BEREC Report on the outcome of the public consultation on the Report on Satellite Connectivity for Universal Service

December, 2022

Contents

Executive Summary

The Board of Regulators adopted the [draft BEREC Report on Satellite Connectivity for Universal Service (the "draft Report")](#) for public consultation at the 51st BEREC Plenary meeting (9 June 2022).

The draft Report set out BEREC's views on the potential of Satcom solutions to provide ubiquitous broadband connectivity for Universal Services in Europe. It was informed by a questionnaire issued to BEREC Members and Participants without Voting Rights and was intended to be factual, objective, and technology-neutral, observing that NRAs have a crucial role in implementation of universal service obligations / USO.

From 15 June until 15 August 2022, stakeholders were invited to comment on any of the material presented in the draft Report, as well as on any other relevant considerations / emerging issues they considered important.

BEREC received 10 contributions from the following stakeholders:

1. EchoStar Mobile Limited (EML)
2. Ecta (European Competitive Telecommunications Association)
3. Eutelsat
4. GSOA (Global Satellite Operators Association)
5. Hispasat
6. Intelsat
7. SES
8. Telecom Strategy Consultant (individual contribution)
9. VATM (Verband für Telekommunikation und Mehrwertdienste)
10. Viasat

This report assesses and summarises the contributions.

In general, stakeholders welcome BEREC's considerations on the potential role of Satcom for USO and welcome the opportunity to comment on the draft Report. Several stakeholders believe it is critical that BEREC continues to be technology-neutral when considering USO.

The definitive versions of stakeholders' contributions are published alongside this report, apart from a 3minute video animation that one stakeholder provided to BEREC to demonstrate some of the relevant capabilities arising from very high throughput satellite services.

Next steps and recommendations for further work

After careful consideration of the stakeholders' views, BEREC does not propose to make any substantive changes to the draft report – which was largely based on the results of a questionnaire issued to Members and Participants without voting rights – but it does correct some of the factual information / references in the report to account for the latest information provided by stakeholders (costs, speeds etc). In addition, one stakeholder provided its views on BEREC's internal questionnaire.[1] The differing perspective it holds on some of the questions may be usefully compared to Chapter 3 in the final Report, where the NRA survey

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[1] Please see the contribution from GSOA.

results are presented, and observing that the internal questions were interpreted in a broad sense by the NRAs.[2]

BEREC considers that the final Report achieves the objective and intention to give interested parties an overview of the current thinking in BEREC on the use of Satcom for USO.

BEREC is aware of other interesting aspects of satellite connectivity and reminds stakeholders about future proposals for a stakeholder workshop / workstream during 2023. The focus of that workshop is intended to be broader than satcom for USO, nevertheless some aspects may be relevant to the present topic.

Structure of this report

The following sections set out some of the high-level comments, observations and recommendations received during the public consultation:

- **Chapter 1** sets out an overview of stakeholder comments & observations
- **Chapter 2** sets out an overview of specific comments on sections of the draft Report, and
- **Chapter 3** sets out a selection of other specific comments such as on Annex V of EECC, gateways, national sovereignty / security issues, and other relevant dimensions.

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[2] For example, where one NRA answered previously that it did not envisage a role for Satellite in any universal service provision, it has revised its position to having "no firm plans for satellite connectivity to universal". Another NRA included an answer too. As a result, section 3.1.1 on overview is updated accordingly – now there are 30 answers in total. 20 responses in the "no firm plan" for satcom category and 4 in the "no role" category, whereas previously it was 18 and 5 responses respectively.

1. Overview of stakeholder comments & observations

This section briefly sets out some of the general comments highlighted by stakeholders:

- support for considering satellite connectivity solutions generally and for USO

- the role of satellite technology advancements including views on the differences between GSO and NGSO constellations, and

- mix of technologies.

Later below, BEREC sets out a brief assessment and response to various comments received.

1.1. Selection of general and more specific remarks

Support for satellite connectivity solutions

HISPASAT claims that satellite is the most suitable technology to provide immediate access to connectivity services due to its global coverage over 100% of the EU territory. As opposed to other technologies, satellite can serve citizens scattered over large areas, national or continental, with a cost that is independent of the end-user location.

Similarly, **Eutelsat** sets out that it is strongly convinced that current and forthcoming satcom solutions suit ubiquitous broadband connectivity needs for Universal Service in Europe.

In the view of **ecta,** it considers that satellite communications may be suited to cover the 2-3% of EU households located in very remote areas, where the costs of terrestrial networks (including fixed, fixed-wireless access, and mobile) cannot be recovered, as a stop-gap measure. Commercial initiatives should always prevail over considering Universal Service funding.

Intelsat sets out that satellite communication can play a significant role in areas (rural, mountainous, and hard-to-reach areas) where terrestrial connectivity is inadequate for ensuring that citizens have access to broadband services. Laying fiber underwater or through forested, adverse, and mountainous areas to provide terrestrial connectivity to rural areas is a severely time and resource intensive process. It also emphasizes that satellite services will provide ubiquitous, uninterrupted, and secure networks for connected and autonomous vehicles, enabling continual security updates, fleet management (like maritime vessels) and navigation services.

GSOA sets out that sometimes the only viable connectivity solution, given challenging geographic terrains such as mountains, thick forests, and large water areas [is satellite]. It also sets out that …in addition there will always be plenty of areas that terrestrial technology will not be able to reach efficiently or before long, and that is where satellite can contribute to ensure that everyone, everywhere, no matter their location, can have access to quality high-speed broadband services.

SES sets out that there will always be plenty of areas that terrestrial technology will not be able to reach efficiently or before long, and that is where satellite can contribute to ensure that everyone, everywhere, no matter their location, can have access to quality high-speed broadband services. **SES** believes that any regulatory approach has to promote technology neutrality and inclusivity. In addition, **SES** sets out that the digital divide is a critical issue that needs to be addressed with high priority – the COVID pandemic has revealed how essential it is to ensure connectivity everywhere.

Viasat sets out that satellite broadband has unique advantages in delivering broadband services—including the ability to efficiently deliver a quality broadband user experience in an expeditious, cost-effective manner to unserved and underserved populations.

VATM sets out that that the satellite can be an effective remedy in the middle term until 2030, complimentary to the good 5G coverage for those left to wait for their fiber connection – in both rural and densely populated areas.

Satellite technology advancements

In relation to technology advancements from satellite such as multi-orbit solutions, stakeholders set out some specific views as follows:

- **Intelsat** sets out that new constellation of Software-Defined satellites will be a critical part of 5G networks in Europe. Combining a 5G core, cloud services, different bands and multiple orbits of today's satellite and terrestrial networks into one functioning system will set a new standard for resiliency, reliability, and reach. **Intelsat** agrees that the report and questionnaires rightly observe recent technological advancements in satellite networks that would allow for better connectivity solutions to be implemented across BEREC's members

- **HISPASAT** sets out that other features of HTS satellites are an increase of flexibility through software defined satellites, increased efficiency via interoperability with terrestrial systems through standardization in 5G and/or the integrated operation of the ground and space components and the use of new higher frequency bands

- **EML** sets out that inclusion of New Radio/5G Non-Terrestrial Networks (NR-NTN) standards in 3GPP Release 17 means that MSS networks will be an even more important part of the 5G ecosystem. Release 17 opens the door for MSS chipsets to be included in smartphones. Users will be able to use their Android, Apple or other mobile device to connect to satellite anywhere on Earth. The result will be ubiquitous global coverage for smartphones, smartwatches, and other connected devices employing 5G technology. MSS systems, such as wideband LEO system, are vital for achieving universal connectivity in Europe because they provide ubiquitous coverage in places that traditional terrestrial networks cannot

- **SES** further explains how satellites at various orbits offer flexibility, coverage and high-speed. There is a great advantage of operating a multi-orbit satellite network that provides the advantages offered by one altitude to be combined with those of another, whilst mitigating each other's disadvantages, and

- **Viasat** sets out what it claims are some of the strengths of satellite including innovation and capacity density (steerable beams that can target capacity to where it is needed and spectrum reuse to increase capacity). In addition, **Viasat** sets out that modern GSO satellite systems are designed to offset the impact of latency on the user experience with a number of innovations including addressing congestion with unprecedented increases in capacity, network management tools including machine learning and artificial intelligence, and increasing VoIP quality using scheduling traffic algorithms and enhancing the codec to efficiently encode/decode signals

The topic of satellite technology was also addressed in general terms by certain stakeholders who set out to distinguish between GSO very high-throughput satellites VHTS and large constellation of low earth orbit satellites LEO (also referred as Non-Geostationary Satellite Orbit, NGSO) in terms of cost-per-bit and capability differences as follows:

- **HISPASAT** sets out that end-user equipment to connect with GSO is available at an affordable cost, which is not the case, however, with large constellations operating in LEO, that still need to devise cost wise antennas for end-users

- **Eutelsat** sets out that geostationary (GSO) and non-geostationary (NGSO) satellite networks and systems cannot be considered on an equal footing with respect to the 2022-2025 timeframe in delivering broadband services to end-users with appropriate customer premises equipment. The contribution of NGSO satellite constellations on the period considered should not be overestimated; there are very few operational NGSOs in Europe over the period considered. While NGSO satellite constellations can provide low latency, universal coverage, GSO "Very High Throughput Satellites" (VHTS) today offer more affordable and cost-effective (cost-per-bit and total cost of ownership) services, for the benefit of individual end-users, albeit with higher latency. Further it states that GSO technology is by far less costly for the European end-users than NGSO, making GSO the only connectivity solution through which an affordable EU Universal Service can be promoted everywhere in the EU. In addition, it claims that GSO CPE wholesale price is much lower than NGSO's (range of one to four), and

- **ecta** claims BEREC may be understating the capabilities of geostationary systems (Section 2.1.1 in the draft report) and may be overstating the capabilities of non-geostationary systems (Section 2.1.2 in the draft report).

Another stakeholder sets out a differing perspective as regards the general state of satellite technology (GSO and NGSO) compared to other connectivity solutions. **VATM** considers that different satellite solutions, including GEO satellites, should be considered in the current report and generally on an equal footing with the rest of the connectivity solutions on the market and be acceptable within the framework of universal service.

Similarly in this regard, **ecta** claims BEREC should not refer to a one-to-one comparability between terrestrial services and the same services delivered over LEO satellite constellations.

Mix of technologies

Several contributions consider the opportunity of mixing technologies / hybrid networks in USO as follows:

- **SES** considers that all technologies offer different capabilities and hybrid solutions (e.g. a mix of technologies combining satellite, mobile, fiber, FWA and/or Wi-Fi) have proven successful in enabling meaningful connectivity everywhere in a cost effective way. **SES** sets out that a mix of technologies is the most effective approach to address broadband for all, and the most recently designed satellite systems are providing a level of performance that is inequivalent to fibre.

- **GSOA** sets out that the truth is, end2end connectivity nowadays often relies on a mix of technologies

- **VATM** sets out that all available solutions must be taken into account to provide connectivity ecosystem of technologies complimenting each other and providing services in a meaningful and economically viable way.

- **ecta** also sets out that private commercial agreements between terrestrial operators and satellite operators to deliver services to remote areas can have a positive impact, as long as competition is not distorted

- As regards the topic of all technologies, **Viasat** also notes that there are tradeoffs for all technologies considered for Universal Service. Fiber and other terrestrial based technologies are cost prohibitive to deploy in some markets where satellite is more affordable and efficient due to its rapid deployment and superior coverage ability.

In relation to the latter satellite network cost point, **Intelsat** claims that remote sites may be located up to 70 kilometres from a core network endpoint. Installing 10 kilometres of fibre to connect these locations via terrestrial backhaul can cost up to USD 190,000 and can take up to one year, with the cost and time to do so increasing drastically for deployment over adverse terrain. Intelsat claims that it has provided more cost-effective alternative to microwave and fiber [in similar circumstances].

1.2. BEREC's assessment and response

BEREC has carefully considered all the responses received and thanks the stakeholders for their views.

BEREC generally agrees with respondents about the ability of satcom solutions to provide services in challenging areas. Several NRAs mentioned similar points in their responses to the internal questionnaire, and in many countries satellite connectivity solutions are adopted by end-users in hard-to-reach areas where terrestrial services have not rolled out.

In relation to views about satellite technology advancements, BEREC is always encouraged by sectoral innovations that improve connectivity for end-users and / or contribute to competitive connectivity solutions. BEREC welcomes new and improved / upgraded standards, such as 3GPP Release 17 which will enable the broadest choice of solutions for end-users including opening up new opportunities in handsets. To the extent that some of the points raised by stakeholders may improve network resilience, such as multi-orbit solutions or application of artificial intelligence, these are welcome advancements too in BEREC's view.

BEREC considers that distinguishing between GSO and NGSO in terms of end-user equipment prices might be too simplistic, as operators make commercial decisions about how they wish to recoup costs – and some may subsidise CPE whereas others may have higher upfront costs and different tariff plans. On balance, some stakeholders do consider that GSO technology is a less expensive solution than NGSO, which seems to be the case at this point in time.

In relation to BEREC's text about *one-to-one* comparability between NGSO and terrestrial solutions (in terms of user experience for certain applications), BEREC maintains its view because NGSO does allow for a variety of lower latency applications from space without using algorithmic innovations required by GSO (e.g services over Virtual Private Networks). BEREC does not dispute that there may be quantitative latency differences between all types of satellite and terrestrial solutions, with terrestrial being the preferable solution in some instances, but it stands over the high-level holistic view in the context of this report. As a result, the final report makes it clear that communications from NGSO are, in BEREC's view, practically one-to-one comparable with terrestrial networks.

2. Comments on Sections of the draft Report

This chapter groups some of the comments made on various sections of the report.

2.1. General and specific comments on Section 2.1 (Product pricing, services, latency and more)

Product pricing

Eutelsat sets out that different commercial models exist to mitigate the inherent upfront cost of satellite equipment (typically €250-300) and installation (typically €100-150). As an example, offers based on Eutelsat Konnect in Germany currently include free CPE and its installation, with an activation fee of 1€ only. Eutelsat also disagrees with some NRA views (from the questionnaire) that high pricing of the customer premises equipment together with monthly fee for the sufficient throughput, could be an issue in future implementation. It also sets out that per today GSO technology is by far less costly for the European end-users than NGSO', making GSO the only connectivity solution through which an affordable EU Universal Service can be promoted everywhere in the EU. Related to this, it also sets out that potential subsidies provided by internet service providers must be deduced from CPE shipping, installation and wiring costs in order to come up with comparable figures.

A telecom consultant claims that given that most consumer side devices may be in non-urban areas, providers can explore renewable power solutions such as solar for these devices to be more sustainable and self-powered. This can also support more reasonable product pricing (mentioned in section 2.1.3 of the BEREC Draft Report).

SES seems to acknowledge the consumer cost when it sets out [… contrary to] satellite-based consumer broadband solutions that rely on a dedicated and costly satellite end-user equipment, satellite backhauling or trunking do not require additional end-user equipment. On the other hand, SES sets out that the price to end-users now proposed by several operators, including **SES** in GEO, have significantly decreased. It illustrates and supports this opinion by providing reference to retail prices for satellite services in its contribution [see also page 9 in its contribution].

One respondent, **Eutelsat** also queried what the level of affordability thresholds is in some countries. It set out that the cost of a satellite internet connection is not expected to be higher than a terrestrial connection (in LI and NL). It also does not agree that the monthly data volume in most of the contract options offered (in DE) is lower than the need determined for normal usage. In addition, **Eutelsat** also did not agree with replies from SE, DK, CZ, RS and SK who pointed out that Satcom will still be a relatively expensive technical solution unable to compete cost-wise with fixed and mobile broadband services.

Services

Stakeholders made the following comments on services:

- Trunking and backhaul

- o **SES** highlights that satellite trunking has long proved beneficial to geographical areas that are underserved. It claims investing in trunking telecom networks with satellite improve efficiency

- o **Intelsat** sets out that it has partnered with mobile network operators in Europe, most recently in Germany, to provide cellular backhaul for 4G LTE services in rural parts of the country

- o **GSOA** considers that satellite backhaul enables cellular services to be provided in areas where traditional terrestrial connectivity such as fiber, cable, or microwave are not economic or very challenging to install. It also sets out that satellite can be chosen as a more cost-effective and more reliable option of backhaul technology to address these challenges. It is essential that BEREC members do not only allow but also encourage this option.

- Disaster relief services & scenarios

  - o **VATM** agrees it is possible to deliver an affordable service to end-users securing the provision of mobile services in remote areas as well as areas struck by natural disasters.

  - o **ecta** wishes to make clear that satellite services are not a good solution for the general population in disaster situations, notably because electricity is needed to power the customer-premises equipment, and active antennas required by low-earth orbit systems, etc. **ecta** asks BEREC to clarify in the final Report that satellite communications solutions are useful for reserve/standby purposes for public authorities, but not as an alternative to terrestrial fixed and wireless networks for the general population.

  - o **Intelsat** welcomes the report's emphasis on the importance of satellite services in helping users stay connected in crisis situations. In critical communications, space-based systems provide a resilient backup to terrestrial networks anywhere in the world

  - o **SES** sets out that satellite enables immediate vital communications for relief efforts.

- IoT / massive connectivity in 5G era / future industrial control applications

  - o **Intelsat** sets out that space-based applications provide a resilient backup to terrestrial networks anywhere in the world. As IoT scales to massive connectivity in the 5G era, satellites will deliver the service continuity needed for critical communications as well as future industrial control applications.

  - o **GSOA** set out that satellites can play a critical role in the provision of the Internet of Things (IoT), machine-to-machine (M2M) and Smart City communications, which fits very well with the need to maintain always-on continuity of such critical services

Service quality and views on latency

Viasat highlights that today's GSO Ultra High Throughput ("UHTS") satellites make it possible to provide cost effective high-speed broadband to customers featuring increased speeds, dramatically increased capacity, and smaller end-user terminals. GSO satellite technology surpasses consumer expectations for mission critical broadband applications (including those discussed above) and is capable of doing so at speeds in excess of 150 Mbps; with extremely low jitter and packet loss; and with coverage of 100 percent of Europe.

According to **Eutelsat** mouth-to-ear satellite round-trip-delay on standard interactive voice and video services is less and less noticeable or annoying thanks to the improvement in the quality of the signal itself. At application level, e.g. for remote work or cloud, no degradation occurs when using TCP acceleration (a series of techniques for achieving better throughput on a network connection than standard TCP achieves, without modifying the end applications). Current satellite networks infrastructures providing broadband internet access adopt TCP acceleration.

SES points out that latency in any communications network is unavoidable. Certain applications are not affected by latency, while other applications can cope with latency by using mitigation techniques to overcome its effects. The latency requirement should therefore only be considered on a case-by-case basis in the context of the applications that the connectivity solution will support. Several considerations should be taken into account:

- GSO satellites are suitable to deliver all applications listed by the EECC as essential to provide broadband universal service in Europe.

- Video streaming, which represents the bulk of Internet applications, does not suffer from latency.

- GSO satellites can perform round-trip connectivity down to 470 ms.

- NGSO solutions, including MEO platforms, operate with latency that is less than or equal to 150 ms.

Three respondents set out views on the relative importance of latency as follows:

o **GSOA** claims that a mix of technologies all affect latency at various degrees, leading to an accumulation of delays which occur in different segments of a same network; and latency anyway depends on many factors including propagation (related to distance and altitude), routing and switching times or congestion – notwithstanding the effect of jitter

o **Viasat** highlights that the potential for introducing latency at every point in the communications path to and from the Internet should be considered, rather than focusing on simply link latency. **Viasat** also made a point about innovations in network management tools concerning addressing latency (see section above on satellite technology advancement), and

o **VATM** would like to point out that the expert opinions prove that latency above 150 milliseconds in all relevant application areas for home office, including VPN and web meetings, secures a good customer satisfaction. Even though there is a tendency towards slow decrease of the customer satisfaction, this does not make the functionality of the application itself not possible or not practical. The full satellite functionality was also proven during a test demonstration organised by VATM for the

MPs and expert witnesses in Berlin. In this regard, it would be unjustified to exclude GEO satellites, which in 95% of all cases guarantee satisfactory coverage for businesses and the population. A study that **VATM** points to in their contribution shows that customer satisfaction not only for voice telephony, but also for the other use cases extends to about 300 milliseconds and, with slight restrictions, to almost 400 milliseconds. In that regard, **VATM** would like to note that the International Telecommunications Union (ITU) also defines this last value as a limit. Therefore, no technology that complies with the international specifications and can ensure sufficient customer satisfaction should be excluded. These data relate above all to GEO satellites, meaning that they cover all necessary technical and user requirements to be widely acceptable connectivity solution in underserved areas.

ecta sets out that among the key features of FttH, FWA and 5G is precisely the ability to provide far greater bandwidth and considerably lower (potentially single digit) latency. Further it claims that no satellite system is likely to meet the objective of availability of 1 Gbit/s to all households by 2030 foreseen in the EU's Digital Decade Policy Programme. For these reasons it asks BEREC to not refer to one-to-one comparability between terrestrial services and those provided using LEO.

2.1.1. BEREC's assessment and response

BEREC has carefully considered all the responses received and thanks the stakeholders for their views.

In relation to the views that product pricing is lower than BEREC asserts in the draft Report, BEREC would continue to contend that end-users generally view satellite connectivity as an expensive option (but that perhaps those users who may have no other connectivity options might hold other views). BEREC is pleased to see the proposed rate card for retail satellite services and that some providers have identified ways to offset upfront costs for CPE. Various schemes at national level are in place to identify and address connectivity blackspots, so opportunities for satcom solutions are available. Satcom solution providers are well equipped to market the solutions as required.

BEREC finds the views on services to be a helpful non-exhaustive list of satcom solutions, which provides useful background context on the types of current and future new opportunities that the industry identifies. When it comes specifically to disaster situations, BEREC tends to agree with the view that satcom solutions often provides a quick, relatively easy, and resilient form of temporary relief areas of disasters. BEREC is aware of recent examples of 'pop-up' base stations connected with backhaul to satellites etc. and understands that often, once terrestrial connectivity is restored, these stations are often stood down, as mentioned by one respondent.

In relation to views on service quality and latency, BEREC observes the technical and service-by-service nature of this topic. BEREC agrees that video is not highly sensitive to latency as other services such as mission critical applications. BEREC also finds the arguments that total network latency is an important consideration to be reasonable, but one cannot speed up earth-to-space and space-to-earth link in satellite systems as free space propagation has a fundamental upper limit. As to point by one respondent that no satellite is likely to meet the EU's Digital Decade Policy Programme of 1Gbit/s to all households, BEREC would tend to agree but argues that there is a role in hard to reach areas (see section 1.2 above for a discussion of the issue). Nevertheless, measured link latency is something which is

distinguishes networks – and satellite networks do have inherent different latency characteristics some of which are orbit dependent. The innovations mentioned by some (see also satellite technical advancement section) work to minimise the effective implications of latency – but there remain those mission critical applications that require a level of resilience and latency that cannot be artificially addressed and where terrestrial may be the primary link source.

As a result of the foregoing, BEREC does not see a need to update the report to account for the views presented on the latency topic.

2.2. Specific comments on Section 2.2 (Satellite Capacity Demand)

VATM sets out that since the Fraunhofer study was carried out consistently and with particular attention to the technical details, it generally welcomes this approach, manifesting that the current BEREC report intends to rely primarily on technical expertise. However, it would like to note that the current report, similar to the German discussion in the national context, does not seem to value some of the results of the study correctly

HISPSAT sets out that it has satellite capacity covering the European Union through its satellites HISPASAT 30W-5, HISPASAT 30W-6 and HISPASAT 36W-1, operating in Ku and Ka bands. These satellites can provide download speeds of up to 100 Mbps and wide range of services, including but not limited to all those included in Annex V of the European Communication Code defining the universal service.

Viasat disagrees with the suggestion that satellite technology has limited capacity. **Viasat** is completing construction of the UHTS ViaSat-3 satellite for Europe, delivering a total throughput of over 1 Terabit per second. Each of the next-generation UHTS ViaSat-4 satellites under development will offer 5-7 times that amount of throughput.

Viasat highlights that today's GSO Ultra High Throughput ("UHTS") satellites make it possible to provide cost effective high-speed broadband to customers featuring increased speeds, dramatically increased capacity, and smaller end-user terminals. GSO satellite technology surpasses consumer expectations for mission critical broadband applications (including those discussed above) and is capable of doing so at speeds in excess of 150 Mbps; with extremely low jitter and packet loss; and with coverage of 100 percent of Europe.

Eutelsat sets out that the forthcoming VHTS (e.g. the Eutelsat Konnect VHTS due to launch in September 2022) will greatly improve the resources available over the EU, thus enhancing the priority data allowance.

2.2.1. BEREC's assessment and response

BEREC has carefully considered all the responses received and thanks the stakeholders for their views. In BEREC's view, the dominant capacity contribution up to 2025 remains as coming from constellations of NGSO such as Starlink.

As regards VATM's claim that the Fraunhofer study may have incorrect values, BEREC would respond that the study does consider and set out a traffic and demand model that uses

assumptions with many variables – but would refute any claims that, as a result, the study is incorrect. There are limitations associated with all forecast models, but BEREC is satisfied that great care has been taken to limit extreme results in particular that the modelling conducted by Fraunhofer takes into account reasonable demand and supply factors as a whole. Small changes to the input values are not likely to have a wide impact on the size and scale of the addressable market for Satcom in Germany. By extension, BEREC considers that the picture would be similar for Europe – (satcom is unlikely to be a mass market product in the foreseeable future).

BEREC acknowledges the contribution from HISPASAT but, similar to the above, does not consider possible additional capacity from HISPASAT would greatly impact the overall capacity picture – mainly because locations so far West (30W to 36W etc.) are not optimal for extensive service provision over Germany and by extension for much of mainland Europe. BEREC would note that at section 3.1.3 of the draft Report, mention had been made of HISPASAT in terms of available and projected capacity. BEREC does, however, add a sentence at page 9 to the final report to acknowledge HISPASATs specific view, in a more general way as follows; *Additional capacity could be available over Europe from different providers as discussed in the response document. For the purpose this report, the above chart [figure 4] is an estimate only, and BEREC is aware that capacity follows market demand; satellite capacity may be redeployed to meet market needs.*

2.3. Specific comments on Section 2.3 (Regulatory considerations)

This section includes stakeholder comments on

- support for a technology-neutral approach when selecting the USO provider

- specific views on USO mechanism/processes, for example use of voucher schemes

- coordinated approaches / harmonisation issues

Technology-neutrality

Technology-neutrality topic is mentioned by several stakeholders and there is general support a technology-neutral approach to Universal Service. For example, some of the views include:

- **SES** asks BEREC to consider satcom solutions in an objective and technology-neutral way to address the persistent digital divide. It believes that any regulatory approach has to promote technology neutrality inclusively.

- **VATM** set out that it would like to call on BEREC to take a technology-neutral position with regard to satellite

- **HISPASAT** is of the opinion that the universalization of broadband access in the European Union can be better managed with a pan-European approach based on technological neutrality

- **ecta** invites BEREC to adopt a technology neutral approach, reflect the services listed in Annex V EECC, and include a general endorsement of satellite technology solutions as relevant for Universal Service in very remote areas, where at least in the short term, the deployment of terrestrial fixed and wireless connectivity technologies would not be feasible

- **Intelsat** explains that a lack of technological neutrality is also a key regulatory constraint for expanding satellite services in many jurisdictions. In addition it sets out that national regulatory authorities ensure that funding opportunities for infrastructure rollout are technologically neutral and do not favor one specific approach

- **GSOA** sets out that [coordinated approach to USO] would need to be technology neutral and identify the appropriate EU or national funding mechanisms to rely on. In addition it sets out that this would be the most pragmatic approach.

- **Viasat** encourages BEREC to [consider to ensure] a technology neutral approach to subsidy support. There are disadvantages to some technologies (e.g., fibe high deployment cost in some markets) and advantages of other technologies (e.g., satellite quick deployment and robust coverage).

Processes of USO (for example, use of voucher schemes)

Two respondents commented on possible use of voucher schemes, as follows:

- **VATM** proposes that BEREC examine the need for a voucher option to meet the demand for satellite connections in those areas where fibre roll-out is not going to start in the foreseeable future and to cover the basic needs of the population living there
- **ecta** sets out that insofar as demand-side measures such as voucher schemes are defined in a technologically neutral way, these could conceivably be taken up by users to procure satellite-based services (but satellite-based services do need to meet the set minimum specifications). However, **ecta** adds that where private investment in suitable terrestrial networks has already occurred, or where terrestrial networks have been granted state aid, or demand-side stimulation measures (such as vouchers) are adopted, it would not be appropriate to 'overlay' this with satellite-based Universal Service.

Three respondents set out views on the implementation of USO funding and also cautioned NRAs / BEREC to take care to ensure markets are not distorted and players are not discriminated when USO is applied, as follows:

- **ecta** makes the point that it needs to be ensured that non-EU satellite operators which receive Universal Service funding in non-EU countries do not distort markets within the EU, e.g. to win Universal Service funding in the EU by being able to make a better offer than EU providers, or to provide commercial services in competition with EU terrestrial (fixed and/or wireless) operators. **ecta** also sets out that Universal Service funding can be envisaged only where it has been verified by the NRA that no private operator is delivering or willing to provide terrestrial (fixed or wireless) connectivity services in the short term meeting the specifications of Annex V of the EECC, as transposed in the national law or regulations of the Member State concerned. In particular **ecta** sets out that

  o Not doing so would lead to funding a competitor to existing networks/services, undermining the business model and investments of commercial operators, and would lead to a double distortion in case Universal Service is subject to industry funding, and

  o safeguards are needed (e.g. accounting separation and auditing) to ensure that Universal Service funding is not abused to expand commercial services outside the geographic area concerned by USO funding even if the geographic scope of satellite-based Universal Service is limited to remote areas where the costs of terrestrial networks cannot be recovered**.**

- **VATM** sets out that it should be possible to perform a cost-benefit analysis of all available technologies outside of the scope of state subsidies, especially in the case of universal service, in order to objectively assess their possible applications, then rather excluding them in advance. If this is not done and satellite, especially GEO satellites, would be technically excluded without an absolutely compelling reason, this would mean discrimination against European providers in particular compared to other providers from the USA or Asia, for example. **VATM** would like to point out that this would cause lasting serious damage to the EU internal market as well as to the national markets for satellite solutions.[3]

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[3] VATM is fully convinced that universal service in the transition to gigabit coverage is mandatory and, similarly to the findings of the study commissioned by the Swedish regulator PTS, VATM believes this can only be secured

- **Viasat** encourages BEREC to consider the following when implementing universal service programs in Member States:
    - Subsidies should fund broadband service that can satisfy the needs of EU citizens like those outlined in Annex V.
    - Subsidies should not skew the market by picking winners and losers but rather should improve the user experience by encouraging all technologies to compete for the opportunity to provide broadband to EU citizens.
    - Subsidies should be applied to proven, viable business models that are not solely reliant on subsidies for their viability.
    - Maximize the limited funding that is available for universal service and encourage all technologies to compete for the opportunity to provide broadband to European citizens.

Coordinated approaches & harmonisation issues (including spectrum harmonisation)

Four respondents advocated for more coordination at Pan European level as follows:

- **HISPASAT** sets out that funding of aspects such as end-user equipment and other at pan-European level is equally important to ensure this universalization of broadband access. It also believes that the universalisation of broadband access in the European Union can be better managed with a pan-European approach

- **Intelsat** considers promoting a more pan-European framework will help provide more clarify for operators and ensure long-term cooperation

- **GSOA** considers that a coordinated approach at European level of aggregating demand, and addressing all connectivity needs resulting from the digital divide, would be the most pragmatic approach

- **Eutelsat** considers that a coordinated approach between Member States could be beneficial to a widespread adoption of satcom solutions to provide ubiquitous broadband connectivity within the scope of Universal Service. In addition, **Eutelsat** sets out there is potential for a coordinated approach between Member States for grouped investments in satellite-based broadband access to ensure critical mass in the numbers of connections involved. This would also leverage the better technical know-how and market knowledge available at pan-European levels. Based on this joint framework procurement, regional authorities can then administrate the deployment, based on their knowledge of the local geographical and socio-demographic situation and compliant with the laws and regulations of each country.

On the matter of spectrum harmonisation, **Eutelsat** considers to create a regulatory framework conducive to a uniform implementation throughout Europe that the implementation of CEPT decisions favouring the harmonization of spectrum usage and exemption of individual licenses for terminals is required. In addition, **Eutelsat** considers that the designation of spectrum dedicated to satellite service and not shared with terrestrial networks, to not impair the

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quickly by making sensible use of satellite technology to provide coverage to the population in thousands of individual cases for the transition period of copper switch off (and only for this!). In addition, This is exactly what the universal service mission is all about - a quick but also practicable solution for the affected households who cannot expect a fast internet connection in a timely manner as part of the regional white spots programmes.

deployment of terminals with unnecessary coordination constraints and favor the provision of Universal Service is required.

Similarly, **GSOA** highlights that frequency authorisation of satellite network / earth stations is best handled based on the various ECC decisions of the CEPT adopted during the last 15 years or so. Several European countries have adopted national rules that comply with these decisions, and GSOA encourages all other countries to follow suit. In practice, this will facilitate simplified authorization procedures (such as "blanket" or "class" licensing regimes). These types of regulatory regimes expedite the practical, economical, and widespread deployment of customer terminals and network gateways.

Intelsat considers that long-term access to specific [radio] bands and ensuring that parts of the spectrum will be reserved for satellite on a pan-European level would be highly beneficial for using space-based connectivity for Universal Service obligations.

Two respondents commented on the case-by-case approach. In particular, **VATM** set out that a palette of interventions and measures will be needed to address the many different types of connectivity challenges that exist in order to provide broadband to everyone, regardless of geographical, social and economic circumstances. **ecta** agrees that the regulatory issues raised in the Draft BEREC Report have a national dimension, which supports a case-by-case approach to satellite communications solutions for universal service as suggested in the draft report.

2.3.1. BEREC's assessment and response

BEREC has carefully considered all the responses received and thanks the stakeholders for their views.

BEREC agrees with stakeholders about the importance of technology-neutrality not only when it comes to USO but also generally in the regulation of electronic communications markets. BEREC does not intend to include any additional statements on technology neutrality in the final Report as it considers this is very well understood and communicated. In relation to the query for BEREC to endorse satcom solutions as a viable USO, BEREC does not agree that it needs to make such an endorsement. BEREC considers that whatever solutions can meet the requirements of a USO set down by the relevant authorities, should be sufficient without any wider endorsement by BEREC. For example, from the survey results, it can be seen that some countries (EL and IS) have already employed satcom for USO and two countries had studied the potential role of satcom in connectivity (DE and SE).

In relation to the procedural points around funding USO such as the use of voucher schemes, BEREC would point out that these detailed matters are beyond the scope of the present study. It is not a matter for BEREC to develop the criteria for USO, and these types of issues may be best addressed as the subject of a separate detailed consultation by the particular authority administering the USO. Nevertheless, BEREC welcomes several of the insights such as that:

- competition must not be distorted as a result of the schemes
- care is taken to not discriminate between stakeholders or groups of stakeholders
- proof that private investment is unlikely
- USO providers have viable plans
- safeguards may be needed (in whatever specific forms that might be address market failure), etc.

In addition, BEREC would confirm that it is not its role to pick winning technologies (i.e. aligning with the technology neutrality points).

In relation to harmonisation of satellite authorisations, BEREC does not have a role in such matters as the authorisation layer is a national / member state competence. BEREC would therefore, encourage stakeholders to continue to make appropriate representations at the CEPT or at the ITU level where the allocation of spectrum and minimum technical conditions for using spectrum is concerned.

3. Other comments

3.1. Some other specific comments (Annex V of EECC, gateways, national sovereignty / security issues, and other relevant dimenions)

Annex V of EECC

Ecta sets out that the list of services (at section 2.1.4 of the draft Report) should correspond to the list contained in Annex V of the EECC.

Gateways

Eutelsat emphasizes that the use of universal services based on satcoms requires the removal of barriers and the simplification of rules in order to create a regulatory framework conducive to a uniform implementation throughout Europe. It sets that the removal of requirement for transit of traffic through national gateway, to simplify operations and reduce costs of deployment of satellite network is required.

SES highlights that one single gateway for GSO networks located in Europe is enough to provide connectivity solutions all over the continent, and does not agree with the BEREC statement that such GSO networks may require a number of gateways (section 2.1 in the draft report).

National sovereignty / security issues

Intelsat welcomes the report's emphasis on the importance of satellite services in helping users stay connected in crisis situations and provide secure communications in case of cyberattacks – a scenario which must be taken into consideration when implementing Universal Service obligations.

ecta appropriate regulation should address the potential risks of competitive distortion and crowding-out private investment in terrestrial networks (fixed and wireless), relating to Universal Service, state aid, national security and sovereignty.

Other relevant dimensions

Eutelsat set out that it disagreed with NL's questionnaire response that *"[]…the availability of (artificial) cheap Satcom offers may slow down the extension of coverage of fixed and mobile networks in rural areas".* **Eutelsat** set out that the inclusion of affordable and quickly available satellite connectivity among solutions providing broadband access as a universal service is indeed a quick and cost-efficient measure to accelerate the take-up in European white areas with no or poor connectivity. Bringing a significant improvement in connectivity in these areas, satellites act as a precursor, fostering the development of digital education and skills that will create favourable conditions for the deployment of terrestrial fixed and mobile networks in these areas in the medium-long term.

3.2. BEREC's assessment and response

BEREC has carefully considered all the responses received and thanks the stakeholders for their views.

BEREC confirms that the services at section 2.1.4 should correspond to Annex V of EECC and amends the text accordingly.

In relation to the gateway issues, similar to the harmonization point discussed above at 2.3.1, BEREC does not have vires to intervene on matters of national competence such as transit through national gateways. BEREC also considers that the number of gateways will also depend on how the satcom services are dimensioned and it may depend on case-by-case situation about the final number of gateways in networks.

BEREC, NRAs, and other national competent authorities will continue to coordinate to ensure the resilience and cyber safety of networks serving European markets and welcomes stakeholders' views on this important topic.

In relation to the dynamics and potential impacts of satellite USO on the rollout of other networks, BEREC also recognizes that uptake of (realistically priced) satellite communication in rural areas may help to create more demand for broadband use and thus may in the longer term create more favorable conditions for extending terrestrial fixed and mobile networks and, as a result, NLs response to question 5 at section 3.1.6 is updated accordingly.