Liberty Global response to BEREC's draft Guidelines on Very High Capacity Networks

Liberty Global welcomes this opportunity to provide feedback on BEREC's draft Guidelines on Very High Capacity Networks (VHCN). We particularly appreciate BEREC bringing the consultation period forward to Q1 to allow stakeholders more time to provide input, and allowing extra time for responses in light of the COVID-19 situation. Following this consultation, we would appreciate further opportunity to engage with BEREC on the Guidelines.

Commission's strategy on Connectivity for a European Gigabit Society

The Commission's strategy on Connectivity for a European Gigabit Society (Gigabit Society Strategy), adopted in September 2016, sets a vision of Europe where availability and take-up of VHCN enables the widespread use of products, services and applications in the Digital Single Market. The Commission launched a series of complementary initiatives to help reach these objectives, including the new European Electronic Communications Code (Code)[1]. This vision, that confirms and builds upon the previous broadband objectives for 2020, relies on three main strategic objectives for 2025:

- Gigabit connectivity for all of the main socio-economic drivers,
- Uninterrupted 5G coverage for all urban areas and major terrestrial transport paths, and
- Access to connectivity offering at least 100 Mbps for all European households.

This Gigabit Society Strategy clearly defines the objectives of VHCN and the applicable legal framework, the Code. It is within these settings, as well as the principles of appropriateness and proportionality, that BEREC must develop its Guidelines – going beyond this would not only be contradictory to the objectives of the Gigabit Society Strategy and the Code, but would also slow down shaping Europe's digital future.

Liberty Global's GigaNetworks

HFC network operators have long been the leaders in investment in very high-speed networks across Europe. Liberty Global operates far-reaching, scalable, multi gigabit-fast networks that rely on optical fibre at their core. We have invested significantly — demonstrated through our high capex-to-turnover ratio — and continue to invest in upgrading our networks to the DOCSIS 3.1 standard, amongst other capacity upgrades. This not only includes moving fibre closer to the end-user, but also investing in new active equipment, backend capacity and technology improving the reliability of our services.

Because of these upgrades, a large portion of our network today is already meeting the Commission's requirements for Connectivity for a European Gigabit Society. Our networks are built to provide Gigabit speeds, ultra-high capacity, reliability, and resiliency for our customers. We are now offering 1 Gbps – 10 times the speed foreseen in the Gigabit Society Strategy – services to 10 million homes across the UK, Netherlands, Belgium, Switzerland, Poland and Slovakia. Going forward, Liberty Global stands ready to offer 1 Gbps commercial services across our entire footprint, and we plan to roll these

[1] Directive (EU) 2018/1972 establishing the European Electronic Communications Code (Recast), OJ L 321/36 [2018] (EECC).

out over the next 12 months. The cable industry has been anticipating consumer demand for better network performance for many years and has invested significant effort into laying the groundwork for 10G.[2] 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. However, for Liberty Global to continue to realise these network improvements over time — and in line with demand for higher capacity and reliability — it is necessary to continue to undertake these gradual, but significant, investments. Our networks ensure a high level of competitive pressure towards incumbents and service-based operators, incentivising them to make investments. Regulation favouring any specific technology at this stage is likely to chill investment in cheaper and faster-to-deploy technologies, just as Europe is ramping up efforts to improve the availability and take-up of very-high capacity broadband services. A mixed technology approach will not only maximize scope for innovation and infrastructure competition, but can also serve as the most cost-effective means to achieve Gigabit Society objectives.

Today, as society faces the challenges associated with COVID-19, our HFC networks have demonstrated that they are fast, reliable and capable of supporting the expected broadband and traffic demands of wide-scale home working and school closures. More than ever, our networks are providing critical connections to families, friends and loved ones, as well as the wider community of business, government, universities and hospitals.

Liberty Global strongly supports regulatory policies that facilitate private deployment of VHCN and sees itself as having a key role in the investment and deployment of VHCN in Europe. The European Commission, as well as other policy-makers and governments, recognised these significant and continuous investments. Subsequently, our existing upgraded DOCSIS 3.1 HFC networks are to be recognised as VHCN. We understand this was also the intention of the EU legislative bodies. In this regard, we note that the capabilities of HFC networks have already been acknowledged by the Commission in its decision regarding the Bavarian 'grey areas' state aid case, where it found that DOCSIS 3.1 networks constituted very high capacity infrastructure.[3] Similarly, Ofcom has consistently categorised Virgin Media's DOCSIS network as 'Ultrafast', alongside FTTH, for the purpose of market assessments[4] and public data reporting.[5]

We note that BEREC states that its criteria should not be interpreted as a view on the appropriateness of such criteria for any other policy instrument, including public funding.[6] Rather, it states that the criteria are relevant only to the qualification of a network as a VHCN for the application of the Code. However, it is important to recognise that the definition of — and ability to qualify as — a VHCN will

[2] For more information, see: CableLabs, 10G: Enabling Future-Ready Networks (Spring 2020).
[3] European Commission, State Aid SA.48418 (2018/N) – Germany: Bavarian gigabit pilot project, C(2018) 8617, Brussels, 18.12.2018.
[4] For example, Ofcom WLA (2018), Final Statement, paragraph 2.12, https://www.ofcom.org.uk/__data/assets/pdf_file/0020/112475/wla-statement-vol-1.pdf.
[5] Ofcom Connected Nations Report (2018) methodology, https://www.ofcom.org.uk/__data/assets/pdf_file/0033/129975/connected-nations-2018-methodology.pdf.
[6] Draft BEREC Guidelines on Very High Capacity Networks, BoR (20) 47, 5 March 2020 (Draft VHCN Guidelines), §24.

have a number of implications, some of which are currently known (such as those arising under the Code provisions) and some which are not yet known. For example, in addition to the potential effect on future investment, there are of course a number of potential regulatory flow-on effects for VHCN under the Code in respect of regulatory pricing, state aid, national broadband plans and the 'designation' of non-VHCN areas under article 22(3) of the Code, eligibility for co-investment and related regulatory relief. However, the terminology may also be adopted in a wider range of regulatory instruments at both EU and national level (e.g. in Germany, there are implications for rights of way).

The Code provides clear legal basis for what constitutes VHCN

Under article 2(2) of the Code, a VHCN means an electronic communications network which consists 'wholly of optical fibre elements at least up to the distribution point at the serving location' or a network that is 'capable of delivering, under usual peak-time conditions, similar network performance in terms of available downlink and uplink bandwidth, resilience, error-related parameters, and latency and its variation'. Under article 82 of the Code, BEREC is required to issue guidelines on the performance criteria that a network must fulfil in order to be considered a VHCN. For fixed networks, and as noted in recital 13, this corresponds to the performance achievable by a FTTB network (with fibre up to the multi-dwelling building).

BEREC's draft Guidelines introduce four criteria for a network to be considered VHCN. For networks that do not automatically fall under criterion 1 or 2, BEREC defined a number of performance thresholds that those networks must meet to qualify as a VHCN. A fixed network will be considered a VHCN if it has rolled out fibre at least up to the multi-dwelling building (i.e. FTTB/FTTH networks, criterion 1) or if it meets certain quality of performance thresholds under usual peak-time conditions (criterion 3) — BEREC defined 7 such cumulative performance thresholds (performance thresholds 1).

Liberty Global has very significant concerns regarding BEREC's approach to setting the performance thresholds 1 in criterion 3 – they are not appropriate nor proportionate, go beyond the wording and spirit of the Code, are inconsistent with Code's key principle of technological neutrality and restrict incentives for investment in VHCN. Also, with this approach, BEREC would go beyond its mission which is *"to ensure independent, consistent, high-quality application of the European regulatory framework for electronic communications markets for the benefit of Europe and its citizens".*

Draft guidelines go beyond wording and spirit of the Code

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 Code, which states that a network will be considered a VHCN 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 themselves as VHCN quickly without further analysis being required.

Liberty Global strongly disagrees, however, with BEREC's approach to setting the performance thresholds 1 in criterion 3. BEREC has defined the performance thresholds 1 based on the achievable performance of a FTTB network with the following in-building access technologies: G.fast on twisted

copper pair[7], and DOCSIS 3.1 on coaxial cable. BEREC explains in section 4.2 of the draft Guidelines that the criteria were determined based on the 'best' available technology—hereafter referred to as the 'best technology approach'.[8] Importantly however, there is no mention of such requirements under the Code. The word 'similar' or 'equivalent' within article 2(2) of the Code and recital 13 cannot be read to mean 'best' or 'better than'. Also, the word 'achievable' in recital 13 of the Code cannot be read to introduce new concepts such as 'best technology' into the definition.

BEREC notes in the draft Guidelines that it is focussing on the newest technologies that will be deployed in FTTB networks in the period up to 2025, even if they are only deployed by a small number of operators in the EU, in order to be as future oriented as possible.[9] The principle of technological neutrality is itself designed to ensure that the Code remains future oriented, however future orientation is not a particular tool attributed under the Code to BEREC. In particular, it was not envisaged by the Code that BEREC should define the performance of a 'gold standard' FTTB network (serving as the VHCN benchmark network) and that other types of networks — which would ordinarily be considered VHCN — would need to invest in their networks further to be able to meet this gold standard. Rather, BEREC has been tasked with adopting a minimum benchmark for what is required of a network to show it has similar or equivalent performance to an FTTB network.[10] In this regard, and as outlined in our response to the draft questionnaire on 4 April 2019, the Code does not specify concerning FTTB networks the types of cabling or in-building access technology that should exist between the distribution point and the end-user. Instead, the benchmark case should be determined based on the types of in-building infrastructure in existence. Currently, this may consist of a wide range of technologies with different capabilities (e.g. (V)DSL, G.fast, DOCSIS, Ethernet, fibre, Wi-Fi). Of course, as demand for faster speed services grows, these technologies will be upgraded or even phased out and the standard required of VHCN will become higher – which is recognised by the principle of technological neutrality.

There is no legal basis for BEREC's approach to setting the performance thresholds 1 in criterion 3 based on this best technology approach. The Code – its plain text as well as its spirit – do not provide the legal basis for such a stretch of the words 'similar', 'equivalent' and 'achievable'. Creating a gold standard also contradicts the Code. Moreover, the desire to be as future oriented as possible is not a sufficient nor transparent justification to adopt an overly narrow approach — this is covered by the principle of technological neutrality.[11] With the draft Guidelines and the adoption of the best technology approach, BEREC would go beyond its legal mandate.

[7] More specifically, FTTB operators with G.Fast 212MHz on the copper in-building access. See Draft VHCN Guidelines, §131 and §158.
[8] Draft BEREC Guidelines on Very High Capacity Networks, BoR (20) 417, 5 March 2020, §30-31.
[9] Draft VHCN Guidelines, §31 and §34.
[10] See EECC, recital 13 which refers to the 'baseline scenario'.
[11] The very few responses to BEREC's questionnaires by FTTB operators with DOCSIS 3.1 on cable, and G.fast on copper demonstrates the limited coverage of these technologies.

Draft guidelines inconsistent with Code's key principle of technological neutrality

We will zoom in on technological neutrality, as that is a key cornerstone of the Code. It requires that all EU law (including the Code itself) be applied in a technologically neutral fashion. It is expressly stated in recital 13 that 'in accordance with the principle of technology neutrality, other technologies and transmission media should not be excluded, where they compare with that baseline scenario in terms of their capabilities'. Whilst BEREC applies the principle to networks covered by criterion 3, it does not apply the principle as regards to fixed networks as a whole.[12]

By limiting the types of in-building technologies

BEREC notes in the draft Guidelines that a network that meets criterion 1 may not — and is not required to — meet the thresholds outlined in criterion 3 (performance thresholds 1).[13] The result is to discriminate against non-FTTB/FTTH networks and create a double standard, whereby non-FTTB networks will need to meet higher thresholds than many existing FTTB networks (and likely also some FTTH networks). This is wholly inconsistent with the wording of the Code and the principle of technological neutrality.

Under the draft Guidelines, FTTB networks that have lower performing in-building access technologies — and which therefore have lower quality of service performance — will constitute a VHCN; whereas other existing networks may be excluded due to the requirement that they meet the higher quality of service performance of FTTB networks with G.fast on copper or DOCSIS 3.1 on coax. This is clearly inconsistent with the principle of technological neutrality.

It also should not follow that networks that meet criterion 1 also have to meet criterion 3 and performance threshold 1; the fact that such a question arises clearly demonstrates that the approach taken by BEREC with regard to defining the performance thresholds in criterion 1 is inconsistent and clearly not envisaged by policy-makers when drafting the Code provisions. Whilst BEREC states that it is 'desirable that technologies which are deployed inside the building correspond to the performance potential of FTTB', this statement is not sufficient to remedy the inherently discriminatory approach taken by BEREC.[14]

It is foreseeable that the use of some lower performing in-building access technologies will be phased out in the future and it is for this reason that BEREC is required to update the guidelines regularly.[15] This is not, however, currently the case across Europe. By presuming such a future scenario, BEREC discriminates against HFC operators whose networks are not based on large step upgrades (such as for incumbents migrating from copper to fibre), but on continuous investments and innovation in line with demand. It also creates a double standard that is likely to endure for many years. As Liberty Global submitted in our response to the draft questionnaires, BEREC should therefore not define a

[12] Draft VHCN Guidelines, §70.
[13] Draft VHCN Guidelines, §17b.
[14] Draft VHCN Guidelines, §61.
[15] Under article 82 of the EECC, BEREC is required to update the guidelines by 31 December 2025, and regularly thereafter.

'gold standard' VHCN with future network performance in mind, but rather define a VHCN that reflects the current market realities (including the current network technologies and performance). As demonstrated by the responses to the questionnaires, there are few FTTB network within Europe that are operating commercial services over G.fast 212MHz (one operator) and DOCSIS 3.1 alone (two operators) in-building wiring.[16]

Accordingly, in our view, BEREC should either base its requirements on the performance of 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). The former would ensure that all non-FTTB networks are treated the same as FTTB networks (i.e. are not held to a higher standard). The latter would at least ensure that non-FTTB operators are held to the same standards as the majority of FTTB operators. The Guidelines can then be updated (in 2025 and beyond) just as networks (and in-building technologies) are upgraded to meet end-user demand and future concepts of VHCN. Both approaches would be in line with the text and spirit of the Code, reflecting the word 'similar' or 'equivalent' within article 2(2) of the Code and recital 13.

By adopting the median values

We also question BEREC's adoption of the statistical median in instances where there are very few data points and where outliers have already been eliminated by excluding their questionnaire responses.[17] BEREC should have undertaken more detailed analysis of the merits of each response, including seeking more information from providers. This would have yielded a more realistic and justifiable outcome that reflect real-life networks. We explain this point in more detail in response to the individual parameters below.

The adoption of the median value also means that some FTTB networks that are already running G.fast or DOCSIS 3.1 over the in-building access wiring would not be able to meet the performance thresholds set out in criterion 3. Again, as with adopting the best technology approach, the consequence is that networks captured by criterion 3 have to meet higher performance thresholds than networks captured by criterion 1 (i.e. not only higher performance thresholds than FTTB operators with lower performing technologies such as VDSL, but also FTTB operators with the 'best' technologies but that fall below the median performance). This is also clearly inconsistent with the principle of technological neutrality under the Code.

Network 'capability' and verification

According to the draft Guidelines, a network will meet criterion 3 if it is capable of delivering, under usual peak-time conditions, services to end-users with certain quality of service criteria (i.e. performance thresholds 1). BEREC clarifies that, to qualify as a VHCN, it is sufficient that a network is

[16] Based on the 27 operators that responded to the survey; only 1 operator offering commercial G.Fast 212MHz services (three operators are currently trialling); only 2 operators have a solely DOCSIS 3.1 network (with 9 others having a joint DOCSIS 3.1/3.0 network).

[17] See Draft VHCN Guidelines, §109 in which BEREC excludes 'implausible' results and §125 where BEREC states the median is more appropriate as it is more robust against outliers.

'capable' of providing a service that meets these thresholds, and that it is neither necessary that the operator offers a commercial service that meets these criteria, or that all services provided by the operator meets these thresholds.[18] BEREC also states that in case the network operator does not (yet) offer a service which meets performance thresholds 1, then the proof whether performance thresholds 1 are met may be based e.g. on measurements with test implementations in the network.[19] Moreover, BEREC states that the thresholds are based on achievable and not currently achieved performance.[20]

At first reading, this is relatively clear and suggests that BEREC is basing its performance thresholds off the general technical capabilities of certain network technologies, rather than whether the network is actually delivering such performance today — the latter of which is often based on commercial network management decisions. Such a reading is supported by the fact that BEREC appears to have based some of the performance requirements on lab-based performance results and information provided by vendors.[21] In our view, this approach aligns with the objectives of the Code and promotion of technologies that will deliver the current and future demands of the Gigabit Society (for example, by ensuring that networks that are capable — today or in the near future — of delivering such performance are not overbuilt using state aid).

Certainly, upgraded DOCSIS 3.1 networks are capable of delivering services to end-users that meet the specified performance thresholds — in both a lab-based setting and in real-life networks. Whether HFC services with such performance characteristics are actually offered to consumers will depend on a range of decisions including customer demand, commercial investment and design options.

On the other hand, the above reading does not align with other related BEREC work streams concerning verification. According to BEREC's Guidelines on Geographical surveys of network deployments, BEREC will use QoS-1 — as used for the European Broadband Mapping Project[22] — in conducting the geographic surveys to characterise the reach and performance of broadband networks (incl. the presence or not of VHCN), and will use QoS-2 and QoS-3 indicators as a means of verifying QoS-1 data.[23] This would appear inconsistent with BEREC's draft VHCN guidance. Firstly, it is not clear how BEREC's approach regarding capability of the network aligns with the definition of QoS-1 'theoretical network performance of existing infrastructure', which is determined by looking at the marketed speeds of providers and actual calculated performance of existing services. Secondly, it is

[18] Draft VHCN Guidelines, §18.
[19] Draft VHCN Guidelines, footnote 21.
[20] Draft VHCN Guidelines, §38.
[21] See Draft VHCN Guidelines, §132-135 where BEREC adopts 200Mbps as the upload speed on the basis that one operator (G5) indicates that such performance on G.Fast 212 MHz possible based on experiences with this technology in a lab environment, and which is supported by vendors.
[22] QoS-1: Calculated availability of service, based on theoretical network performance of existing infrastructure; QoS-2: Measured provision of service, measured at the Customer Premises Equipment (e.g. router) excluding end-users' environment; and QoS-3: Measured experience of service, based on actual users' experience when using internet access services including the end-users' environment. See: https://ec.europa.eu/digital-single-market/en/broadband-and-infrastructure-mapping-project .
[23] BEREC Guidelines on Geographical surveys of network deployments, BoR (20) 42, 5 March 2020, page 11.

not clear how national regulatory authorities and other competent authorities can measure services based on end-user quality of service or experience, in each sub-area[24], 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[25])?

In light of the above, and if BEREC does indeed intend for the a capabilities of networks to be verified in this manner, then Liberty Global would have grave concerns regarding the performance thresholds 1 specified for criterion 3. In particular, that — in addition to BEREC's legal interpretation of the provisions raised above — BEREC will have defined performance parameters based on over-simplified analysis and a lack of robust real-life network performance information. Moreover, it will have based its criteria on what appears to be lab-based performance whilst at the same time proposing to verify quality of service based on real-life performance of the network and end-user services. Our detailed concerns regarding the parameters in this regard are set out below.

We understand that BEREC will issue further guidelines in December 2020 on how it intends to verify the quality of service parameters required under the geographic surveys, including existence of VHCN. However, given the significant interrelation between these two projects, we would urge BEREC to explain to stakeholders clearly — and with sufficient time to engage — how it intends to approach this verification process.

Consultation process

In relation to the consultation process, we recognise the initiative of BEREC in issuing an initial call for input on the draft questionnaires. Liberty Global responded on 5 April 2019 to the call for input and urged BEREC to take sufficient time to review and discuss with stakeholders their input to allow stakeholders to provide adequate input on their views. BEREC however did not engage further with stakeholders, but issued on 13 May 2019 a call for stakeholders to complete the finalised questionnaires. In this call for input, BEREC did not reflect on Liberty Global's response, which was in particular relevant to the underlying approach adopted by BEREC, as this served as the basis for the final questionnaires being limited to certain technologies. We also provided a position paper to BEREC and requested an opportunity to discuss our position regarding this topic in late September 2019.

We are particularly concerned that our concerns regarding the best technology approach were rejected at an early stage — without further dialogue — and that, as a result, BEREC did not seek information from operators regarding the performance of a wider range of in-building access technologies and ultimately pre-determining the outcome of these consultations. Furthermore, as a consequence of this narrow data collection exercise, BEREC has moved along much further in the guideline development process and may not have the time (nor likely inclination) to collect further

[24] Draft VHCN Guidelines, §67-29.
[25] Draft VHCN Guidelines, §37.

network information from FTTB operators over alternative in-building access technologies, such as VDSL.

Going forward, we encourage BEREC to hold another stakeholder workshop regarding the draft Guidelines as soon as possible after the consultation process has closed.

Specific comments on the draft Performance Thresholds 1

As noted above, there remain significant questions regarding the approach to verification, and therefore whether the thresholds will be required to be current achievable performance (due to the methods of verification) or whether they will indeed — as BEREC has indicated — be based on the pure technical capability of the network (including future capability).

Liberty Global is concerned, however, that the performance thresholds 1 set out in criterion 3 have been based on information and analysis that lacks robustness and is internally inconsistent. Here it is important to stress that many of these parameters have waterbed effects on other parameters (for example, setting high packet loss requirements could have a negative impact on latency, and potentially also data rates). Whilst many networks, including HFC, may be capable of meeting a range of the performance thresholds, together they set an unreasonably high bar for all fixed network operators. Noting, however, that this will ultimately only affect non-FTTB/FTTH networks (i.e. those required to meet criterion 3), directly in contradiction to the principle of technological neutrality.

This exercise has also been taken without regard to the demand aspect of VHCN and how this affects investment incentives. Broadband networks are generally designed to meet actual and predicted usage over time, plus additional capacity in case of unexpected peaks. For example, as our end-users tend to download significantly more than they upload, our networks are configured to provide more capacity in the downstream direction. These network design and capacity decisions are largely based on the extent to which certain performance characteristics are desired by end-users, and therefore can support a business case. At present, our networks are able to deliver twice as much capacity as is currently consumed in peak time. Below we highlight a number of parameters where BEREC has proposed thresholds that would require significant investment, at little or no benefit to end-users.

Download speed: ≥ 1000 Mbps

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. As noted above, we are offering 1 Gbps services to 10 million homes across the UK, Netherlands, Belgium, Switzerland, Poland and Slovakia. Going forward, Liberty Global stands ready to offer 1 Gbps commercial services across our entire footprint, and we plan to roll these out over the next 12 months. HFC network operators are capable of offering even faster services in the future. The cable industry has been anticipating consumer demand for better network performance for many years and has invested significant effort into laying the groundwork for 10G. 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.

We consider this threshold is broadly in line with the Gigabit Society Strategy and the Code, which promotes investment in broadband networks that 'are capable of providing at least 100 Mbps, and which are promptly upgradeable to gigabit speeds'.[26]

Upload speed: ≥ 200 Mbps

BEREC appears to have based the upload threshold of 200Mbps on what it considers the typically achievable speeds of G.fast 212 MHz services. However, most G.fast operators have not yet deployed 212MHz and will thus have provided the data solely based on field trials or lab tests This would surely not meet the principles of appropriateness and proportionality — this is clearly an example of gold plating that cannot be supported by the wording of the Code or the principle of technological neutrality.

The upload threshold of 200Mbps also appears to be arbitrary from a customer demand perspective. In the past, operators have gradually increased the upload speeds reflecting customer demand and they will continue to do so. Today, upload speeds of less than 20 Mbps are more than sufficient for typical end-user applications, including video-conferencing applications (such as Zoom and WebEx), cloud and gaming. End-users typical upstream data consumption is only 10 per cent of their downstream consumption (even as more people work from home because of the COVID-19 pandemic). A different approach as foreseen by BEREC – unilaterally forcing operators to build the upload speeds that BEREC is advocating in the draft Guidelines would be at odds with sound investment principles. There would be no justification for such forced acceleration of current network plans in light of current upload capacity usage.

The results also serve to demonstrate the lack of fairness in BEREC's approach. Based on Table 4 of the draft Guidelines, only seven (or 26 per cent) of the 27 FTTB operators that responded to the survey would be able to meet the required upload performance threshold of 200Mbps — including one provider operating on DOCSIS 3.0 and only offering 400 MB download speeds. Only five out of the 27 operators would meet both the upload and download speed performance thresholds. Naturally, these FTTB operators would still fall within criterion 1 of the draft Guidelines. Yet, non-FTTB/FTTH operators would need to meet requirements that 81% of the surveyed FTTB operators would not.

Although we consider that adoption of the median is inappropriate, we consider that it would be better than the current approach. It would also be more inconsistent with BEREC's methodology for the other parameters. Here again though, we stress that it is important that BEREC bases its adopted thresholds on well-reasoned analysis, particularly where there are only a few data points. For example, if we were only to look at the FTTB operators running on DOCSIS 3.1 (or joint DOCIS 3.0/3.1) over cable and G.Fast over copper, then indeed the median would be 150 or 161.5Mbps.[27] However, the value of 161.5Mbps is based on a FTTB with G.Fast network offering download speeds of only 627 Mbps — clearly, this network would not be capable of offering both the required 1 Gbps download

[26] EECC, recital 24.

[27] See Draft VHCN Guidelines, §147 where BEREC states that the median is 160Mbps.

and 200 Mbps upload speeds. The upper level of the results also includes a G.Fast FTTB operator with 472 Mbps upload speeds, and only 837 Mbps download speeds.

Liberty Global notes that our upgraded DOCSIS 3.1 networks are capable of delivering 200 Mbps upstream, though the majority is not currently configured to offer such services. Whilst we would be capable of meeting this threshold within a short period it would be very difficult to justify accelerating our current network plans in light of current upload capacity usage and demand.

IP packet error ratio: ≤ 0.05%

Liberty Global's HFC networks are able to meet and even exceed this threshold. Error correction is inherent to the proper operation of DOCISIS networks.

In any case, as mentioned above, we disagree with the use of median values that do not capture the real-life performance of networks. This would surely not meet the principles of appropriateness and proportionality.

IP packet loss ratio: ≤ 0.0025%

Liberty Global has significant concerns with this threshold, in particular that it appears to have been defined solely based on field trials or lab tests — without reference to the performance of real-life networks. This would surely not meet the principles of appropriateness and proportionality. The investments needs to ensure an IP packet loss ratio of ≤ 0.0025% would far outweigh any benefits for consumers. We note that consumers are unlikely to notice any issue with performance where the IP packet loss ratio is ≤ 0.01. Accordingly, BEREC could triple this threshold and there would be no discernible impact on end-user performance.

Round-trip IP packet delay: ≤ 10 ms

BEREC notes in its draft Guidelines that, to take into account long distances between the end-user and the nearest peering point, that the round-trip IP packet delay increases for every 100km by 1 ms. We understand this to mean that BEREC will accept longer round-trip pack delay results in such instances.

It is not clear, however, how BEREC intends (if at all) to verify this parameter and if BEREC intends to require network operators to ensure that their network meets these thresholds at each sub-area of the network. This would surely not meet the principles of appropriateness — it would be impracticable — and proportionality. At present, such parameters are generally only reported based on performance across the whole of the network.

Importantly, there is no guarantee that the content/application services provider will actually send traffic to the nearest peering point (i.e. the peering point located geographically nearest to the end-user). As a result, actual traffic flows and the latency experienced might be very different. Operators cannot unilaterally decide where they peer, as this has to be at a location that makes operational and commercial sense to both parties involved in that relationship (e.g. other operators, content providers, CDNs, etc.). Moreover, this is also a domain that is very much under development. Peering

points are not a static feature of a particular network or network design. Lastly, a round-trip packet delay to the nearest peering point will give no indication of actual latency experienced, as that is also dependent on the route taken towards our network (and characteristics of those networks).

In light of the above, we consider that BEREC should instead specify that this round-trip packet delay threshold of ≤ 10 ms applies only to the access network (i.e. from the end-user network termination point to the access node) and that it can increase by 1 ms for every 100 km beyond. In that case, our HFC networks would certainly be able to meet this threshold. This will be even more the case as Liberty Global ubiquitously rolls out DOCSIS 3.1 (in the download and upload) coupled with low latency DOCSIS.

We note that BEREC extends the measurement of these parameters beyond the access network on the basis that the Code defines a VHCN as an 'entire network'.[28] However, as noted above, measurement on this basis is extremely impracticable and in any case — since the access network is the only differentiator between FTTB/H and other networks (such as HFC) — fibre backhaul and core network performance would face similar measurement and performance issues.[29] We therefore consider it would be disproportionate and contrary to the spirit of the Code — particularly where BEREC has provided little other justification — to require operators to measure the path from the end-user to the first point in the network where the traffic of the end-user is handed over to other public networks (e.g. nearest peering point).

IP packet delay variation: ≤ 2 ms

Again, Liberty Global considers that the threshold for this parameter has been set too high and that by trying to achieve it, there could be negative consequences on other parameters (as a result of waterbed effects) — essentially placing operators in an impossible position. This would surely not meet the principles of appropriateness and proportionality. As with the threshold for the IP packet loss ratio, 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 addition, it would be very difficult to measure this parameter beyond the access network.

As with round-trip IP packet delay, we consider that BEREC should instead specify that the IP packet delay variation threshold of ≤ 2 ms applies only to the access network, in line with principles of appropriateness and proportionality. Liberty Global notes that we are generally able to meet this threshold across our upgraded DOCSIS 3.1 HFC access network.

IP service availability: ≥ 99.9% per year

Liberty Global notes that our HFC networks are able to meet this threshold. For example, in 2019, our average IP service availability across the whole of our footprint for the year was 99.9%.

[28] Draft VHCN Guidelines, §48.
[29] See Draft VHCN Guidelines, §52 where BEREC recognizes that performance thresholds 1 and 2 focus more on the access network since core networks are usually based on fibre.

Adverse external events can, however, have an effect on our ability to meet this threshold. We therefore request that BEREC clarify that that such events should be excluded, particularly where they are outside of our control (e.g. in case of power outages or if construction works have resulted in fibre lines being dug up).

About Liberty Global

Liberty Global is one of the world's leading converged video, broadband and communications companies, with operations in six European countries under the consumer brands Virgin Media, Telenet and UPC. We invest in the infrastructure and digital platforms that empower our customers to make the most of the digital revolution.

Our substantial scale and commitment to innovation enable us to develop market-leading products delivered through next generation networks that connect 11 million customers subscribing to 25 million TV, broadband internet and telephony services. We also serve 6 million mobile subscribers and offer WiFi service through millions of access points across our footprint.

In addition, Liberty Global owns 50% of VodafoneZiggo, a joint venture in the Netherlands with 4 million customers subscribing to 10 million fixed-line and 5 million mobile services, as well as significant investments in ITV, All3Media, ITI Neovision, LionsGate, the Formula E racing series and several regional sports networks.