Body of European Regulators
for Electronic Communications
BEREC

Final

Summary Report on the Outcomes of Mobile Infrastructure Sharing Workshop

18 December, 2020

Contents

Executive Summary

Mobile infrastructure sharing is important to many stakeholders including BEREC. As long as sufficient infrastructure-based competition is maintained, infrastructure sharing allows cost savings and makes more extensive coverage viable. BEREC's current thinking on the subject is set out in document BoR(19) 110 (the "2019 Common Position"), which was based on document BoR(18) 116 (the "2018 Report"). Essentially, the 2019 Common Position identifies and describes factors to be considered by NRAs when assessing an infrastructure sharing agreement, where they have competence to do so.

Following up on the 2019 Common position on infrastructure sharing, and due to the high level of stakeholder interest in this project, BEREC organised this workshop to enable discussion with stakeholders on the BEREC work and on possible future evolutions of the Common Position.

In advance of the workshop BEREC set out some questions for stakeholders, so that they could provide targeted presentations referring to practical examples to support their views (c.5-7mins followed by short discussions with experts). The main audience for the presentations was BEREC's Wireless Network Evolution working group.

The agenda for the workshop is set out at Annex 1. The questions for stakeholders are set out at Annex 2. Essentially, the questions covered the following topical areas:

- 5G Rollout & infrastructure sharing

- 5G sharing challenges/opportunities/trends

- 5G sharing in context of small cells

- 2019 BEREC Common Position

The workshop was well attended, with ten stakeholders presenting, and eleven other stakeholders and twenty-two NRAs observing.

Having carefully considered the views of stakeholders, BEREC believes that its Common Position remains fit for purpose at this moment in time. For example, some forward looking issues which were identified in the consultation on the draft Common Position have not yet become substantially clearer; such as the view that 5G deployment in the 26 GHz may be different. Allied to this, however, BEREC has received information about how operators consider software and virtualisation in the context of 5G that should change the way we think about infrastructure-based competition. BEREC will be interested in practical examples of how these features might materially alter the way the 2019 Common Position should apply. In addition, changes to network security and resilience may necessitate dialogue with other competent authorities for security of networks and services (see also Article 40 of the EECC[1]). But as the 2019 Common Position is rooted in case-by-case assessment, BEREC is satisfied

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

that emerging trends would not be prevented. In essence, further dialogue would help here, based on some real world 5G mobile infrastructure sharing deployments.

BEREC has also considered some of the high-level proposals by stakeholders during this workshop and does not believe that the 2019 Common Position should be adapted based on them. For example, one stakeholder proposed that a threshold be defined to exempt sharing arrangements from assessment (i.e. block exemption rule-based approach), and another stakeholder suggested that the competitive effects of non-sharing parties should be given more prominence. Another stakeholder claimed that the distinction between passive/active and rural/urban in sharing models is blurring. It therefore considered that more thought should be given to hardware/software distinctions. In this regard, the stakeholder considered that the 2019 Common Position was based on historic parameters whereas networks are becoming hardware agnostic, with competition being enabled by virtualisation.

Furthermore, several stakeholders repeated views that they had expressed during the consultation on the 2019 Common Position, and these are not summarised again here. Presentations are published on the BEREC website.

BEREC would like to thank the following stakeholders for giving their time to prepare and develop presentations at the workshop: Brekoverband (German Broadband Association), CETIN, Deutsche Telekom, ECTA (European Competitive Telecommunications Association), ETNO (European Telecommunications Networks' Operators Association), EWIA (European Wireless Infrastructure Association), GSMA (Global System Mobile Communications Association), Huawei, Orange and Vodafone Group.

The remainder of this summary report is divided into the following sections, some of which summarise stakeholders' views on each of the topical areas.

- **Chapter 1** Background, which briefly introduces the 2019 Common Position and motivation for the workshop

- **Chapter 2** 5G Rollout & infrastructure sharing

- **Chapter 3** 5G sharing challenges/opportunities/trends

- **Chapter 4** 5G sharing in context of small cells

- **Chapter 5** Adapting the 2019 Common Position and other suggestions from stakeholders

- **Chapter 6** Next steps and recommendations for further work.

1. Background

In 2018, BEREC published a report on infrastructure sharing, which provides a provisional analysis of mobile network infrastructure sharing arrangements that are currently in place in various individual European markets.[2] Following the report, BEREC identified best practices on mobile infrastructure sharing arrangements and, after having a public consultation, published a common position on infrastructure sharing.[3]

Common Position

The common position describes criteria which can be taken into account by NRAs in assessing mobile infrastructure sharing agreements where NRAs have competence to do so. It is intended to provide NRAs, stakeholders and interested parties with information relating to the treatment of such agreements in Europe.

To this end, the common position provides 'background information' relevant to the consideration of infrastructure sharing agreements which do not (on their own) constitute a common position. This includes information on relevant legal frameworks relating to the treatment of infrastructure sharing agreements and information on the potential benefits and drawbacks of infrastructure sharing agreements.

The common position itself consists of:

- common definitions of different infrastructure sharing types: passive sharing, co-location, site sharing, mast sharing, active sharing, RAN sharing, MORAN sharing, MOCN sharing, frequency (or spectrum) pooling, national/local roaming, core network sharing and backhaul sharing;

- common important objectives which NRAs should consider when assessing infrastructure sharing agreements (providing that it is within their competence to do so): effective competition, better connectivity and efficient use of spectrum;

- common factors which NRAs should consider when assessing infrastructure sharing agreements (providing that it is within their competence to do so): competitive market forces evolution, the feasible level of competition, type of sharing, shared information between the sharing parties and its impact on their ability to compete, reversibility and contractual implementation.

It should be noted that consideration of these factors, their relative importance to one another, and the relevance of potentially significant other factors not listed in the common position are likely to be highly context specific. In all instances, therefore, assessing infrastructure sharing agreements will require evidence-based analysis on a case-by-case basis.

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[2] BoR (18) 116, https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8164-berec-reporton-infrastructure-sharing

[3] BoR (19) 110, https://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/common_approaches_positions/8605-berec-common-position-on-infrastructure-sharing

Finally, the common position provides a description of potential treatment of specific infrastructure sharing types.

Forward looking issues identified during the public consultation in 2019

In the public consultation preceding the publication of the common position[4], the following 5G related issues were raised. New sharing models like network transport slicing should be included. 5G deployment in the 26 GHz would be different. Infrastructure sharing would become more important in the context of 5G deployment.

Following up on the 2019 Common position on infrastructure sharing, and due to the high level of stakeholder interest in this project, BEREC organised this workshop to enable discussion with stakeholders on the BEREC work and on possible future evolutions of the Common Position.

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[4] BoR (19) 109, https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8604-berec-report-on-the-outcomes-of-the-public-consultation-on-the-draft-berec-common-position-on-infrastructure-sharing

2. Stakeholders views on 5G rollout & infrastructure sharing

Summary of BEREC's questions on the issue 5G Rollout & infrastructure sharing

- What network and/or physical infrastructure accessed/rolled out for your 5G (Core, RAN, tower/masts)?

- Is there any need for an increase in sharing due to the roll-out of 5G? Circumstances for this need?

- Which sharing options (i.e. passive and/or active sharing) for 5G and motivations behind them?

- Do you see different needs to share mobile network and/or physical infrastructure depending on the type of technology that is used? (2G 3G 4G 5G /5G small cell) please elaborate?

Summary of stakeholders' views

One respondent set out that densification in urban areas might be restricted by a lack of access to finance and costs of spectrum awards. It noted that sharing in rural areas is important and that guidance on sharing can be helpful. It set out that it has a strategy to remain independent in urban areas in order not to be constrained by any sharing partner when making investment decisions. If two MNOs engage in sharing, the party with the interest in the smallest rollout might be decisive. Sharing is important in rural areas where cost savings might be decisive for rollout.

Another respondent set out that it uses network sharing for the past 15 years and intends to consider infrastructure sharing for 5G. It set out that access technologies become interchangeable in 5G (i.e. access technologies will be situated in 'one box'). As a result, it set out that differentiation exists more on software (SW) level as technologies are interchangeable. Infrastructure sharing allows cost savings and can assist to manage the traffic explosion. It believed, however, that 5G will require more equipment indoors and more restrictions/requirements that might be expensive. It also set out that differentiation between urban/rural is extinct, it considered that this concept needs to be revisited with 5G. It considered that rooftops in urban areas would be a bottleneck. It also set out that the new distinction should be between software/hardware (SW/HW) – as SW will be more centralized in the cloud. Multi-standard RAN is the future – one box for 3G, 4G and 5G.

Another respondent set out some general comments related to this topic given that it has over 10 years of experience in sharing arrangements and has sharing agreements in multiple countries (e.g. Romania, Slovakia, Belgium, Spain and more).

Another respondent claimed that 5G will change how networks are configured and managed. It didn't have specific answers to the questions but did suggest that network sharing is a key to decrease costs, accelerate roll-out, etc. Ex-ante regulation should be avoided to minimize market distortion. In its view, commercially agreed upon sharing agreements are sufficient

and that there is no need for regulatory ex-ante control. It noted that 5G is characterized by virtualization and that active sharing is not a risk *per-se*. For example it believed even spectrum sharing allows for some differentiation.

One respondent referred to nine requirements set out in Implementation Guidelines on Promoting Telecom Infrastructure Co-construction and Sharing: a China Case. It set out that there are requirements on MNOs to follow the relevant co-construction and sharing procedures in relation to poles and pipes. It also set out that more extensive sharing leads to higher savings. Whereas passive sharing enables 10-20% cost savings, large scale RAN sharing could reach 25-30% cost savings. Full consolidation lead to over 40% cost savings.

3. Stakeholders views on 5G sharing trends, challenges and opportunities

Summary of BEREC's questions on: 5G sharing challenges / opportunities/ trends

- What are current and future trends in mobile network roll-out and infrastructure sharing? What could be the impact of 5G on those trends?

- What are the specific challenges of 5G infrastructure sharing?

- Have you experienced/heard of any challenges regarding sharing of mobile networks and/or infrastructure?

Summary of stakeholders' views on trends

One stakeholder set out some relevant technology trends, which lead to more flexibility and facility for the sharing partners. Equipment is technology agnostic providing flexibility even with network sharing, eg. multi-standard RAN, one can use 2G, 3G, 4G, 5G interchangeable in one RAN. The multiband radio module enabled better and wider Network sharing, providing more capacity for each player. In addition, open-RAN and virtualization leads to 'off the shelf' radio hardware without differentiation possibilities at radio sites.

For example, it claimed that 5G reduced importance of RAN for differentiation. On the technology side, it set out two relevant points, as follows:

- Firstly, the access technologies will become interchangeable with 5G. Different access technologies like fixed, mobile and wifi will work with one core network. The 5G joint core network provides same services and services experience over different access technologies;

- Secondly, the virtualization will further reduce the importance of RAN infrastructure. It considered that, if needed, differentiation will be on the software layer as technologies are interchangeable (hardware will be more generalized).

Therefore, the stakeholder summarized the trend as follows; that 5G services will become RAN agnostic, and that 5G services will be totally IP based.

One stakeholder set out that RAN sharing agreements that could have been problematic in the past should no longer raise competition issues (in 5G), mostly because, in its view, coverage is no longer a differentiation parameter. It considered that the operators already cover the same territories and population. It believed that differentiation is about core network, quality, innovative services, spectrum (especially with 5G that requires higher bandwidth) and 5G requires more capacity to offer to the consumer and not only coverage.

Another stakeholder set out that the decade 2020-2030 will be a B2B decade. 5G is mainly a B2B story and will support *Industry 4.0*. The stakeholder set out that it is necessary to improve competition, and that improving competition is overdue in some markets. It set out that B2B markets will remain highly concentrated. Like other stakeholders, it also set out that differentiation in 5G will be less about coverage (i.e. not coverage based), yet some services will rely on the best coverage (e.g. autonomous vehicles). In addition, it commented that

operators are divesting tower infrastructures and so will engage more in infrastructure sharing in the future.

Many stakeholders set out trends in terms of challenges, summarised next below.

Summary of stakeholders' views on challenges

Most stakeholders set out views on challenges. For example, stakeholders claimed that there were many challenges facing 5G *inter alia*, as follows:

- Access to capital to finance 5G rollouts and densifications and increased operational costs associated with IT and service platform upgrades, new frequency bands, and substantial site densifications. In addition, one respondent set out that existing infrastructures are insufficient to support increased traffic and technical requirements of 5G

- Fragmentation in licensing approaches in MS, and approaches / treatments of sharing arrangements

- Absence of sufficient clarity / regulatory predictability around sharing assessments (e.g. one stakeholder referring to a 'deep' investigation of a sharing arrangement that only partly covered a territory that it operates in)

- Distribution of spectrum "not being fair" in the view one stakeholder

- National roaming needs to continue in 5G and wholesale markets that are not functioning competitively now will not do so in 5G

One stakeholder set out that the first challenge for the telecom industry is access to further capital and investment finance to roll-out the 5G. It set out that there are many pressures on the market (capital expenditure in order to increase the network resilience and capacity in response to the pandemic, extra cost due to the cost of equipment taking into account of international trade disputes, observing that some regulators in Europe consider that introducing additional players in the market will improve market structure and revenues).

It also considered that sharing make sense in rural areas and is possible that this may apply to other segments of the market too. It set out that the key difference with 4G and 5G, is that in 5G will be a densification of the urban network. The challenge is that sector is not in position to finance this densification yet.

Another stakeholder set out that that the challenge is that the current legal framework does not provide sufficient security/predictability, with many regulatory obligations. It set out that the EECC and the recent recommendation of the EC on 5G toolbox supports the benefits of infrastructure sharing. In its view, one main challenge faced by it are the numerous questions it receives when it is trying to implement sharing agreements, such as in Czech Republic, Holland, Belgium, Italy (in one example, it set out that there was a deep investigation on a RAN sharing agreement concerning only one third of the territory, which it deemed unnecessarily burdensome).

The stakeholder set out the current regulatory approach imposes constraints on MNOs that try to differentiate themselves on deployment of new technologies. It cited an example from France, where the new licenses for 5G imposed that the future deployment of SA 5G must be implemented by all the operators within 2 years when it will become available.

Another stakeholder set out that while 5G reduces costs per bit, it cannot compensate the rising costs due to traffic explosion. Another challenge arises from the fact that 5G uses higher frequency bands with reduced coverage resulting in the need for network densification. In addition, it noted that high 5G peak rates may require indoor installments due to penetration loss of building for higher frequency bands and so more restrictions/requirements that might increase expenses.

In the view of another stakeholder, there are other challenges too. For example, it claimed that fiber networks are a prerequisite for 5G connectivity, and that when it comes to connecting 5G base stations sharing should be based on agreement rather than on regulation. It set out connecting base stations with fiber in a densified network may be a challenge. It also claimed that it is important to maintain existing market dynamics in fiber deployment without causing further delays by introducing additional regulation. Essentially, its view was that connecting fiber to 5G base stations is a functioning market that should not be impaired by regulation.

Another stakeholder set out that in a 5G environment, the access network ecosystem will be even more competitive as more technologies come into play (partnerships and OTT IP-based services). As a consequence, network sharing models may become more complex and the need and rationale for sharing could increase, be it passive or active form.

In the view on another stakeholder, some other potential trend and challenges in infrastructure sharing are networks slicing, competitive 5G wholesale markets and 5G private networks and their interoperability with public networks, unfair distribution of spectrum, electromagnetic fields (EMF) standards (power density limits), increasing role of software and the virtualization of the networks and synergies between FTTH and 5G.

Another stakeholder set out that the deployment and operation of 5G implies higher costs in terms of backhauling, RAN updating, IT and service platform upgrading, new frequency bands (higher spectrum bands characteristics), densifying sites in the network. It considered that current technology networks are insufficiently dimensioned to support increased traffic and technical requirements of 5G, etc. Operators must invest into 5G and at the same time update their current mobile networks. The stakeholder also claimed that, due to Covid 19 pandemic, costs were higher and revenues were lower but it didn't elaborate on this point beyond citing there was an unprecedented demand on communication networks in the period.

Summary of stakeholders' views on opportunities

One stakeholder set out that, as a consequence of the challenges, and to face these headwinds, any methods that could reduce the cost burden on operators to accelerate the roll out of the 5G should be welcomed. One main concern of sharing it observed is the need to achieve the benefits (of sharing) while continuing to preserve the competition between networks within the market. It noted that 2019 Common Position had been of some assistance in this regard. The stakeholder also set out that the approach of *club licensing* (in Italy) was an interesting approach. It considered that the approach gives a possibility to use unused

competitors' frequencies, and this could lead to a cost-effective densification of 5G in urban networks. It also noted that the approach incentivizes operators to be first to rollout, given the frequency rights are non-exclusive.

The stakeholder set out that sharing can be an opportunity to retire older networks as follows. For 2G networks, which will be more difficult to switch off than 3G, there is an opportunity to 'collapse' competing 2G networks together, creating a single shared legacy network. This would free up valuable spectrum for all involved parties so that more frequencies could be re-farmed for 4G or 5G uses. It considered that the impact on competition would be minimal compared with the benefits in this case.

Another stakeholder set out that 5G Ran sharing agreements are important in terms of possibilities to deploy new technologies.

Two stakeholders commented that 5G sharing could have a positive impact on the environment.

Another stakeholder also set out that network sharing is a key to decrease costs, accelerate roll-out, etc. The stakeholder also set out that network sharing agreements are proving essential to support the sustainability of mobile network investment. Deployment of 5G technology is designed not only to increase network performance, but also to deliver increased energy efficiency for higher traffic demand.

Another stakeholder set out the opportunities as follows: 5G will also enhance mobile broadband, to enable use cases for vertical industries, smart cities, etc. There will be a rapidly increasing demand for capacities for data transfer. 5G will have to support a wider range of mobile application and services. 5G will bring new forms of cooperation strategies and network design.

One stakeholder described the 5G mobile infrastructure opportunity in terms of increased number of different options for operators to collaborate on infrastructure, utilizing existing assets, combining resources and the ability to share transmission resources, which require extensive capital investments, provide the largest sharing potential. The stakeholder also commented on the other main features of 5G that are achieved through massive MIMO plus high-power adaptive antenna units.

Another stakeholder set out that tower companies have an incentive to share infrastructure with as many parties as possible. It made mention of the benefits of neutral host models which may improve access to scarce infrastructures such as rooftops. It also suggested that the model could address an *every-operator antenna per lamp post* situation, which could be inefficient for a number of reasons.

4. Stakeholders views on 5G sharing in the context of small cells

Summary of BEREC's questions: 5G sharing in context of small cells

- What is the demand for network and/or infrastructure sharing in the context of 5G small cell rollout?

- Are there any differences related to 5G that impacts sharing of equipment (antenna) and/or infrastructure (e.g. street furniture)? Is that difference related to different spectrum bands (e.g. 26 GHz) or to another aspect of the 5G technology and capability?

Summary of stakeholders' views

The views of stakeholders on this theme were general. Most of their points have been noted above, namely that densification of networks will be challenging.

For example, one stakeholder did set out that permits will need to be issued quickly to enable rollout of small cells (2 years waiting for permits is too long a time).

Another stakeholder provided views on the *club* licensing of 26GHz in Italy set out above and no further insights on the issues facing mobile infrastructure sharing in the context of 26 GHz were provided.

Another stakeholder set out that connectivity policies (for small cells) need to take into account the benefits of independent wireless infrastructure sharing. In addition, it referred to the Commission's Small Cells Implementing Regulation 2020/1070[5]. It set out that tower companies or other neutral hosts could assist in the sharing of street furniture, observing there maybe are some rules provided by for e.g. local authorities (aesthetics).

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[5] https://ec.europa.eu/digital-single-market/en/news/commission-adopts-implementing-regulation-pave-way-high-capacity-5g-network-infrastructure

5. Stakeholders views on adapting the 2019 Common Position and other suggestions from stakeholders

BEREC's question

- Is there a need to adapt the 2019 BEREC Common Position as a result of the roll-out of the 5G?

Summary of stakeholders' views

Two stakeholders set out support for BEREC's case-by-case methodology defined in the 2019 Common Position. Another stakeholder acknowledged that case-by-case assessments probably cannot be avoided and yet another stakeholder acknowledged that BEREC's guidance had been helpful in setting the broad principles to help reduce the cost burden on operators extending network reach and accelerating rollout, but stressed that predictability and consistency are needed. In addition, one of these stakeholders considered that the Common Position was flawed because there was insufficient reference to 5G.

For example, the stakeholder considered that some terminology in the 2019 Common Position refers to historic parameters that will become less relevant in the context of 5G, such as:

- **Urban/rural distinction,** which it believes is outdated since sharing in urban areas could become impacted by scarcity of rooftops sites, and costs are higher. It will be difficult to find relevant sites for the densification in urban areas and it will be more expensive, which changes the economic dynamic. Further, as set out above coverage is no longer a differentiation parameter, and the distinction between urban and rural areas must be reviewed;

- **Passive/active distinction,** which it believes is less relevant with virtualization and open RAN as intelligent SW (software) and centralized data centers. The stakeholders suggested it would be better to concentrate in on the distinction between hardware/software. At RAN sites level only generalized hardware radio equipment is kept and differentiation is provided by RAN software in the cloud, which can be adapted individually in sharing context.

The stakeholder also set out that benefits of network sharing agreement must be more reflected in the approach of network sharing. Consequently, due to their benefits and procompetitive nature the network sharing agreements should generally be regarded as permissible. It would like to see a general exemption for network sharing, but acknowledged that case-by-case would likely be necessary.

In support of the case-by-case approach, one stakeholder considered that there should be a bit more reflection on the parameters in the guidelines: network coverage; spectrum use; cost reduction and sustainability goals. For example, it set out that the assessment of impact on competition should take into account a variety of aspects that play a role e.g. topology, existing network grids, access to antenna sites.

Another stakeholder set out that the case-by-case approach could include an analysis of the impact on the electromagnetic field emissions. In addition, the stakeholder set out that there is a need to ensure non-discriminatory access and that NRA's need the flexibility to take into account local circumstances. In addition, the stakeholder supported the case-by-case assessment on the benefits and drawbacks of sharing, as it considered that BEREC cannot put everything in the guidelines. It also claimed that the EECC should prevail over the cost reduction directive when it comes to dispute resolution measures, however stakeholder did not elaborate further on this point during the workshop. Finally the stakeholder suggested that the implementation of the CP should be monitored.

Another stakeholder set out that the 2019 Common Position should

- Be more supportive to widespread 5G roll-out. It considered that a more open and neutral approach towards various new forms of cooperation strategies would be necessary. In its view BEREC should concentrate on service-based competition that takes over infrastructure-based competition.

- Reflect the need for more network virtualization, new financial business models of deployment and operation of 5G networks (industry collaboration – partnerships between network operators and broadcasters or third-party players, central and local government support).

- Be more compatible with future technologies. For example, the stakeholder considered that the CP should reflect the fact that the rural-urban topology is no more conforming 5G needs. The passive sharing only is insufficient, due to the lack of physical space. In 5G active sharing becomes more extensive (taking into account the inevitable 5G densification, the lack of physical space to accommodate all individual operators' equipment and the significant expenditure beyond rural areas).

Summary of stakeholders' other suggestions

In addition to the above, stakeholders provided views on some other specific proposals, which are utilized in this section. These were not related directly the 2019 Common Position but are proposals by stakeholders to address 5G mobile infrastructure sharing and challenges. For example, stakeholders suggested that the following proposals might be considered

- More dialogue between parties for a consistent approach and more regulatory support

  o One stakeholder set out that there is a need to have a more consistent approach in the EU and with competition authorities for all these questions of network sharing. It claimed that there was also a need also for more dialogue between national competition authorities, regulators, and the DG competition, BEREC and industry.

  o Similarly, another stakeholder set out that more dialogue is necessary between competition and regulatory authorities on network sharing arrangements to provide legal certainty.

- o One further stakeholder set out that in order to help widespread 5G roll-out, early regulatory support is needed otherwise high-quality 5G deployment might not be achieved. The stakeholder claimed that what is needed is a transparent, open and up-to-date EU/national legal and regulatory framework supporting operators' incentives in order to make risky, expensive 5G investments.

- Application of a block exemption rules on certain sharing agreements would be an element to help the sharing of networks

  - o One stakeholder set out that there is a need to utilize a block exemption rule-based approach. It suggested that the approach could be constructed on three criteria: (i) guaranties in commercial differentiation capacities of operators (for example, no core network sharing or no spectrum sharing), (ii) guaranties in terms of information exchanges and (iii) particulars regarding the geographical scope, if other operators that are not part of the sharing agreement cover the proposed areas. Essentially, the stakeholder set out that if these three criteria are meet the agreement should be considered as competitive.

  - o In addition, the stakeholder also set out that, because of the new 5G context, there needs to be a review of the analysis of the competition and regulatory approaches to RAN sharing.

  - o Another stakeholder considered that guidance on the competition law aspects is more necessary, as a block exemption rule may not avoid a case-by-case analysis.

  - o Another stakeholder also set out that guidelines clearly articulating which technical elements could be shared without endangering competition should be drafted. It considered that these guidelines could set out minimum requirements on what technical, commercial differentiation, and information exchange safeguards need to be in place for arrangements to be looked on favorably.

- Other suggestions around how the assessment should be conducted

  - o One stakeholder set out that the competitive assessment should focus more on following parameters of the horizontal guidelines:

    - Limited cost communality

    - Safeguards on information exchange

    - There remains room for differentiation towards the customer (even if we share the access network, 5G allows differentiation).

  - o Another stakeholder set out that the more effective the external market competition is, the more effective the network sharing could be because they need to keep up with the competition. When assessing the agreement, the stakeholder considered that it is *a must* that the counterfactual is examined, in other words if the sharing makes it possible to make a network investment that

otherwise they would not be viable or possible in the absence of sharing, the merit of that outcome needs to be carefully considered.[6] It set out that, from a policy maker's perspective, the level of external competitive pressure should be considered as decisive.[7]

- o Another stakeholder set out that assessment should accommodate the latest market developments with focus on:

  - Equal assessment of the overall objectives

  - Technical developments

  - Analysis of the benefits and drawbacks of the different parameters

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[6] The stakeholder also suggested that state aid could be helpful to extend the boundaries of economic investment.
[7] For example, the stakeholder claimed that in a market with only one minor independent MNO, there might not be sufficient competitive pressure. Whereas, in a 4-player market, a sharing agreement between two players will be beneficial, if two other MNOs can cooperate on a competing, independent infrastructure.

6.   Next steps and recommendations for further work

Stakeholders have submitted useful information about many forward-looking items, and BEREC is thankful for these views. Many stakeholders are positive about the flexibility and differentiation opportunities that will be afforded to operators from software and virtualisation of mobile networks, and Open RAN, etc.

The 2019 Common Position is rooted in case-by-case assessment, which gives BEREC comfort that once more real world 5G mobile infrastructure sharing cases are in the market, more case information can be shared amongst BEREC, NRAs, Competition Authorities, and competition practitioners and advisors of stakeholders, as required. In addition, in the context of network virtualisation, changes to network security and resilience may necessitate dialogue with other competent authorities for security of networks and services. Thus, more dialogue can be expected.

BEREC is also keen to ensure that the 2019 Common Position does not act as an undue barrier to future new sharing arrangements, whatever the technology paradigm. In this regard, BEREC is grateful that stakeholders have set out views on how they consider the market might develop, and the challenges and opportunities which 5G mobile infrastructure sharing may give rise to (see also section 3.0 above). BEREC is encouraged by stakeholder beliefs that 5G mobile infrastructure sharing may be able to unlock great benefits for the sector without distorting competition. In this regard, however, BEREC considers that the views of NRAs on the operation of the 2019 Common Position in the context of 5G would also be central to any decisions to modify the current position document.

BEREC remains of the view that collaborations and sharing arrangements must comply with competition law. 5G network deployments are happening across Europe now and are expected to continue to do so notwithstanding identified challenges. Stakeholders consider it is only a matter of time before the demand for 5G mobile infrastructure sharing will necessitate assessment guidance. In this matter, BEREC does not observe the same level of urgency as stakeholders. Presently BEREC observes that operators are conducting useful case studies (5G passive network sharing case studies in Germany and UK), and that these studies help to improve our collective understanding of the relevant issues. In addition, the extent that 5G mobile infrastructure sharing might be different in 26GHz, this remains unclear too. For example, the level of demand for 26 GHz remains largely uncertain (Finland and Italy have assignments in the band, and some countries have plans to release part of the band in 2021).

As a result, BEREC is reasonably satisfied that the definitions, objectives, and non-exhaustive list of assessment factors as set out in the 2019 Common Position remain valid, and that there is no urgent requirement to update them. As for the implications of software and virtualisation, BEREC would note that when NRAs have the competence to assess an arrangement it will still be conducted on a case-by-case basis. BEREC would encourage NRAs to take account of this workshop report alongside the 2019 Common Position, the Report on the Consultation BoR(19) 109, and the Report on infrastructure sharing BoR(18) 116.

In summary, BEREC's view is that the 2019 Common Position will continue to offer NRAs valuable information to assess mobile infrastructure sharing arrangements where they have the competence to do so.

Annex 1 – Workshop Agenda

Agenda

Workshop on mobile infrastructure sharing

Location:	Videoconference
Date & Time:	16 November 2020, 10.30-12.15 CET

10.30	Workshop starts

Opening remarks by WNE WG co-chair   10.30-10.35

Presentations (5-7min per speaker)   10.35-12.05

- **Huawei**
  Dr. Hui Cao - Head of Strategy and Policy (EU Public Affairs & Communication Office)
- **Vodafone Group**
  Mr. Stephen Pentland - Policy & Public Affairs Head
- **Orange**
  Mr. Matthieu Agogue - Deputy Director of Regulatory Affairs of Orange Group
- **Deutsche Telekom**
  Ms. Grania Holzwarth - Head of EU Competition Policy
- **Brekoverband (German Broadband Association)**
  Mr. Jan-Niklas Steinhauer - Head of Regulation
- **GSMA (Global System Mobile Communications Association)**
  Mr. Daniel Gueorguiev - Public Policy Manager Europe, Russia and CIS
- **ETNO (European Telecommunications Networks' Operators Association)**
  Ms. Maarit Palovirta - Director of Regulatory Affairs
- **ECTA (European Competitive Telecommunications Association)**
  Mr. Luc Hindryckx- Director General
- **EWIA (European Wireless Infrastructure Association)**
  Mr. Jaume Pujol Huguet - Head of Regulation at Cellnex Telecom
- **CETIN**
  Ms. Ivana Müllerová - Competition Counsel

Q&A with WNE WG experts between presentations

Wrap up and closing remarks by WNE WG co-chair   12.05-12.15

12.15	End of Workshop

Annex 2 – Questions to Stakeholders

5G rollout

What network and/or physical infrastructure do you currently access/rollout for your 5G (Towers/Masts, RAN, Core, small cells)? Do you see any needs for an increase in sharing due to the roll-out of 5G? If yes, please describe specifically the circumstances for the need to increase sharing. Furthermore, what do you see as sharing options (i.e. passive and/or active sharing) for 5G and what are the motivations behind? Please elaborate

In case of passive sharing, what kind of physical infrastructures do you share due to 5G implementations? Are there any best practices developed for that? Please elaborate.

Do you see different needs to share mobile network and/or physical infrastructure depending on the type of technology that is used? (2G 3G 4G 5G /5G small cell) please elaborate.

5G sharing challenges/opportunities/trends

What are the current and future trends in mobile network roll-out and infrastructure sharing? What could be the impact of 5G on those trends?

In your view, what are the specific challenges of 5G infrastructure sharing?

Have you experienced challenges / Have you heard of any challenges amongst the members of your association with regards to sharing mobile networks and/or mobile infrastructure? Please elaborate.

5G sharing in context of small cells

Please describe whether and to what extent there is a demand for network and/or infrastructure sharing in the context of 5G small cell rollout. If so, what are the main challenges?

Is there any difference related to 5G that impacts sharing of equipment (antenna) and/or infrastructure (e.g. street furniture). If so, is that difference related to different spectrum bands (e.g. 26 GHz) or to another aspect of the 5G technology and capability (and if so please elaborate on that aspect(s)?)?

2019 Common Position

Do you see a need to adapt the 2019 Common Position as a result of the roll-out of the 5G? If so, please provide a specific suggestion with detailed underlying argumentation(s).