, as it is the baseline scenario, and therefore would very likely be capable to provide a similar network performance with the consequence that it needs to be considered a very high capacity network. In BEREC's view, considering a legacy network (FTTEx) with fibre rolled-out solely to the local exchange as a very high capacity network is not the intention of the EECC.

If only the part of the access network which is in the multi-dwelling building is not considered when a network is examined whether it qualifies as very high capacity network then the network performance of the baseline scenario would not be generally applicable which is shown in the following two examples. (i) In case of a network with fibre rolled-out solely up to the local exchange (FTTEx) each end-user in a multi-dwelling unit is connected with an individual subscriber access line to the local exchange (FTTEx) and, therefore, at the distribution point of the multi-dwelling building there are several subscriber access lines in parallel and no single point exists where the network performance could be defined or measured. (ii) In the baseline scenario the network performance (e.g. the data rate) up to the multi-dwelling building is shared between the end-users in the multi-dwelling building. Therefore, this data rate would be significantly higher than the data rate that is available for a single end-user in the multi-dwelling building. However, in case of end-users in a single family house, it would also be necessary to apply this high data rate. Therefore, a network would have to provide a significant higher data rate to an end-user in a single family house than an end-user in a multi-dwelling building in order to qualify as very high capacity network which in BEREC's view would be against the intentions of the EECC.

Concerning the proposal of BMLRT that criterion 4 should include an additional parameter for indoor coverage, BEREC would like to clarify that the performance thresholds of criterion 4 are based on the data collected from mobile network operators and since only one network

operator provided data for indoor this is not possible. Moreover, indoor coverage performance is also extremely difficult to verify in practice, since it typically concerns private space. For that reason, many operators rely on estimations or crowdsourced data.

BEREC's response to the proposal of a stakeholder to reduce threshold values of criterion 4 based on values common in current LTE-Advanced networks or the 5G target downlink data rate of 100 Mbps according to an ITU-T recommendation is that, as already explained above, the performance thresholds of criterion 4 needs to be based on the 'best' technology and not on technologies currently common in mobile networks and that 5G will enable higher data rates than LTE-Advanced, the technology on which the performance thresholds of criterion 4 are based on.

Regarding eir's view that the achievable end-user QoS may have been overestimated due to its focus on fibre to the base station alone, BEREC would like to clarify that the EECC (Art. 2(2), Rec. 13) demands that the performance thresholds of criterion 4 are based on a fibre roll-out up to the base station (see para. 12.d of the draft Guidelines).

Concerning MEO's comment that criterion 4 needs to allow wireless networks with microwave backhaul to be also considered a very high capacity network, BEREC would like to point out that criterion 4 (see para. 16 of the draft Guidelines) does not include the condition that the network needs to have fibre rolled-out up to the base station and, therefore, criterion 4 clearly applies also to mobile networks with microwave backhaul.

BEREC's response to ecta's proposal to define the data rate thresholds of criterion 4 solely on the data points which refer to outdoor only is as follows. If only operators with outdoor only data rates are considered, the number of observations would reduce from 13 to only 8 which means that the 90% percentile would pick the maximum of all observations. The maximum might be an outlier and not representative. To avoid this, BEREC is of the opinion that the 90% percentile should be determined based on the 13 observations included in the draft Guidelines. One observation of an operator who reported a value for indoor only could be dropped, but this would not change the result. Furthermore, BEREC is of the opinion that a down- and upload data rate of 150/50 Mbps is already ambitious compared to the highest data rates which are measured today in 4G networks during peak time (see annex 6 of the draft Guidelines).

With regards ecta's comments on the plausibility assessment, BEREC would like to clarify that the range of 70-100 Mbps quoted by ecta refers to the typical values of the 95% percentile. Even if the full range (shown in Figure 16 in annex 6 of the draft Guidelines) is considered, this would not change the conclusions. The capabilities of 3GPP releases 12 and 13 mentioned by ecta are solely a design goal for standardisation and it is difficult to derive from them data rates that will actually be achieved in real networks which heavily depend on network design by the operators (not only on technological capabilities). For example, another stakeholder (see above) suggests to reduce the downlink data rate threshold to 100 Mbps since according the 5G network deployment recommendation of ITU, the end user's target downlink data rate for outdoor wide area network usage is solely 100 Mbps. In any case, the performance thresholds for wireless networks will be updated not later than 2023 to take into account further technological developments, in particular 5G.

With regard to the suggestion of a stakeholder to include also energy efficiency targets, BEREC would like to point out the following. While acknowledging the importance of energy efficiency, the purpose of very high capacity networks, as this term already says, is to provide high capacities and the EECC does not define that energy efficiency should also be included in the criteria defining very high capacity networks.

4.2 Paragraphs 17 to 24

4.2.1 Stakeholder responses

Para. 17.b: Discrimination against non-FTTB/FTTH networks

Liberty Global argues that para. 17.b shows a discrimination against non-FTTB/FTTH networks and the creation of a double standard, whereby non-FTTB networks will need to meet higher thresholds than many existing FTTB networks (and likely also some FTTH networks). FTTB networks that have lower performing in-building access technologies will constitute a very high capacity network whereas non-FTTB/FTTH networks need to meet the performance thresholds 1 of criterion 3. Liberty Global emphasises that it should not follow from this that networks that meet criterion 1 also have to meet criterion 3 and performance threshold 1 but instead Liberty Global disagrees with criterion 3 (see Liberty Global's comment on para. 16 criterion 3 above).

Para. 17.b and c: Criterion 2 and 4 should be fulfilled cumulatively

A stakeholder agrees with the determination of the four criteria proposed by BEREC. However, this stakeholder believes that a distinction should be made between wired and wireless networks in the sense that while this stakeholder fully agrees that for wired connections a network can be defined as a very high capacity network either by fulfilling one of the criteria proposed for wired network (either criterion 1 or criterion 3), this is not the case for the criteria proposed for the wireless networks (criteria 2 and 4), which, in the view of this stakeholder, should be fulfilled cumulatively in order to qualify such networks as very high capacity networks.

The reason of such distinction is that in case of wired networks there is a close connection between the topology and the performance that can be achieved since an FTTB/H network can reach by design high performances without any need of further verifications. Conversely, this may not necessarily be the case for wireless networks. Maintaining criteria 2 and 4 separate will entail the risk that low performance technologies (i.e. 2G/3G/4G or FWA based on 4G) could be considered as very high capacity networks only because they provide fibre up to the base station.

Para. 17.b and c: Criteria 1 and 2 should be removed or criteria 3 and 4 should be added to criteria 1 and 2 respectively

Javier Aracil et. al are of the view that para. 17.b and 17.c are a misinterpretation of the EECC since they state that the networks that served as a reference to define performance criteria, namely, networks with fibre rolled out to the distribution point for fixed and wireless networks, may themselves not meet this criterion. This can lead to serious inconsistencies e.g. an NRA could categorise 3G networks with base stations connected to a fibre optic

backhaul or VDSL networks with copper sections in poor condition as very high capacity network, even though they do not meet the equivalent performance criteria. Javier Aracil et. al therefore propose to remove criteria 1 and 2 of the Guidelines, leaving only the performance criteria, or add criteria 3 and 4 performance parameters to criteria 1 and 2 respectively.

Para. 17.c: It is necessary to establish the same requirements for criterion 2 and 4

AMTEGA considers that it is necessary to establish the same requirements for criterion 2 and 4, since it would not make sense to distinguish between two types of very high capacity networks. In Galicia most of the current networks that could be considered very high capacity networks according to criterion 2 would not meet criterion 4.

Para. 18.a: Agreement with the general statement in this para.

A stakeholder agrees with the general statement in para. 18.a that the requirement is that the network is capable of providing services with identified speeds and QoS parameters without this translating into a requirement to actually offer such services.

Para. 18.a: Providers should be obliged to offer at a minimum one service that meets criterion 3

BMLRT points out that, according to para. 18.a and 67 of the draft Guidelines, for the qualification as a very high capacity network, it is sufficient that the network is capable to provide a service which meets the performance thresholds 1 of criterion 3 and it does not need to actually offer such a service. In the view of this ministry, the pure claim that the network meets the performance thresholds 1 is insufficient and providers should be obliged to offer at a minimum one service that meets the very high capacity network criteria.

Para. 18.a: It is not clear how NRAs can determine whether a criterion is fulfilled if the network does not offer a service which meet this criterion

Liberty Global argues that it is not clear how NRAs and other competent authorities can measure services based on end-user QoS or experience, if there are no commercial services being offered by the operator that are capable of meeting these criteria. For example, would operators be required to set up a dedicated service in each sub-area in order to demonstrate performance? In addition, how would this align with the need to show that such performance can be achieved during peak time conditions (i.e. under realistic end-user conditions)? If the capabilities of networks need to be verified in this manner, then this would be a serious problem since the criteria have been determined on what appears to be lab-based performance whilst at the same time they need to be verified based on real-life performance of the network and end-user services.

Para. 18.a: The purpose of the distinction between ‘achieved’ and ‘achievable’ network performance is not clear

In the view of Javier Aracil et. al, para. 18 has the potential to be problematic in the context of broadband mapping. The purpose of the distinction between ‘achieved’ and ‘achievable’ network performance is not clear and making this distinction in the definition of ‘very high capacity network’ makes it very easy for network operators to report that their deployed

networks are very high capacity network while not in fact delivering the corresponding levels of performance.

Para. 18.b: A distance parameter for the copper loop should be added

A stakeholder does not see para. 18.b reflected in the identified capable speeds for G.fast as there is no mention of what the distance is of the copper connecting the G.fast Access Concentrator to the user modem. The speeds achievable in G.Fast depend on the distance and this stakeholder assumes the data provided in the draft Guidelines are based on a distance of a couple of hundred meters of copper. The stakeholder believes BEREC should add a distance parameter to comply with the performance KPIs for G.fast. Although the stakeholder appreciates the focus on 'last mile' access technologies, it would encourage an extended focus to the node above in the network hierarchy since service providers' pre-aggregation networks are becoming a bottleneck.

Para. 18.e: Long distances should be applicable to satellite networks

ESOA argues that a similar situation to that described in para. 18.e would naturally arise in case of satellite communications. The Guidelines should therefore ensure an interpretation of the applicability of the adaptation of the round-trip IP packet delay performance in the case of 'long distances'. For instance, considering the GEO distance from earth (35,786 km), this leads to the following correction: 2* 35,786 / 100 = 715 ms extra time which, added to 25 ms, provides a round-trip IP packet delay performance target of 740 ms.

Para. 19: BEREC has to underline a differentiation between mobile and fixed networks

In the view of 1&1 Telecom, BEREC has to underline that there is no uniform term of a very high capacity network, but a differentiation between mobile and fixed networks. Otherwise, the possible conclusion would be that a market analysis based on the very high capacity network definition must be anticipated and that mobile networks and fixed networks have to be combined within the very high capacity network area without a further analyses of a substitution. This entails the high risk of significant market distortions, as there is no substitution.

Para. 19: The Guidelines must emphasize that fixed and wireless networks remain complementary

DIGITALEUROPE believes the Guidelines must emphasize that fixed and wireless networks remain complementary and both contribute equally to achieving gigabit connectivity. DIGITALEUROPE agrees that performance criteria for these networks might be different. However, the Guidelines must ensure this does not get misunderstood as a signal to rather focus on one type of network but simply reflects the differences between the speeds, etc., that these networks can achieve.

Para. 19: The significant role of fixed very high capacity networks should be further emphasized

In the view of BREKO, the Guidelines should further emphasize the significant role of fixed very high capacity networks and specifically of FTTB networks. BREKO questions whether a distinction between fixed and wireless very high capacity networks is necessary. The distinction of two separate "types" of very high capacity networks with such significant

differences regarding their achievable performance creates a degree of uncertainty regarding the term ‘very high capacity networks’. BREKO is of the opinion that wireless very high capacity networks can only be considered supplementary to fixed very high capacity networks.

Para. 19, 20: NRAs should be encouraged to base policies on services and service levels rather than ‘fixed’ and ‘wireless’ networks

Ericsson is of the view that in section 3 a formulation should be used that avoids a potential bias of NRAs on ‘fixed very high capacity network’, and that NRAs decouple the service offered from the network by which the service is offered. NRAs should be encouraged to base policies on services and service levels rather than ‘fixed’ and ‘wireless’ networks.

Para. 20: BUGLAS and a further stakeholder welcome BEREC’s approach

BUGLAS shares BEREC’s approach regarding FWA solutions. FWA networks should also need to fulfil the QoS parameters of fixed very high capacity networks to be considered as such since FWA products can only be considered as substitutes for fixed-line products and are not used for mobile connectivity.

A further stakeholder welcomes BEREC’s approach to consider 5G FWA networks, when fulfilling both criteria 2 and 4 and criterion 3, as equivalent to wired very high capacity network.

Para. 20: Another stakeholder welcomes para. 20

Another stakeholder welcomes that 4G/5G FWA can qualify as very high capacity network if the network meets criterion 2 and/or criterion 4, and also criterion 3.

Para. 20: FWA networks must fulfil the QoS thresholds of criterion 3 in order to be considered equivalent to a fixed very high capacity network

BREKO and ELFA are of the opinion that FWA networks must fulfil the QoS thresholds of criterion 3, in order to be considered equivalent to a fixed very high capacity network. FWA networks cannot generally be considered equivalent to a fixed very high capacity network. NRAs should determine on a case by case basis whether a FWA network fulfils the requisite criteria to be considered equivalent to a fixed very high capacity network.

Para. 20: FWA should be considered a very high capacity network if the fibre is installed up to the base station

EOLO considers it necessary to amend the definition in para. 20 of the draft Guidelines as follows: a ‘Fixed wireless network’ should be considered a very high capacity network if the fibre is installed up to the base station without the need to fulfil other criteria. EOLO argues that such networks could be easily upgraded to ‘Gigabit performance’ as soon as the 5G technology will be deployed. 5G FWA represent the faster, economic and flexible way to assure the achievement of Gigabit Society objectives especially in rural areas.

Para. 20: It is not clear how a network that meets criteria 2 or 4, or both, can also meet the performance thresholds of criterion 3

In MEO’s view it is not clear how a network that meets criteria 2 or 4, or both, can also meet the performance thresholds of criterion 3 and be also considered a FWA. It is necessary to

guarantee that the definition of criterion 3 allows FWA networks and services to be also considered very high capacity networks (regarding the threshold parameters definition).

Para. 20: The radio conditions necessary to meet the minimum performance levels should be known

Javier Aracil et. al are of the opinion that the radio conditions necessary to meet the minimum performance levels should be known (e.g. line-of-sight required, fresnel zone cleared, …) in order to determine in what baseline conditions wireless networks could be considered as fixed very high capacity network.

Para. 20: The guidance contained in para. 20 should be deleted

Ecta considers para. 20 problematic since a wireless network fulfilling criterion 2 must neither be evaluated with regard to criterion 4, nor with regard to criterion 3. Accordingly, it also cannot fulfil both of the criteria 2 and 4 in a legally relevant sense. A wireless network that is not fibred up to the base station and meets the performance thresholds 2 qualifies as a very high capacity network and, therefore, no added value derives from demonstrating its capability of meeting performance thresholds 1. A further danger linked to the proposed approach is that wireline operators capable of meeting the latter performance thresholds could invoke a right to qualify as very high capacity network, arguing that such cross-category qualification must not be denied in view of the reverse possibility existing for wireless operators. Therefore, the guidance contained in para. 20 should be deleted.

Para. 23: NLconnect considers BEREC's intention to be sensible

NLconnect considers BEREC's intention to update criterion 4 as soon as possible and not later than 2023 to be sensible.

Para. 23: The criteria for the definition of 'very high capacity networks' needs to be updated regularly

In FTTH Council Europe's view para. 23 seems to be inappropriate since it cannot be anticipated how network performance may have evolved by 2025 even if only looking at copper/coax technological improvements. It is also not in line with the requirements of the EECC which states at Article 82 '[….] BEREC shall update the guidelines by 31 December 2025, and regularly thereafter.'

Para. 23: The criteria to update the Guidelines should be removed

Ecta argues that the criteria 'as soon as possible and not later than 2023' and 'mature deployment and significant penetration' do not derive from the EECC and do not have a legal basis. Ecta also notes that this double standard appears to contradict the inclusion of G.fast in the draft Guidelines since the overall limited G.fast deployment is also echoed by the limited number of responses covering this technology. For these combined reasons, ecta believes that these additional criteria should be removed from the Guidelines and they should focus on defining a reliable framework for consideration of relevant technological developments as these occur ensuring that forthcoming revisions of the Guidelines occur in a predictable manner.

Para. 23 and 36: It seems there would be sufficient basis for considering already available 5G performance

Ecta observes that BEREC's arguments in para. 23 that 5G 'has not yet reached mature deployment and significant penetration' and in para. 36 '5G had not yet been deployed in networks to a relevant extent' appear to contradict BEREC's emphasis on 'the newest technologies used' (see para. 34). Ecta is aware that some of its members were already engaged in 5G field trials at the time of data collection. In the view of ecta, therefore it seems there would be sufficient basis for considering already available 5G performance and suggests to do so as far as possible in finalising the performance thresholds in the Guidelines.

Para. 24: Austria strongly supports this paragraph

BMLRT points out that Austria strongly supports this paragraph, as this definition provides this ministry with the opportunity to consider specific regional situations especially in case of implementing future State Aid programs.

Para 24: BREKO and ELFA agree

BREKO fully agrees that the Guidelines should not be interpreted as a view on the appropriateness or as a criterion for any other policy instruments, including public funding as explained by the BEREC working group chair in the meeting with the stakeholders on these draft Guidelines on 17 March 2020.

ELFA agrees with BEREC's view that the Guidelines should not be applicable for the interpretation of other policy instruments.

BREKO and ELFA propose the inclusion of an additional section to make clear that the Guidelines are addressed to the respective NRA and therefore, constitute no legal basis for policy instruments.

Para. 24: Copper infrastructure shall not be regarded as eligible for funding

1&1 Telecom points out that the definition of very high capacity networks will be a key indicator and benchmark for future funding and cost reduction initiatives. Therefore, it must be made clear within the definition that an out-dated technology cannot be included in the scope of the application. In particular it is important to exclude copper infrastructure that could still be regarded as eligible for funding after all.

Para. 24: It is extremely likely that national authorities will have reference to the Guidelines

In the view of eir, the EECC and other policy instruments (e.g. public funding) may be inextricably linked, in particular with regard to Article 22 of the EECC, since the geographical survey according to Article 22 also includes very high capacity networks. It is therefore extremely likely that national authorities will make reference to the Guidelines in determining the allocation of public funds for the deployment of networks and the design of national broadband plans.

Para. 24: Removing references to state aid / public funding

DigitalES and Ericsson understand and agree with BEREC's acknowledgement that matters of state aid go beyond the scope of the Guidelines as outlined in paragraph 24. DigitalES suggests to remove any references to state aid / public funding in the Guidelines in order to minimize misinterpretation regarding the relationship between the BEREC Guidelines on very high capacity networks (the definition and criteria described in the Guidelines) and state aid / public funding matters. Ericsson suggests to outline the main objective of the EECC is to boost Europe's Gigabit connectivity and to change para. 24 as follows: 'The Guidelines ~~provide criteria for the consideration of a network as a very high capacity network, where this is~~ are relevant for the application of the EECC. The EECC's primary objective is to boost Europe's Gigabit connectivity and therefore BEREC outlines criteria for the consideration of fixed and wireless networks as networks capable to deliver very high capacity connectivity. ~~They should not be interpreted as a view on the appropriateness of such consideration as a criterion for any other policy instrument, including public funding~~.'

4.2.2 BEREC response

BEREC response to (i) Liberty Global's view that para. 17.b of the draft Guidelines shows a discrimination against non-FTTB/FTTH networks (but criterion 3 should not be added to criterion 1), to (ii) the view of another stakeholder that criteria 2 and 4 (but not criteria 1 and 3) should be fulfilled cumulatively, to (iii) the view of Javier Aracil et. al that criteria 1 and 2 should be removed or criteria 3 and 4 should be added to criteria 1 and 2 respectively and to (iv) AMTEGA's view that it is necessary to establish the same requirements for criteria 2 and 4 is as follows. These stakeholders suggest similar but different adaptations of the Guidelines. While Javier Aracil et. al would like to add criterion 3 to criterion 1, Liberty Global and the other stakeholder explicitly state that this should not be done and AMTEGA also does not suggest this. To add criterion 4 to criterion 2 is suggested by Javier Aracil et. al and the other stakeholder, but not by Liberty Global and AMTEGA does not say whether criterion 4 should be included in criterion 2 or criterion 4 should be lowered to the level of criterion 2.

With regard to these comments, BEREC would like to point out that criteria 1 and 2 solely repeat what is already defined in the EECC (see also para. 17.a and footnote 6 in the draft Guidelines). According to Art. 2(2) of the EECC, fibre roll-out up to a certain point is sufficient for a network to be classified as very high capacity network and, according to Recital 13 of the EECC this point is the multi-dwelling building in case of fixed-line connections and the base station in case of wireless connections. Since criteria 1 and 2 are already defined in the EECC, the Guidelines cannot change these criteria and it is not possible to add further conditions e.g. that the performance thresholds of criterion 3 and 4 respectively need to be fulfilled and it is also not possible to remove them since, according to the EECC, networks which meet these criteria qualify as very high capacity networks. The Guidelines have been adapted in order to make this clearer.

BEREC welcomes that a stakeholder agrees with para. 18.a of the draft Guidelines and would like to clarify the following with regard to the comment from the BMLRT on para. 18.a that providers should be obliged to offer at a minimum one service that meets criterion 3. The term 'very high capacity network' is already defined in the EECC (Art. 2(2)) and according this definition a network needs to be 'capable of delivering' a certain network

performance in order to be considered as a very high capacity network. The EECC does not define that the network actually has to deliver this network performance. Criteria 3 and 4 correctly reflect this definition. However, in order to determine whether a network does have these capabilities an NRA may demand that a test service which meets the performance thresholds 1 or 2 is implemented in the network. The Guidelines have been adapted in order to make this clearer.

Concerning Liberty Global's comment that it is not clear how NRAs can determine whether a criterion is fulfilled if the network does not offer a service which meet this criterion, BEREC would like to clarify, as explained above, according to the EECC, it is sufficient that a network is capable of delivering a certain network performance and does not need to actually offer it. In case the network operator does not (yet) offer a service which meets the performance thresholds of criterion 3 or criterion 4, then the proof whether these performance thresholds are met may be based e.g. on measurements with test implementations in the network (see footnotes 21 and 22 in the draft Guidelines). The Guidelines have been adapted in order to make this clearer.

Regarding the comment from Javier Aracil et. al on para. 18 that the purpose of the distinction between 'achieved' and 'achievable' network performance is not clear, BEREC would like to point out that para. 18 solely states that it is sufficient that a network is capable to provide a service which meets the performance thresholds of criterion 3 or criterion 4 and does not refer to 'achieved' or 'achievable' network performance.

BEREC's response to the suggestion of a stakeholder that a distance parameter for the copper loop should be added is that criterion 3 applies to any network (also to networks without a copper loop) and, therefore, it is not possible to add the proposed distance parameter.

With regard to ESOA's proposal that the long distances in para. 18.e of the draft Guidelines should be applicable to satellite networks, BEREC would like to clarify that these distances refer to distances as the crow flies and not to distances from earth to satellite and back to earth which would result, according to ESOA, in an increase of the round-trip IP packet delay of 715 ms. The Guidelines have been adapted in order to make this clear.

Concerning 1&1 Telecom's view that the Guidelines should underline a differentiation between mobile and fixed networks, BEREC would like to point that the draft Guidelines already do this in para. 19 with the introduction of 'fixed very high capacity networks' and 'wireless very high capacity networks'.

BEREC's response to (i) DIGITALEUROPE's view that the Guidelines must emphasize that fixed and wireless networks remain complementary, to (ii) BREKO's view that the significant role of fixed very high capacity networks should be further emphasized and to (iii) Ericsson's view that NRAs should be encouraged to base policies on services and service levels rather than 'fixed' and 'wireless' networks is that, according to the EECC (Art. 82), the scope of the Guidelines is the definition of the criteria a network has to fulfil in order to be considered as a very high capacity network and does not include other aspects.

BEREC welcomes that BUGLAS agrees with BEREC's approach regarding FWA solutions. BEREC also welcomes that another stakeholder agrees with BEREC's approach to consider

5G FWA networks, when fulfilling criterion 2 and/or criterion 4 and also criterion 3, as equivalent to a fixed very high capacity network.

Regarding the comment from BREKO and ELFA that FWA networks must fulfil the QoS thresholds of criterion 3 in order to be considered equivalent to a fixed very high capacity network, BEREC would like to point out that para. 20 already provides this.

Concerning EOLO's comment that FWA should be considered a very high capacity network if the fibre is installed up to the base station, BEREC would like to clarify that, according to criterion 2, any network and, therefore, also a network based on FWA which provides a wireless connection with fibre roll-out up to the base station is considered to be a very high capacity network. However, since this network fulfils criterion 2 it is a 'wireless very high capacity network' and in order to be considered equivalent to a 'fixed very high capacity network' it also needs to fulfil criterion 3 (see para. 19 and 20 of the draft Guidelines).

With regard to MEO's opinion that it is not clear how a network that meets criteria 2 or 4, or both, can also meet the performance thresholds of criterion 3, BEREC would like to clarify that criteria 2 and 4 apply to any network, and therefore also to networks based on FWA. In case a network based on FWA not only fulfils criterion 2 and/or criterion 4 but also meets the performance thresholds of criterion 3 then it may be considered to be equivalent to a 'fixed very high capacity network' (see para. 20 of the draft Guidelines).

BEREC's response to the comment from Javier Aracil et. al that the radio conditions necessary to meet the minimum performance levels should be known is that any network which provides a wireless connection and meets the performance thresholds of criterion 4 qualifies as very high capacity network independent from the technological implementation. According to para. 18.f of the draft Guidelines the performance thresholds of criterion 4 refer to the average value within the coverage area considered and, therefore, the different radio conditions of this network in the coverage area considered are taken into account.

BEREC does not agree with ecta's view that the guidance contained in para. 20 of the draft Guidelines should be deleted since no added value derives from demonstrating that also the performance thresholds of criterion 3 are met. As pointed out in para. 19 of the draft Guidelines, 'very high capacity network' does not represent a unified concept and two different categories, 'fixed' and 'wireless' very high capacity networks can be distinguished. Therefore, in case of networks based on FWA it may be relevant whether they also are considered to be equivalent to a 'fixed very high capacity network'.

BEREC welcomes that NLconnect considers BEREC's intention to update criterion 4 as soon as possible and not later than 2023 to be sensible.

Regarding the comment from FTTH Council Europe that the criteria for the definition of 'very high capacity networks' need to be updated regularly and ecta's view that the criteria 'as soon as possible and not later than 2023' and 'mature deployment and significant penetration' should be removed, BEREC would like to clarify that the EECC (Art. 82) demands that the Guidelines will be updated by 31 December 2025 and regularly thereafter but not that the Guidelines need to be updated regularly already before 2025. Para. 23 of the draft Guidelines solely informs that criterion 4 will already be updated earlier than 2025 since it was not yet possible to take 5G fully into account. The criterion 'mature deployment and

significant penetration' of 5G is necessary since only then it is possible to update criterion 4 and for stakeholders it is useful to know when this update will be done at the latest.

Concerning ecta's comment that it seems there would be sufficient basis for considering already available 5G performance, BEREC would like to point out that 5G had not yet been deployed in networks to a relevant extent at the time when it was necessary to collect the data for the development of these Guidelines (see para. 36 of the draft Guidelines). In addition, the EECC demands to consider 'under usual peak-time conditions' and in the beginning 5G networks are still rather empty since only test users or very few end-user already use the 5G service and, therefore, in such a networks 'usual peak-time conditions' do not yet occur.

BEREC welcomes that BMLRT strongly supports para. 24 of the draft Guidelines and that BREKO and ELFA agree with the content of this paragraph.

BEREC's response to 1&1 Telecom's opinion that copper infrastructure shall not be regarded as eligible for funding and eir's view that it is extremely likely that national authorities will make reference to the Guidelines in determining the allocation of public funds is that policy instruments regarding public funding need to be based on their objectives and this is not within the scope of the Guidelines. Para. 24 of the draft Guidelines already makes clear that the Guidelines define criteria for the application of the EECC and they should not be interpreted as a view on the appropriateness for any other policy instrument e.g. public funding.

BEREC welcomes that DigitalES and Ericsson agree with BEREC's acknowledgement that matters of state aid go beyond the scope of the Guidelines as outlined in para. 24 of the draft Guidelines. BEREC, however, does not agree with the suggestion to remove any references to public funding from this paragraph, since it is important that the Guidelines make it clear what is within the scope of the Guidelines and what is not.

5 Determination of the performance thresholds 1 and 2

5.1 Stakeholder responses

Para. 29: The limitation of wireless networks to mobile access technologies appears problematic

In ecta's view, the limitation of wireless networks to mobile access technologies appears problematic especially in the transition to 5G as a technology generation incorporating both mobile and FWA solutions. Ecta considers it important that all wireless technologies should be able to qualify for consideration in defining relevant thresholds. Potentially exclusionary effects of focussing on only one technology should be weighed in particular since in the fixed technology space, two access technologies have been considered.

Para. 30, 34, 35: ELFA agrees with the 'best in class'-approach

ELFA agrees with the 'best in class'-approach chosen by BEREC to determine the QoS parameters that needs to be fulfilled by a network to qualify as very high capacity network. The reference network should be an FTTB network, with the best available in-house

transmission technology. G.fast 212 MHz can be used as a good interim solution. This creates necessary incentives to further deploy FTTB networks in Europe and establishes a strong infrastructure foundation for the remaining investment into FTTH networks.

Para. 36: Remove 'BEREC expects that 4G and earlier generations of mobile networks are not able to meet performance thresholds 2'.

In the view of DigitalES and Ericsson, the Guidelines should reflect the dynamics of the industry, by offering a flexible framework for NRAs to include upgrades implemented to existing technologies as well as improvements obtained by network design. DigitalES argues that the evolution of LTE continues to be relentless and 4G LTE by 2021 from which the Guidelines are valid, normally can fulfil performance thresholds 2. Ericsson is of the opinion that the Guidelines must avoid to explicitly exclude any current technologies or evolution thereof as alternative to implement very high capacity network. Current text indicates that 4G and some earlier generations are not able to meet performance thresholds 2 which is not accurate and should be removed.

Para. 38 and 40: Specific situations in which to apply performance thresholds 1 and 2 need to be defined

Javier Aracil et. al are of the view that it is necessary to define specific situations (e.g. traffic profile, number of users who share the medium, length of the access media, life cycle of the cables etc,) in which to apply performance thresholds 1 and 2, otherwise it is not possible to establish specific criteria to decide if an electronic communication network is a very high capacity network or not, and under what conditions. Javier Aracil et. al also argue that the use of 'achievable' but not 'achieved' and 'highest end-user QoS (data rate) possible' in para. 38 gives ample room for any QoS level.

Para. 39: 'Typical end-user QoS' shall include the inter-network segment

National Association of ISPs in Romania (ANISP) argues that not all networks are interconnected directly and that for this reason the typical end-user QoS considered in para. 39 shall include also the inter-network segments. When the ends are in different networks end-to-end services are degraded by the transit path.

Section 4.5 QoS parameters: NLconnect agrees with the QoS parameters

NLconnect is of the opinion that the definition of criteria 3 and 4 should be as technology neutral as possible and that the QoS parameters serve this purpose.

Section 4.5 QoS parameters: BEREC should conduct an assessment of the available performance tools

MEO suggests that BEREC should conduct an assessment of the available performance tools operators have for measuring QoS parameters (and the available/existing/used performance parameters). MEO expects that the proposed assessment on the recommendations and standards Y.1540, RFC 2681 and RFC 3393 reveals a set of certified suppliers and equipment, namely a central platform to program and monitor the test plans and also to support the distributed probes mechanisms.

Section 4.5 QoS parameters: An effort from BEREC should be made in order to define a precise test plan

MEO also proposes that BEREC should define a framework for the application of the several existing recommendations on QoS to each very high capacity network implementation scenario. In MEO's view an effort from BEREC should be made in order to define a precise test plan on which these measurements are to be taken since all operators should have the same common base methodology.

Section 4.5 QoS parameters: Alignment with other BEREC Guidelines

TIM suggests that the latency (delay), the delay variation (jitter) and the IP packet loss ratio definitions should be aligned to the ones provided in the BEREC Guidelines detailing quality of service parameters (BoR (20) 53, Table 1A, p. 13) in order to ensure the consistency with the EECC Annex X and across different BEREC guidelines.

Section 4.5 QoS parameters: Non-comparable data from operators may have been collected

TIM believes BEREC may have collected non-comparable data from operators due to the absence of a clear definition of parameters. BEREC did not provide a definition of peak time conditions which might have led to different interpretation by operators responding to the questionnaires. Different operators may have referred to different parameters since the questionnaire requested the 'data rate of the IP packet payload or otherwise specify the OSI layer to which the data rate refers to and whether it refers to payload or gross bitrate' and asked 'in case values cannot be provided for a certain QoS parameter, please provide values for a comparable QoS parameter'.

Para. 45: Throughput instead of data rate should be considered

TIM is of the view that the Guidelines should consider throughput instead of data rate. TIM argues that data rate is not representative of the end-to-end QoS experienced by the end user, which instead actually depends on the application throughput. For example, the thresholds defined for criterion 3 would mean that the end-user experience a throughput of about 200 Mbps. Should an operator build an infrastructure capable of providing a similar, equivalent or even better throughput for the end-user by improving IP packet loss ratio and round-trip IP packet delay against a lower downlink data rate target, this network should be considered similar and thus qualified as very high capacity network. A throughput-based threshold would therefore allow operators a greater flexibility in deciding how to efficiently reach a certain network performance.

5.2 BEREC response

BEREC's response to ecta's view that the limitation of wireless networks to mobile access technologies appears problematic is that the determination of the performance thresholds of criterion 4 are based on mobile networks since end-user services provided by wireless networks are typically mobile services based on mobile networks (see para. 29 of the draft Guidelines). In the EU, services based on networks with a FWA (other than 3G/4G) are currently a niche product in most EU countries and, therefore, only available for and used by

a rather small share of end-users in the EU and not representative for the end-users in the EU.

BEREC welcomes that ELFA agrees with the ‘best in class’-approach chosen by BEREC to determine the performance thresholds.

Regarding the suggestions from DigitalES and Ericsson to remove in para. 36 ‘BEREC expects that 4G and earlier generations of mobile networks are not able to meet performance thresholds 2’, BEREC would like to clarify that the performance thresholds 2 (criterion 4) are based on the ‘best’ LTE Advanced networks in the EU and, therefore, it is likely that most of the current LTE Advanced (or earlier generations) networks in the EU will not meet these thresholds. The Guidelines have been adapted in order to make this clearer.

Concerning the comment from Javier Aracil et. al that the specific situations in which to apply performance thresholds 1 and 2 need to be defined, BEREC would like to clarify that any network qualifies as a very high capacity network in a certain coverage area if it provides a fixed-line / wireless connection and meets the performance thresholds 1 / 2 regardless its technological implementation (e.g. technology used, length of the access line, size of the shared medium). The performance thresholds are met if in the coverage area considered an end-user will experience, under usual peak-time conditions, on average at least the QoS of the performance thresholds 1 / 2 (see para. 69 and 75 of the draft Guidelines). Therefore, there is no need to define any further specific situation under which the performance thresholds need to be met.

BEREC’s response to the proposal from the National Association of ISPs in Romania that the ‘typical end-user QoS’ shall include the inter-network segment is that only the characteristics of the network are relevant for the determination whether a network qualifies as very high capacity network, not the inter-network segment which belongs to a different network.

BEREC welcomes that NLconnect agrees with the QoS parameters defined in the Guidelines.

With respect to MEO’s suggestion that BEREC should conduct an assessment of the available performance tools, BEREC would like to point out that the Guidelines do not prescribe to the network operators which measurement tools they should use since different measurement tools may be in use and it would not be appropriate to force operators to replace or implement further tools.

Regarding MEO’s comment that an effort from BEREC should be made in order to define a precise test plan, BEREC would like to clarify that according to the draft Guidelines (para. 69, 75) it is possible to use for the determination whether or not criteria 3 and 4 are met internet speed tests (criterion 3) and drive tests (criterion 4). The use of internet speed tests and drive tests is common and these test methods seem to be sufficiently defined.

Concerning TIM’s suggestion that the latency (delay), delay variation (jitter) and IP packet loss ratio definitions should be aligned with the BEREC Guidelines on QoS parameters (BoR (20) 53, Table 1A), BEREC would like to clarify that this is the case for latency (delay) and delay variation (jitter) since both guidelines refer to RFC 2681 and RFC 3393. For the IP

packet loss ratio, the draft Guidelines use Y.1540 instead of Y.2617 since this standard was more appropriate (see para. 49, footnote 13 of the draft Guidelines).

BEREC's response to TIM's comment that non-comparable data from operators may have been collected is as follows. In case of the data rate, the questionnaire asked for the OSI layer and whether it refers to payload or gross bitrate and with this information data rates are comparable. With regard to the comparable standard, BEREC would like to clarify that it was very rarely that operators referred to a different standard and these data have not been taken into account.

With respect to TIM's view that throughput should be considered instead of data rate, BEREC would like to clarify that criteria 3 and 4 refer to any network and, therefore, the QoS parameters also need to be applicable to any network, even to networks which are not yet deployed but will be deployed when the Guidelines are in force. Since today nearly all communications networks are based on the Internet Protocol (IP), the QoS parameters are based on IP (see para. 42 and 43 of the draft Guidelines). Therefore, the data rates are also based on IP, the IP packet payload (see para. 45 of the draft Guidelines), and not on the application throughput as suggested by TIM.

6 Application of the criteria 1 to 4

6.1 Stakeholder responses

Para. 60: ELFA fully agrees that any FTTB or FTTH network is considered as a very high capacity network

ELFA fully agrees with the proposed Guidelines that any FTTB or FTTH network is considered as a very high capacity network regardless of the respective transmission technology. Thus, any network providing a fixed-line connection that is fibre of at least up to the multi-dwelling building must be considered as a very high capacity network without any exceptions.

Para. 61 and 65: Minimum requirements need to be established based on the objectives of the Gigabit Society

Javier Aracil et. al is of the view that it is not sufficient to 'desire' but instead minimum requirements must be established based on the objectives of the Gigabit Society (see also Javier Aracil et. al response to para. 16 above), in particular those related to high performance 5G connectivity.

Para. 74: The phrasing 'appropriate sub-areas' is too ambiguous

Javier Aracil et. al argues that the phrasing 'appropriate sub-areas (e.g. coverage area of base station or group of base stations)' is too ambiguous, as it can span the range of a femto-cell to a group of macro-cells, corresponding to a sub-area size of few square meters to several square kilometers. Importantly, this vague definition of per-sub-area very high capacity network classification for wireless networks is likely to cause conflict with the granularity of geographic grids required for EU broadband mapping.

Para. 75: It is problematic to consider the average user and drive tests have implications on EU broadband mapping guidelines

In the view of Javier Aracil et. al it is problematic that the sub-area of the wireless network is considered to be very high capacity network if the performance of the average user in the sub-area meets the performance thresholds 2 since this means that it is possible that 50% or more of the users in that network sub-area have performance under the very high capacity network threshold and the sub-area will still be classified as a wireless very high capacity network.

Javier Aracil et. al also note that by mentioning 'drive tests', para. 75 implies that the verification of whether the very high capacity network thresholds are met would be done via QoS-2 field measurement tests. This definition and similarly also footnote 22 have implications, and a potential for conflict, with EU broadband mapping guidelines which primarily rely on QoS1-based theoretical calculations/estimates of broadband reach mapping.

Section 5.3: A network can either be a very high capacity network or not but not a very high capacity network up to a certain point

Open Fiber deems appropriate to clarify para. 68 which introduces the division of each network in sub-areas, which seems to suggest that the same network can be very high capacity network up to a certain point and non-very high capacity network after that point, however, a network can either be a very high capacity network or not.

In the view of Open Fiber, section 5.3 does not appear to give enough clarity with regard to the conditions that such networks have to fulfil in order to be considered very high capacity network. Open Fiber would suggest BEREC adds the distance between the point where the network ceases to consist of fibre and the end-user's premises to the list of parameters under criterion 3.

Section 5.3 and 5.4: In TIM's view the draft Guidelines include inconsistencies

In the view of TIM, section 5 of the draft Guidelines includes inconsistencies. On the one hand BEREC states in para. 67 and 73 respectively that for meeting criterion 3 / 4 it is sufficient that the network is capable to provide a service which meets the performance thresholds 1 / 2. On the other hand, it requires in para. 69 and 75 respectively that the end-users in this sub-area will typically experience at least the QoS of the performance thresholds 1 / 2. BEREC even mentions the use of speed test and drive test for measuring the QoS (in para. 69, 75). If the BEREC criteria shall be assessed through measurements, also the definition of the thresholds shall reflect QoS which could be actually achieved and measured or if the thresholds refer to achievable performance, then criteria 3 and 4 shall be assessed on the basis of the theoretical achievable performances declared by operators.

Para. 75: It should be made clear that drive test method is only one example methodology

DigitalES and Ericsson point out that in para. 75 of the draft Guidelines, BEREC should strengthen the clarification that drive test is only one example out of many alternatives. In the view of DigitalES, the Guidelines should also encourage NRAs to use performance

measurement methodologies according to the service delivered by the network and in Ericsson's view the Guidelines should clarify that NRAs can use other methodologies considering their suitability with the service delivered by the network.

6.2 BEREC response

BEREC welcomes that ELFA fully agrees that any FTTB or FTTH network is considered as a very high capacity network.

Regarding the comment from Javier Aracil et. al that in case of criteria 1 and 2 minimum requirements need to be established based on the objectives of the Gigabit Society, BEREC would like to clarify that the term 'very high capacity network' is already defined in the EECC (Art. 2(2), Rec. 13) and according to this definition fibre roll-out up to a certain point is sufficient for a network to be classified as very high capacity network. Therefore, it is not possible to include in criteria 1 and 2 additional conditions as e.g. minimum requirements which need to be fulfilled.

Concerning the view of Javier Aracil et. al that the phrasing 'appropriate sub-areas' is too ambiguous, BEREC would like to point out that the draft Guidelines give also examples of appropriate sub-areas (e.g. multi-dwelling building, group of single-family houses) and, therefore, also provide guidance on what is an appropriate sub-area (see para. 68 and 74 of the draft Guidelines). However, BEREC is of the view that the exact definition of the appropriate sub-area is best done on a case-by-case basis taking into account the specifics of the networks and the possibility to verify whether the performance thresholds of criterion 3 / 4 are met. This may result in a sub-area which e.g. covers several femto cells or only one or a few small cells.[3] In BEREC's view this does not cause conflict with the granularity of geographic grids required for EU broadband mapping since if a network qualifies as a very high capacity network in a certain sub-area then a very high capacity network is available in each square of the geographic grid in this sub-area.

BEREC's response to the comment from Javier Aracil et. al that it is problematic to consider the average user is that the performance thresholds have been determined based on average (not e.g. minimum) values reported from the operators and, therefore, it is necessary to apply the performance thresholds also as an average value. On average an end-user will experience a QoS according to the performance thresholds in the sub-area considered. With regard to the EU broadband mapping guidelines mentioned by Javier Aracil et. al, BEREC would like to clarify that the BEREC Guidelines on geographical surveys (Art. 22) are based on the draft Guidelines and, according to para. 24 of the draft Guidelines, the draft Guidelines should not be interpreted as a view on their appropriateness for any other policy instrument.

BEREC agrees with Open Fiber's comment that a network can either be a very high capacity network or not but not a very high capacity network up to a certain point and would like to clarify that, according to para. 68, the coverage area is divided in appropriate sub-areas and a network may qualify as a very high capacity network in a certain coverage area but not in a

[3] Macro cells seem not to play a significant role in case of LTE-Advanced (and 5G) and the provision of services with high data rates.

different coverage area. Regarding Open Fiber's suggestion to add the distance between the point where the network ceases to consist of fibre and the end-user's premises to the list of parameters of criterion 3, BEREC would like to clarify that the performance thresholds of criterion 3 apply technological neutral to any network providing a fixed-line connection independent from this distance.

Concerning TIM's view that the draft Guidelines include inconsistencies since, on the one hand, it is sufficient that a network is capable to meet the performance thresholds and, on the other hand, the draft Guidelines (para. 69 and 75) mention speed test and drive test for measuring the QoS, BEREC would like to clarify that, according to criteria 3 and 4 (para. 16), a network needs to be capable of delivering services to end-users with a certain QoS and when an NRA examines whether this is the case it may measure the QoS with e.g. speed tests or drive tests. For these reasons, BEREC does not see any inconsistency with regard to this. However, the Guidelines have been adapted in order to make this clearer.

Regarding the comment from DigitalES and Ericsson that it should be made clear that drive test method is only one example methodology, BEREC would like to point out that the draft Guidelines already do this in para. 75 which states 'For example, if the data rate in this sub-area will be measured during peak-time with a drive test, […]'. However, in order to avoid any misunderstanding para. 75 has been adapted in order to make this point even clearer.

7 Annexes of the draft Guidelines

Responses from stakeholders which refer to both the main body and to an annex (or several annexes) of the draft Guidelines are included in the section(s) above (not in this section).

7.1 Stakeholder responses

Concern about the representativeness of BEREC's approach

Ecta is concerned about the representativeness of BEREC's approach since the geographical distribution of the questionnaires taken into account shows significant imbalances by country, the already small populations of G.fast, DOCSIS and LTE-A respondents are further reduced and the draft Guidelines provide only high-level description and no analysis or discussion of the precise technology specifications and their parametrisation. Ecta suggests that BEREC and especially its members should engage in exchange with operators to further extend and consolidate the evidence base across the jurisdictions they represent.

Undocumented assertions and conceptual decisions

In the view of ecta, the draft Guidelines relies on a number of assertions and conceptual decisions that remain undocumented and/or without supporting argument, as for example the typicality of copper and coax access for end-user services provided from the distribution point (see para. 28) and the relatively uncommon character of Ethernet deployment on in-building twisted pair cables (see para. 113).

7.2 BEREC response

BEREC's response to ecta's concern about the representativeness of BEREC's approach is that the NRAs sent the questionnaires to the network operators at the national level and all operators had the possibility to fill in the questionnaires. BEREC has only the possibility to take into account the questionnaires it receives and cannot force operators to complete them. In addition, the Guidelines have to follow the approach defined in the EECC (Art. 2(2), Rec. 13) and therefore, the determination of the performance thresholds of criteria 3 and 4 is based on the 'best' technologies, as already explained above, and the corresponding questionnaires and not on all questionnaires BEREC received. In addition, the draft questionnaires were sent to the network operators and their comments e.g. on parameters used in the questionnaires were taken into account in the final questionnaires.

Regarding ecta's comment on undocumented assertions and conceptual decisions, BEREC would like to clarify that para. 28 of the draft Guidelines clearly explains the reason why copper and coax-based in-building infrastructure are considered which is that the in-building infrastructure of FTTB networks in the EU is typically based on these media and, therefore, contrary to other media, these are representative for the EU. The draft Guidelines also explain in detail (see para. 232 to 234) why in-building twisted pair cable of category 5 or higher has not been used for the determination of the performance thresholds of criterion 3.

Abbreviations

AGGFA	Action Group Gigabit Fiber Access
AMTEGA	Galician Agency for Technological Modernization
ANISP	Asociatia Nationala Internet Service Providerilor din România
BEREC	Body of European Regulators for Electronic Communications
BMLRT	The Austrian Federal Ministry of Agriculture, Regions and Tourism
BoR	Board of Regulators
BREKO	German Broadband Association
BUGLAS	German Federal Association of Fiber Access Operators
CET	Central European Time
CMG-AE	Computer Measurement Group - Austria & Eastern Europe
DAE	Digital Agenda Europe
DigitalES	The Spanish Association for Digitalisation
DOCSIS	Data Over Cable Service Interface Specification
DSL	Digital Subscriber Line
ECTA	European Competitive Telecommunications Association
EECC	European Electronic Communications Code
EC	European Commission
ELFA	European Local Fiber Alliance
ESOA	EMEA Satellite Operators Association
EU	European Union
FTTB	Fibre-To-The-Building
FTTH	Fiber-To-The-Home
FWA	Fixed Wireless Access
GPON	Gigabit Passive Optical Network
GSMA	Global System for Mobile Communication Association
HFC	Hybrid Fiber-coaxial
ISP	Internet Service Provider
ITU	International Telecommunications Union
KPI	Key Performance Indicator
LTE	Long Term Evolution
LTE-A	Long Term Evolution - Advanced
NLconnect	The Dutch broadband trade association
NGA	Next Generation Access
NRA	National Regulatory Authority
QoS	Quality-of-Service
VDSL	Very high speed Digital Subscriber Line
VHC	Very High Capacity
VKU	German Association of Local Public Utilities

List of Stakeholders

Network operator

1&1 Telecom
Eir
EOLO S.p.A.
Hutchison Drei Austira
Liberty Global
MEO (Altice Portugal)
Open Fiber S.p.A.
TIM S.p.A (Telecom Italia)
Vodafone Group
[Confidential]
[Confidential]

Association of network operators at national level

ANGA
ANISP - Asociatia Nationala Internet Service Providerilor din România
BREKO - The German Broadband Association
BUGLAS - The German Federal Association of Fiber Access Operators
CableLabs
CMG-AE AGGFA - Computer Measurement Group - Austria & Eastern Europe, Action Group Gigabit Fiber Access
DigitalES - The Spanish Association for Digitalisation
VKU - German Association of Local Public Utilities
NLconnect - The Dutch broadband trade association

Association of network operators at European or international level

DIGITALEUROPE
Ecta – The European Competitive Telecommunications Association
ELFA - European Local Fiber Alliance
ESOA - EMEA Satellite Operators Association
FTTH Council Europe
GIGAEurope
GSMA

Vendors

ADTRAN
Ericsson
[Confidential]
[Confidential]

Authorities

AMTEGA - The Galician Agency for Technological Modernization
BMLRT – The Austrian Federal Ministry of Agriculture, Regions and Tourism

Other

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