



भारतीय दूरसंचार विनियामक प्राधिकरण
Telecom Regulatory Authority of India



**Recommendations on
Telecommunication Infrastructure Sharing,
Spectrum Sharing and Spectrum Leasing**

New Delhi, India

24th April, 2024

Mahanagar Doorsanchar Bhawan, Jawahar Lal Nehru Marg New Delhi- 110002

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CHAPTER-1: INTRODUCTION

A. DoT's Reference

- 1.1 The Department of Telecommunications (DoT), Ministry of Communications, Government of India, through its letter No. 20-405/2013-AS-I dated 07.12.2021 (**Annexure-I**), sent a reference to the Telecom Regulatory Authority of India (hereinafter also referred to as "TRAI", or "the Authority") under Section 11(1)(a) of TRAI Act, 1997 (as amended) on allowing sharing of core network elements such as MSC, HLR, IN etc., among telecom operators. The said reference is reproduced below:

"The Department of Telecommunications has received request from Cellular Operator Association of India (COAI) for allowing sharing of core network elements also such as Mobile Switching Center (MSC), Home Location Register (HLR), Intelligent Network (IN), etc., among telecom operators. The copy of COAI reference is enclosed.

2. At present, as per the provisions contained in Unified License, the sharing of active infrastructure is limited to antenna, feeder cable, Node B, Radio Access Network (RAN) and transmission system only. The relevant condition of Unified License Agreement is reproduced as under:

"33. Sharing of infrastructure:

33.1 Sharing of active/ passive infrastructure shall be governed by the terms and conditions of respective service authorization and amendment/ guidelines to be issued by the Licensor from time to time.

33.2 Sharing of Active infrastructure amongst Service Providers based on the mutual agreements entered amongst them is permitted. Active infrastructure sharing will be limited to antenna, feeder cable, Node B, Radio Access Network (RAN) and transmission system only. Sharing of infrastructure related to Wi-Fi equipment such as Wi-fi router, Access Point etc. is allowed. Sharing of backhaul is also permitted.

33.3 The Licensee may share its own active and passive infrastructure for providing other services authorized to it under any other telecom license issued by Licensor.

33.4 An authorized Gateway Hub operated by the satellite provider itself is permitted to be shared with the satellite bandwidth seeker."

3. In view of above, TRAI is requested to submit its recommendations under Section 11(1)(a) of TRAI Act, 1997 (as amended) on allowing sharing of core network elements also such as MSC, HLR, IN etc., among telecom operators."

1.2 Along with the afore-mentioned reference dated 07.12.2021, DoT also enclosed the COAI's representation dated 29.11.2021 on 'facilitating the infrastructure sharing between the telecom operators'. Through the said representation, COAI had requested DoT to allow the sharing of core network elements such as MSC, HLR, IN, etc., between the telecom operators for the following reasons:

- (a) Telecom being capital intensive needs huge investments for growth and expansion of service. Therefore, it is important for telecom service providers (TSPs) to have a model which enables them to share infrastructure i.e., passive, active and core, to reduce capital expenditure (CAPEX), operating expenditure (OPEX) and maximise network capacity and capabilities.
- (b) As per BEREC¹, there can be a cost saving of 16%-35% in passive infrastructure sharing in both CAPEX and OPEX. The cost saving can be as much as 45% in case of active infrastructure sharing.
- (c) In addition to the cost savings, sharing the active infrastructure will provide following benefits:
 - (i) Avoid duplication of investment by the TSPs
 - (ii) Improved quality of service
 - (iii) Positive incentives to provide service in underserved areas

¹ The Body of European Regulators for Electronic Communications (BEREC) is the regulating agency of the telecommunication market in the European Union.

- (iv) Attract investment from the entities providing infrastructure funds
 - (v) Help TSPs to concentrate on their core business/ competency
 - (vi) Accelerate roll out of digital services
- (d) Currently active infrastructure sharing is allowed to TSPs for only antenna, feeder cable, Node B, and transmission systems.
- (e) The policy of infrastructure sharing should be further liberalized to allow the sharing of core infrastructure such as MSC, HLR, IN, etc., among licensees having Unified License (Access Authorization).
- (f) Sharing of core network elements such as MSC, HLR, IN, etc. among the TSPs will reduce the cost for the TSPs and facilitate faster rollout.
- 1.3 Subsequently, COAI, through its letter dated 04.01.2022 addressed to DoT with a copy to TRAI, informed that COAI has deliberated the issue internally with its members and, at present, it does not wish to pursue this subject any further.
- 1.4 Thereafter, DoT, through its letter No. 20-405/2013-AS-I dated 10.02.2022 (**Annexure-II**), while mentioning its earlier reference dated 07.12.2021, stated as below:

"2. In order to promote optimum resource utilization among the licensees, it is proposed to allow sharing of all kinds of telecom infrastructure and network elements among all categories of service providers, licensed under the Section 4 of Indian Telegraph, Act, 1885, for provision of authorized telecom services.

3. Therefore, TRAI is requested to submit its recommendations under Section 11 (1) (a) of TRAI Act, 1997 (as amended) on this issue."

B. Issues Relating to Sharing and Leasing of Spectrum

- 1.5 In the year 2020, during the TRAI's consultation process on 'Methodology of applying Spectrum Usage Charges (SUC) under the weighted average method of SUC assessment, in cases of Spectrum Sharing', a few stakeholders had requested the Authority that inter-band spectrum sharing as well as leasing of

spectrum should be permitted in the country. The Authority considered the requests from such stakeholders, and it was observed that inter-band spectrum sharing and leasing of spectrum, could involve larger issues, and modalities also need to be worked out, which need to be well-examined and consulted with stakeholders. As the issues related to inter-band spectrum sharing and leasing of spectrum were not part of the consultation process, at that point of time, the Authority decided that these issues would be examined separately.

- 1.6 Through the National Digital Communication Policy (NDCP)-2018, the Government has envisaged the following strategy:

"Further liberalizing the spectrum sharing, leasing and trading regime"

- 1.7 In view of the above, the Authority decided to take up the issues related to spectrum sharing and leasing of spectrum along with the issues related to infrastructure sharing, through a single consultation paper.

- 1.8 Meanwhile, on 24.12.2023, the Telecommunications Act, 2023 has been enacted. The chapter II (Powers of Authorisation and Assignment) provides, *inter-alia*, as below:

"The Central Government may permit the sharing, trading, leasing and surrender of assigned spectrum, subject to the terms and conditions, including applicable fees or charges, as may be prescribed."

[The appointed date of the Telecommunications Act, 2023 is yet to be notified by the Government.]

C. Consultation Process

- 1.9 The Authority issued the 'Consultation Paper on Telecommunication Infrastructure Sharing, Spectrum Sharing and Spectrum Leasing' dated 13.01.2023 (hereinafter, also referred to as, "the CP dated 13.01.2023") for soliciting comments of stakeholders on the issues related to telecommunication infrastructure sharing, spectrum sharing and spectrum leasing. In the

consultation paper, specific issues related to infrastructure sharing, connectivity issues faced by the subscribers in the remote and far-flung areas, inter-band spectrum sharing among access service providers, authorized shared access of spectrum, and leasing of spectrum were raised. Initially, the last dates for submission of comments and counter comments were 10.02.2023 and 24.02.2023, respectively. However, considering the request of an industry Association for extension of time, the last dates for submission of comments and counter comments were extended up to 03.03.2023 and 17.03.2023, respectively. In response to the CP dated 13.01.2023, the Authority received comments from 21 stakeholders and counter comments from five stakeholders. The comments and counter comments received from stakeholders are available on TRAI's website (www.trai.gov.in). As a part of the consultation process, an Open House Discussion (OHD) was conducted on 24.05.2023 through online mode.

- 1.10 Based on the comments received from stakeholders and a further analysis of the issues, the Authority has finalized these recommendations. The recommendations comprise three chapters. This chapter provides an introduction and background to the subject. Chapter-II provides a brief description of the issues, a summary of stakeholders' comments, and the Authority's analysis and recommendations thereupon. Chapter-III provides a summary of the recommendations.

CHAPTER-II: EXAMINATION OF ISSUES

2.1 Through the CP dated 13.01.2023, the Authority solicited comments of stakeholders on a range of issues related to infrastructure sharing, connectivity issues faced by the subscribers in the remote and far-flung areas, inter-band spectrum sharing among access service providers, authorized shared access of spectrum, and leasing of spectrum. Considering the comments received from stakeholders in the consultation process, an analysis of the issues is being presented below:

A. Telecommunication Infrastructure Sharing

2.2 The present telecommunication service licensing framework in India makes a distinction between active and passive infrastructure sharing. In general, active infrastructure sharing is the sharing of electronic infrastructure of the telecommunication network, while passive infrastructure sharing is where non-electronic infrastructure is shared².

2.3 Initially, under the Cellular Mobile Telephone Service (CMTS) License and Unified Access Service License (UASL), access service providers were permitted to share only the passive infrastructure. Based on the TRAI's recommendations on 'Infrastructure Sharing' dated 11.04.2007, DoT issued 'Guidelines on Infrastructure Sharing Among the Service Providers and Infrastructure Providers' dated 02.04.2008. These guidelines provided, *inter-alia*, that "[s]haring of active infrastructure amongst Service Providers based on the mutual agreements entered amongst them is permitted. Active infrastructure sharing will be limited to antenna, feeder cable, Node B, Radio Access Network (RAN) and transmission system only. Sharing of the allocated spectrum will not be permitted. The licensing conditions of UASL/CMSP will be suitably amended wherever necessary to permit such sharing." Thereafter, DoT issued amendments to the Unified

² Source: <https://www.gsma.com/futurenetworks/wiki/infrastructure-sharing-an-overview/>

License (Access Service), UASL and CMTS License permitting to share active infrastructure limited to antenna, feeder cable, Node B, RAN and transmission system on 11.02.2016.

- 2.4 Subsequently, based on the TRAI's recommendations on 'In-Building Access by Telecom Service Providers' dated 20.02.2017, DoT issued an advisory dated 18.11.2019, through which all TSPs were advised to share the in-building infrastructure (in building solution, optical fiber cable and other cables, ducts, etc.) with other TSPs, in all the existing Government/ public buildings/ places like Airports, Railway Stations, Bus Terminals, Metro Stations/ Lines, hospitals, etc., as per the terms and conditions of their respective licenses.
- 2.5 Thereafter, based on the TRAI's recommendations on 'Proliferation of Broadband Through Public Wi-Fi Networks' dated 09.03.2017, DoT issued amendments dated 06.04.2021 to Unified License, UASL and Internet Service Provider (ISP) License, permitting sharing of infrastructure related to Wi-Fi equipment such as Wi-Fi router, access point, and backhaul.
- 2.6 At present, some of the service licenses and authorizations under Unified License do not contain specific provisions relating to the permission for passive infrastructure sharing. Further, there are certain ambiguities in the provisions related to infrastructure sharing in different types of telecom service licenses/ authorizations. In this regard, through the Recommendations on 'Use of Street Furniture for Small Cell and Aerial Fiber Deployment' dated 29.11.2022, the Authority recommended, *inter-alia*, that DoT should bring clarity on the provisions of sharing of infrastructure under different licenses to remove the ambiguity in infrastructure sharing provisions in Unified License mentioned in the chapters related to generic conditions and authorization specific chapters.
- 2.7 DoT, through the instant reference dated 10.02.2022, has stated that "*[i]n order to promote optimum resource utilization among the licensees, it is proposed to allow sharing of all kinds of telecom infrastructure and network elements among all categories of service providers, licensed under the Section 4 of Indian Telegraph, Act, 1885, for provision of authorized telecom services.*"

2.8 In this background, through the CP dated 13.01.2023, stakeholders were requested to furnish their comments on the following questions:

Q1. Should passive infrastructure sharing be permitted across all telecommunication service licenses/ authorizations? Kindly justify your response.

Q2. Should other active infrastructure elements deployed by service providers under various licenses/ authorizations, which are not permitted to be shared at present, be permitted to be shared among licensees of telecommunication services?

Q3. If your response to the Q2 is in the negative, which active infrastructure elements should not be permitted to be shared? Further, which active infrastructure elements should be permitted to be shared with which licensees/ authorization holders? kindly provide details for each authorization with detailed justification.

Q4. In case it is decided to permit sharing of any additional active infrastructure elements among licensees,

(a) What precautionary conditions should be put in place to avoid disruption in telecommunication services due to any unforeseen situation? The response may be provided for each active infrastructure element.

(b) Whether there is a need to have a provision for permission from/ intimation to the Licensor before commencement of such sharing? If yes, what provisions and timelines need to be prescribed for each active infrastructure element?

Q5. Whether any other amendment is required to be made in the telecommunication services licenses/ authorizations with respect to the provisions relating to both active and passive infrastructure sharing to bring clarity and remove anomaly? If yes, clause-wise suggestions in the

telecommunication services licenses/ authorizations may kindly be made with detailed justification.

Comments of stakeholders on the Q1

2.9 In response to the Q1, all stakeholders were of the view that the sharing of passive infrastructure should be permitted across all telecommunication service licenses/ authorizations. A broad summary of the comments of stakeholders is given below:

- (a) Passive infrastructure sharing across all telecommunication service licenses/ authorization will lead to cost savings, more efficient use of resources, and improved coverage and capacity.
- (b) It will result in reduced carbon footprint, sustainable environment and help society at large.

2.10 A few stakeholders contended that the extant license conditions already permit passive infrastructure sharing across all telecommunication service licenses/ authorizations; it is only inadvertently that such enabling provisions were included in some authorizations and not in other authorizations; therefore, for bringing clarity and removing ambiguity, enabling provisions for passive infrastructure sharing should be introduced in all individual service authorizations under the Unified License (UL), and Unified License for VNO [UL (VNO)].

Comments of stakeholders on the Q2 and Q3

2.11 In response to the Q2 and Q3, many stakeholders were of the view that all kinds of active infrastructure elements should be permitted to be shared among telecommunication service licensees. The reasons cited by such stakeholders for permitting sharing of all kinds of active network elements are summarized below:

- (a) The permission for sharing of all kinds of active infrastructure elements would result in larger resource pool sharing, greater cost efficiencies,

enhanced service coverage, improved time to market, and enhanced competitiveness.

- (b) It would improve the business case for the less covered rural areas where demand and purchasing power are lower, and the per capita cost of broadband network deployment is higher.
- (c) The sharing of active infrastructure in the core networks of wireline telecom operators will enable the delivery of low-cost voice, data, and internet products which are essential for the wireline segment to sustain and flourish.

2.12 On the other hand, many stakeholders contended that the sharing of additional active infrastructure elements such as core network elements should not be permitted. The reasons cited by such stakeholders are summarized below:

- (a) The license amendment issued by DoT in 2016 provides for the active infrastructure sharing of antenna, feeder cable, Node B, Radio Access Network, and transmission system. This list of active infrastructure is exhaustive and adequate for sharing among licensees of telecommunication services, and there is no requirement to expand the active infrastructure elements. The existing service providers have already laid out adequate and robust infrastructure, and they are now in the process of rolling out 5G networks. Any further sharing will raise concerns among the competition and also disincentivize potential investors from making new investments in such infrastructure creation.
- (b) Core network sharing provides very little saving to service providers. Besides, the sharing of core network may have a direct impact on the quality of service (QoS) due to technical incompatibilities. Any failure in a shared core network can result in a single point of failure, impacting the services of all wireless access service providers.
- (c) The sharing of core network nodes involves a lot of complexities and challenges. The complexity in the core routing would make it difficult for

a single node to handle multi-PLMN³ traffic. Further, there would be significant challenges in implementing separate charging and lawful interception (LI) for the participating operators. The hosting of subscriber databases of multiple operators on a single node would also give rise to a major competition concern. The potential risks such as partner conflict, technical incompatibilities, etc. far outweigh any potential cost benefits that may be achieved with the sharing of core network elements.

- 2.13 One of the stakeholders mentioned that as per the clause 33.3 of the Unified License, the licensee may share its own active and passive infrastructure for providing other services authorized to it under any other telecom license issued by Licensor; however, the same has not been allowed in the case of standalone NLD/ ILD/ ISP licenses yet. The stakeholder contended that the license conditions should be uniform for infrastructure sharing across all service licenses/ authorizations as far as possible.

Comments of stakeholders on the Q4

- 2.14 A broad summary of the comments of stakeholders in response to the Q4 (a) on the precautionary conditions to be put in place to avoid disruption in telecommunication services due to any unforeseen situation is given below:
- (a) It should be ensured that the sharing does not compromise encouragement for the creation of infrastructure, robustness of digital communication infrastructure, prevention of any single point of failure, ensuring sufficient competition to deliver the benefit of sharing to consumers, security and privacy of information, and accountability.
 - (b) Active infrastructure sharing is a complex process; therefore, DoT should regularly monitor the sharing of active infrastructure and may ask the licensed operators to submit status reports from time to time.

³ PLMN is an acronym of public land mobile network. PLMNs are used for providing terrestrial wireless communication to subscribers.

- 2.15 In response to the Q4 (b) regarding the need for a provision for permission from/ intimation to the Licensor (DoT) before the commencement of active infrastructure sharing, a few stakeholders contended that there should be no requirement of intimation to/ permission of the Licensor with respect to active infrastructure sharing. On the other hand, a few other stakeholders suggested that intimation should be made within 15 days from the commencement of sharing.
- 2.16 The comments of stakeholders in response to the Q5 regarding the amendments required to be made in the telecommunication services licenses/ authorizations with respect to the provisions relating to both active and passive infrastructure sharing to bring clarity and remove anomalies are summarized below:
- (a) The license conditions with respect to infrastructure sharing should be generic with specific exceptions, if any. Also, such conditions should be uniform across all licenses and service authorizations as far as possible to avoid unnecessary confusion.
 - (b) For abundant caution and to remove any ambiguity, enabling provisions for passive infrastructure sharing should be introduced in all individual service authorizations under the UL and UL (VNO), and to maintain uniformity such enabling provisions may be in line with clause 4.2(i) of Chapter-VIII (Access Service) of the Unified License⁴.

Analysis w.r.t. the Q1, Q2, Q3, Q4 and Q5

- 2.17 Expanding digital connectivity, combined with complementary policies, offers the possibilities to create more dynamic and inclusive societies.⁵ International

⁴ The clause 4.2 (i) of Chapter- VIII (Access Service) of the Unified License provides as below:

"4.2 The sharing of infrastructure, owned, established and operated by the Licensee under the scope of this Authorization, is permitted as below:

(i) Sharing of "passive" infrastructure viz., building, tower, dark fibre, duct space, Right of Way etc. with other Licensees."

⁵<https://www.worldbank.org/en/news/press-release/2023/10/04/conectividad-digital-impulsa-crecimiento-inclusion-perspectivas-america-latina-caribe>

Finance Corporation (IFC)⁶, in its paper titled 'Accelerating Digital Connectivity Through Infrastructure Sharing' (2020), stated that "*[d]igital connectivity has enormous potential to support development. Yet today some four billion people in emerging economies remain offline, partly due to a lack of affordable Internet access. Sharing infrastructure among operators and across sectors is a potential solution. It can accelerate digital connectivity at lower cost, especially in the least developed markets where returns to investment can be limited. It can also reduce investment costs and operating expenses for investors and operators, and increase their balance sheet sustainability. Sharing models can also benefit consumers by increasing competition, lowering prices, and raising service quality.*"⁷

2.18 Telecommunication infrastructure sharing means various kinds of arrangements by which an owner of telecommunication network facilities (including but not limited to, antennas, switches, access nodes, systems, ducts, poles, towers, premises, and rights of way) agrees to share access and usage of those facilities with another legal entity, normally another network operator or service provider, subject to a commercial agreement between the parties.⁸

2.19 As indicated earlier, telecommunication infrastructure sharing can be divided into two broad categories viz. (a) passive infrastructure sharing, and (b) active infrastructure sharing. Under passive infrastructure sharing, the non-electronic infrastructure such as towers, poles, ducts, and premises are shared but all the active network electronics remains proprietary to the individual network operators. Passive infrastructure sharing is technically the simplest form of infrastructure sharing. Active infrastructure sharing includes electronic

⁶ IFC is the private sector arm of the World Bank Group.

⁷ <https://www.ifc.org/en/insights-reports/2020/emcompass-note-79-digital-infrastructure-sharing>

⁸ Source: Paper titled 'The Infrastructure Sharing Imperative' (25.08.2022) published by *Digital Regulation Platform* (collaboration between the ITU and the World Bank), accessible at the URL: <https://digitalregulation.org/the-infrastructure-sharing-imperative/>

infrastructure such as switches and radio access nodes as well as passive network elements.⁹

2.20 In India, the telecommunication service licensing regime has evolved with the passage of time. Earlier, the Government of India granted standalone service licenses for various telecommunication services such as access service, internet service, etc. However, since the year 2013, the Government of India has been following a regime of Unified License for the provision of telecommunication services. Eligible entities may obtain appropriate authorization(s) under the Unified License and provide a range of telecommunication services to their customers. It has been observed that – (a) the provisions for enabling passive infrastructure sharing appearing in different service licenses/ authorizations under Unified License are worded somewhat differently, and (b) in a few licenses/ authorizations under Unified License, the provisions for enabling passive infrastructure sharing have not been included. A few examples are given below:

(a) Some of the Authorizations under Unified License, such as GMPCS, PMRTS, Commercial VSAT CUG, etc., do not contain specific provisions relating to permission for passive infrastructure sharing.

(b) In Internet services authorization under Unified License for VNO, the clause 2.1(vii) provides that “*the Licensee may share “passive” infrastructure namely building, tower, dark fiber, duct space, Right of Way owned, established and operated by it under the scope of this Authorization with other VNO Licensees*”. It can be inferred that the sharing of passive infrastructure is permitted only between VNOs and not with the network service operators (NSOs).

2.21 Considering the above, through the CP dated 13.01.2023, stakeholders were requested to provide their comments on whether passive infrastructure sharing should be permitted across all types of telecom service licenses/ authorizations and whether any amendment is required to be made in the telecommunication

⁹ ibid

service licenses/ authorizations in order to bring clarity and remove anomalies. In the consultation process, stakeholders were of the consensus view that passive infrastructure should be permitted to be shared across all types of telecommunication service licenses/ authorizations. The Authority concurs with the views of stakeholders on this aspect. The Authority notes that, at present, the Infrastructure Provider (IP-I) registered companies are permitted to provide dark fiber, Right of Way, duct space, and tower on lease/ rent out/ sale basis to the licensees of telecommunication services¹⁰. Therefore, there appears to be no rationale for not permitting the licensed telecommunication service providers to share their passive infrastructure with other licensed telecommunication service providers.

2.22 With respect to the scope of the passive infrastructure sharing, the Authority took the following aspects in mind:

(a) In its earlier recommendations on 'Infrastructure Sharing' dated 11.04.2007¹¹, TRAI had stated that "*[p]assive infrastructure sharing means sharing of physical sites, buildings, shelters, towers/ masts, power supply and battery backup, etc.*"

(b) The Clause 4.2(i) of Chapter-VIII (Access Service) of the Unified License, provides as below:

"4.2 The sharing of infrastructure, owned, established and operated by the Licensee under the scope of this Authorization, is permitted as below:

(i) Sharing of "passive" infrastructure viz., building, tower, dark fibre, duct space, Right of Way etc. with other Licensees."

2.23 In light of the foregoing discussion, the Authority is of the view that telecommunication service licensees should be allowed to share the passive infrastructure such as building, tower, electrical equipment including battery and

¹⁰ Source: <https://dot.gov.in/sites/default/files/RevisedIP-1Guidelines22122021.pdf?download=1>

¹¹ Source: <https://www.trai.gov.in/sites/default/files/recom11apr07.pdf>

power plant, dark fiber, duct space, Right of Way, etc. owned, established, and operated by them under the scope of the respective service licenses with all types of telecommunication service licensees. The Authority is also of the view that there is a need to review all types of service licenses/ authorizations under UL to ensure that the enabling provisions relating to passive infrastructure sharing contained in them are clear and unambiguous. Besides, such provisions should be uniform across all service licenses/ authorizations, to the extent possible.

- 2.24 On the issue related to the need for permitting the sharing of all other types of active infrastructure elements, which are not permitted to be shared at present among telecommunication service licensees, the stakeholders, in the present consultation process, were not unanimous in their views. While many stakeholders affirmed that all types of active infrastructure elements including core network elements should be permitted to be shared, many other stakeholders contended that there is no need for permitting sharing of any additional active infrastructure elements particularly, the core network elements. The stakeholders, who supported the sharing of all types of active infrastructure elements including core network elements, averred that such a sharing will result in efficient use of resources, lower industry costs, increased network coverage, enhanced competition, and lower consumer prices. On the other hand, the stakeholders, who were against the permission for sharing of core network elements, contended that the sharing of core network elements may give rise to operational challenges, reduced network resilience, and reduced incentive to invest.
- 2.25 Typically, the telecommunication networks deployed by telecommunication service providers comprise of access network and core network. The access network connects end-user devices, such as telephone sets, computers, smartphones and tablets to the public networks such as PSTN, PLMN, public Internet etc. through a core network. The core network is the heart of a telecommunication network. It is a collection of network hardware, devices, and software that provides the fundamental services in a telecommunication network.

The devices and facilities used for the core networks are generally switches and routers¹². In general, a core network offers the functionality of aggregation, call control, switching, authentication, charging, gateway functionality, etc.¹³ The following figure depicts a typical telecommunication network of TSPs:

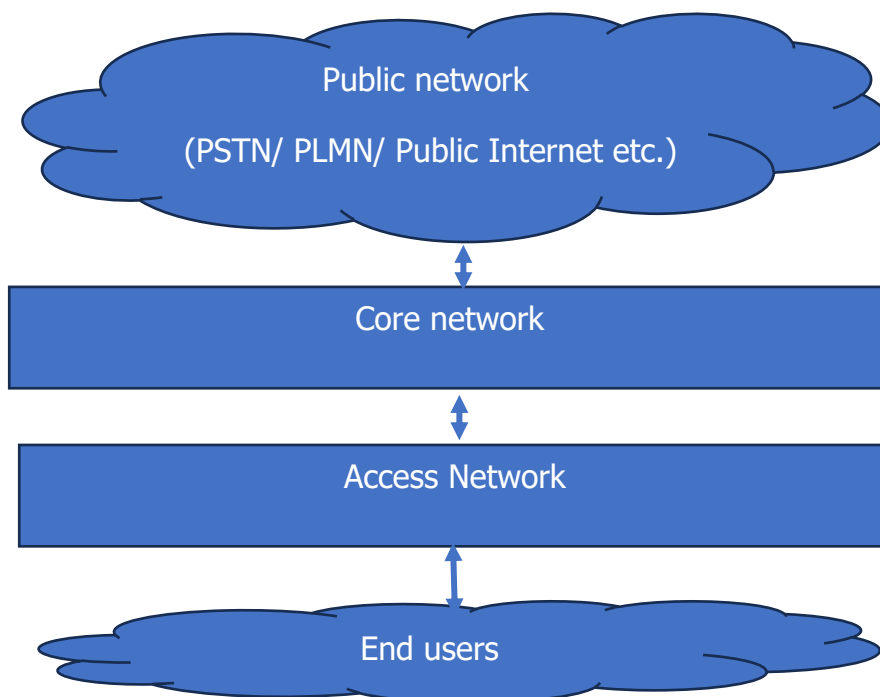


Figure 2.1 : A typical telecommunication network of TSPs

2.26 While analyzing the inputs received from stakeholders with respect to active infrastructure sharing, the Authority took note of the following aspects:

- (a) In respect of cellular mobile networks, ETSI, in its technical specification No. TS 132 130 V17.4.0 (2022-05)¹⁴ on 'Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Network sharing; Concepts and requirements (3GPP TS 32.130 version 17.4.0 Release 17)', has provided, *inter-alia*, the technical

¹² Source: <https://drivenets.com/resources/education-center/what-is-a-core-network/>

¹³ Source: <https://www.tatacommunications.com/knowledge-base/network-core-network-explained/>

¹⁴ Source: https://www.etsi.org/deliver/etsi_ts/132100_132199/132130/17.04.00_60/ts_132130v170400p.pdf

specifications for Gateway Core Network (GWCN). In GWCN, besides sharing Radio Access Network nodes, the participating operators may also share Core Network nodes.

- (b) In its paper titled 'Infrastructure Sharing: An Overview' (June, 2019)¹⁵, GSMA has stated that *"[c]ore network enables greater cost-saving potential but is complicated to operate and to maintain strategic differentiation. It is important to note that core network sharing has not been popular and only a few cases have been suspected to be so."*
- (c) Based on the TRAI's recommendations on 'Introducing Virtual Network Operators in telecom sector' dated 01.05.2015, DoT, in the year 2016, introduced Unified License for VNO [UL (VNO)] regime in the country. An entity which wishes to provide telecommunication services to its customers by utilizing the underlying network and/ or access spectrum of an existing network service operator (NSO), has to obtain UL (VNO) license. A UL (VNO) licensee, after entering into a mutual agreement with an NSO, may utilize the telecommunication network (including access network elements and core network elements) of its parent NSO, as per the terms and conditions of the mutual agreement. At present, more than 800 entities hold UL (VNO) licenses in the country¹⁶. It is worth mentioning that though there are 10 authorizations under UL (VNO), most UL (VNO) licensees have preferred ISP Category C authorization (with jurisdiction in a Secondary Switching Area), ISP Category B authorization (with jurisdiction in a telecom circle/ metro) and Access Service Category 'B' authorization (with jurisdiction in a district). For the other authorizations under UL (VNO), there has been relatively less interest. Thus, the VNO regime, which involves the utilization of the telecommunication network

¹⁵ Source: <https://www.gsma.com/futurenetworks/wiki/infrastructure-sharing-an-overview/>

¹⁶ Sources: <https://dot.gov.in/sites/default/files/UL%28VNO%29.pdf?download=1> and <https://dot.gov.in/sites/default/files/List%20of%20ISP%20Authorizations%20under%20Unified%20License%20VNOas%20on%2029022024.pdf?download=1>

(including core network) of NSO by its VNO, has been particularly successful for certain services, while for the other services, it has yet to gain momentum. In a nutshell, one may infer that – (i) the introduction of the VNO regime in the country was a successful policy initiative, owing to the presence of more than 800 UL (VNO) licensees in the country, and (ii) the VNO regime found wider acceptance in those service segments, which were particularly conducive for it. Also, with the introduction of VNO regime, the proposition of the shared utilization of active infrastructure elements including core network between telecommunication service licensees has been successfully tested, albeit only between NSO (parent) and VNO (child).

2.27 Considering the comments of stakeholders and the foregoing discussion, the Authority is of the view that in case other active infrastructure elements, which are, at present, not permitted to be shared, are also permitted to be shared amongst telecommunication service licensees based on mutual agreements, it will enable the telecommunication service licensees to share a few or all active infrastructure elements including core network elements, as per their business cases. As the telecommunication services sector is, at present, at a reasonably matured stage, it is expected that the market participants will utilize this enabling provision to best serve their interests, that is to lower their network costs without compromising the network resilience.

2.28 The Authority is cognizant of the fact that core network is, essentially, the backbone of telecommunication networks. Any failure in the shared core network elements could become a single point of failure and may affect the services of all service licensees which are involved in such sharing. It is expected that to serve their best interests, telecommunication service licensees, while sharing core network elements, would build their networks in a manner that sufficient redundancy is built to avoid the possibility of a single point of failure. Nevertheless, with a view to ensure the plurality of end-to-end telecommunication networks, the Authority is of the opinion that the sharing of core network should not be done if the number of independent core networks

held by telecommunication service licensees is reduced to less than two for the concerned telecommunication service by such sharing.

- 2.29 Further, the Authority notes that the proliferation of wireline telephone and broadband services is quite low in India. There were only 33.10 million wireline telephone services and 39.46 million wireline broadband subscribers in the country as on 28.02.2024. It is expected that permitting active infrastructure sharing among telecommunication service licensees would result in lowering the cost of the provision of wireline services, which may boost the proliferation of wireline telephone and broadband services in the country.
- 2.30 The Authority notes that the clause 33.3 of the Unified License provides that *"[t]he Licensee may share its own active and passive infrastructure for providing other services authorized to it under any other telecom license issued by Licensor."* Further, the clause 32.3 of the Unified License for VNO also contains a similar provision. In this regard, a stakeholder stated that a similar enabling provision has not been included in the stand-alone NLD/ ILD/ ISP licenses as yet. The Authority examined the matter and is of the opinion that DoT should review the provisions of all stand-alone telecommunication service licenses and may include a provision like clause 33.3 of the Unified License in the stand-alone telecommunication service licenses as well.
- 2.31 As far as the sharing of lawful interception system (LIS) deployed by a Unified Licensee company for all the authorizations/ service licenses held by it is concerned, the Authority is of the view that the same is covered by the clause 33.3 of the Unified License. Further, the Authority is of the view that the sharing of an LIS held by a licensee company with other licensee companies may also be allowed with the permission of DoT on a case-to-case basis, provided that there are no security concerns in such sharing.
- 2.32 The Authority is of the opinion that in case of core network sharing, the participating service licensees should be mandated to furnish a joint intimation about core network sharing to the Licensor within seven days of the effective date of core network sharing along with a statement of compliance to the

condition of availability of at least two independent core networks of separate licensees post such sharing for the concerned telecommunication service.

2.33 The Authority took note of the contention of a few stakeholders that the existing provisions for active infrastructure sharing lack clarity. The clause 33.1 of the Unified License provides that "*[s]haring of active/ passive infrastructure shall be governed by the terms and conditions of respective service authorization and amendment/ guidelines to be issued by the licensor from time to time*". However, notably, the provision relating to active infrastructure sharing (clause 33.2 of the Unified License) is mentioned in Part-I of the Unified License and not under individual authorizations. A plain reading of these clauses of the Unified License may create confusion. Therefore, the Authority is of the view that DoT should review all types of telecommunication service licenses/ authorizations to ensure that clear and unambiguous provisions relating to the active infrastructure sharing are contained in different types of licenses/ authorizations.

2.34 In view of the above, **the Authority recommends that-**

(a) Telecommunication service licensees should be allowed to share the passive infrastructure such as building, tower, electrical equipment including battery and power plant, dark fiber, duct space, Right of Way, etc. owned, established, and operated by them under the respective licenses with all types of telecommunication service licensees.

(b) Telecommunication service licensees should be allowed to share all types of active infrastructure elements owned, established, and operated by them under respective licenses with all types of telecommunication service licensees as per the scope of their services.

(c) However, the sharing of core network elements shall not be done if the number of independent core networks held by the licensees

for the concerned telecommunication service is reduced to less than two by such sharing.

- (d) DoT should review the provisions of all stand-alone telecommunication service licenses and may include a provision like clause 33.3 of the Unified License viz. "*The Licensee may share its own active and passive infrastructure for providing other services authorized to it under any other telecom license issued by Licensor*" in the stand-alone telecommunication service licenses.
- (e) Sharing of the Lawful Interception System (LIS) held by a licensee company with other licensee companies may be allowed with the permission of DoT on a case-to-case basis, provided there are no security concerns in such sharing.
- (f) The telecommunication service licensees participating in the sharing of core network should be mandated to furnish a joint intimation about core network sharing to the Licensor within seven days of the effective date of such sharing, and a statement of compliance to the condition in the recommendation (c) above, through an online portal.
- (g) DoT should review all types of telecommunication service licenses/ authorizations to ensure that clear and unambiguous provisions relating to passive and active infrastructure sharing are contained in them. The enabling provisions related to passive infrastructure sharing should be uniform across all telecommunications service licenses/ authorizations, to the extent possible.

B. Need for mandatory sharing of Government funded infrastructure

2.35 Apart from the higher capital cost of providing telecom services in rural and remote areas, these areas also generate lower revenue due to lower population

density, low income, and lack of commercial activity. Thus, normal market forces alone would not direct the telecom sector to adequately serve backward and rural areas. Keeping in mind the inadequacy of the market mechanism to serve rural and inaccessible areas on one hand and the importance of providing vital telecom connectivity on the other, most countries of the world have put in place policies to provide Universal Access and Universal Service to ICT.¹⁷

- 2.36 In India, the New Telecom Policy-1999 provided that the resources for meeting the Universal Service Obligation (USO) would be raised through a 'Universal Access Levy' (UAL), which would be a percentage of the revenue earned by the operators under various licences.¹⁸ The Universal Service Support Policy for the provision of telecom facilities in rural and remote areas of the country came into effect on 01.04.2002. Universal Service Obligation Fund (hereinafter, also referred to as "USO Fund", or "USOF") was established with the fundamental objective of providing access to basic telegraph services to people in remote and rural areas at affordable and reasonable prices. Subsequently, the scope of USO Fund was widened to provide access to telegraph services (including mobile services, broadband connectivity, and ICT infrastructure creation) in rural and remote areas.
- 2.37 For deploying telecommunication infrastructure in commercially non-viable rural and remote areas, the USO Fund provides subsidy support in the form of Net Cost or Viability Gap Funding (VGF) to incentivize telecom service providers. DoT has provided funds through USO Fund to both public and private TSPs to deploy telecommunication infrastructure in such areas.
- 2.38 USO Fund projects are assigned to TSPs on nomination, or tender basis. The evaluation of bids is carried out, including, based on the least quoted total subsidy. A TSP, to whom a USOF project is assigned, is referred to as the Universal Service Provider (USP) in respect of that project. The USP is required

¹⁷ Source: <https://usof.gov.in/en/about-usof>

¹⁸ At present, the License fee @ 8% of the adjusted gross revenue (AGR) of the licensee is inclusive of USO Levy which is presently 5% of AGR.

to set up, operate, maintain, and manage the telecommunication infrastructure as per the terms and conditions laid down in the agreement. In general, the infrastructure, created under the USOF project, is owned by the respective USPs.

2.39 In this background, the stakeholders were requested to furnish their comments on the following questions:

Q6. Should there be any obligation on telecom service providers to share infrastructure that has been funded, either partially or fully, by the Government through Universal Service Obligation (USO) Fund or otherwise, with other telecom service providers? Kindly justify your response.

Q7. In case it is decided to impose some obligations on telecom service providers to share the infrastructure funded by Government with other telecom service providers, is there a need to provide a broad framework for sharing of such infrastructure? If yes, kindly suggest the key aspects of such framework with detailed justification.

Q8. Any other suggestion to facilitate infrastructure sharing may kindly be made with proper explanation and justification.

Comments of stakeholders on the Q6

2.40 In response to the Q6 on the need for any obligation on telecom service providers to share the infrastructure that has been funded, either partially or fully, by the Government through Universal Service Obligation (USO) Fund or otherwise with other telecom service providers, many stakeholders favoured mandatory sharing of such infrastructure, while many others opposed it.

2.41 A broad summary of the comments of the stakeholders, who supported the mandatory sharing of the infrastructure that has been funded, either partially or fully, by the Government, is given below:

(a) It is economically unviable to create infrastructure/ connectivity in areas where the Government funding is being extended, coupled by the fact that

the funding is being given to only one TSP in such areas, will lead to connectivity from only one TSP in such areas, as other TSPs will never be able to provide coverage/ connectivity to those areas. This will lead to consumers getting service option from one TSP only. To ensure the public reap the benefits of coverage from all TSPs and the Government funding delivers long term public good, TSPs should be mandated to share infrastructure that has been funded, either partially or fully, by the Government.

- (b) Through mandatory sharing, the benefits of USO funded infrastructure can be extended to the subscribers of other service providers and thereby to a much larger beneficiary base. The provision of mandatory sharing will avoid duplicate asset creation in economically unviable areas.

2.42 The comments of the stakeholders, who did not support the mandatory sharing of the infrastructure that has been funded, either partially or fully, by the Government, are summarized below:

- (a) The areas identified for the projects funded by the Government through the USO Fund, are sparsely populated and located mostly in uneconomic and rural/ remote areas. As a result, they have barely any business potential. There are also structural issues like unavailability of roads and power, adverse weather conditions etc. which make the execution of these projects extremely difficult as well as costly. It would therefore be unviable for TSPs to execute these projects on their own. Since the USOF subsidy is granted to merely bridge the viability gap, and not to fund the entire capex and opex of the projects, the amount of the subsidy offsets only a small part of the infrastructure development costs in USO projects. The intent of the USO subsidy is not to bring retail competition into a market where the economics of the subscriber itself are too poor to afford the service, making cost recovery for TSPs challenging. Any mandatory sharing of USO sites will disincentivize the TSPs from actively investing for infrastructure

development in such areas as the bare minimum revenue available will get fragmented.

- (b) The provision of mandatory sharing will lead to anti-competitive pre-tender agreements undermining the tender process. Therefore, sharing should not be mandated for the infrastructure created using USO Fund irrespective of partial or full funding.
- (c) A USP creates network infrastructure to provide services to its customers. Therefore, the decision of sharing of network infrastructure should be under the purview of the USP after analyzing the current utilization of the network infrastructure.

2.43 A few stakeholders also contended that in the future tenders, having partial or full funding by the Government, it may be desirable to mandate infrastructure sharing; however, a retrospective application of any mandatory infrastructure sharing guidelines to the existing USOF agreements would be unfair to the successful bidders, as it would disturb the whole cost-and-revenue model on which they would have based their bids.

Comments of stakeholders on the Q7

2.44 A few stakeholders who favoured the provision of mandatory sharing of the infrastructure funded by the Government, also provided inputs with respect to a broad framework for the mandatory sharing. A broad summary of the comments of such stakeholders is given below:

- (a) The infrastructure created under USOF should be made available to all licensees including virtual network operators (VNOs) on a first-come-first-served basis. The infrastructure sharing framework should be based on a fair, reasonable, and non-discriminatory sharing of USO funded infrastructure in a time-bound manner.
- (b) The scope of the agreements, in both the existing projects and new projects, should be amended to include (i) mandatory inter-circle roaming,

and (ii) mandatory sharing of active and passive infrastructure deployed under such projects. If the TSPs are unable to mutually agree on the wholesale rate of inter-circle roaming, TRAI should determine a ceiling of wholesale roaming charge.

Comments of stakeholders on the Q8

- 2.45 A broad summary of the stakeholders' comments in response to the Q8 on any other suggestions to facilitate infrastructure sharing is given below:
- (a) Government should encourage network sharing and site sharing in rural and remote areas by providing incentives and rebates in license fees and spectrum charges. A specific list of such areas where such incentives are available should be uploaded on the website of DoT.
 - (b) All charges paid for using telecommunication infrastructure, and received for sharing infrastructure should be allowed as a deduction in adjusted gross revenue (AGR) of TSPs. It will promote the incumbent service providers to share their network infrastructure in an effective manner.

Analysis w.r.t. the Q6, Q7 and Q8

- 2.46 The underlying concept of Universal Service is to ensure that telecommunications services are accessible to the widest number of people (and communities) at affordable prices. Telecommunications administrations and national regulatory authorities (NRAs) have been turning to the concept of a specific universal service funding mechanism designed as an incentive to encourage operators to assist these administrations in achieving their universal service goals.¹⁹ In India, the Indian Telegraph (Amendment) Act, 2003 giving statutory status to the Universal Service Obligation Fund (USOF), was passed by the parliament in December 2003. The Universal Service Obligation (USO) Fund was established with the fundamental objective of providing access to "Basic" telegraph services to people

¹⁹ Source: https://www.itu.int/pub/D-PREF-EF.SERV_FUND

in remote and rural areas at affordable and reasonable prices. Subsequently, the Indian Telegraph (Amendment) Act, 2006 was notified on 29.12.2006 to repeal the term "Basic" wherein the scope of USO Fund was widened to provide access to telegraph services (including mobile services, broadband connectivity, and ICT infrastructure creation) in rural and remote areas.²⁰

2.47 As per the information available on the USOF website, USOF has completed several schemes/ projects such as (a) rural wireline broadband scheme, (b) Amarnath project, (c) sanchar shakti project, (d) village public telephone project, (e) mobile infrastructure scheme, (f) rural community phone project, (g) rural direct exchange lines project, (h) solar mobile charging facilities project, (i) mobile tower project.

2.48 For illustration purposes, a brief description of a couple of projects/ schemes of USOF is given below:

(a) Mobile infrastructure scheme: In June, 2007, a USOF scheme for setting up mobile services in specified rural and remote areas was started. This project aimed at setting up and managing infrastructure sites and provision mobile services in specified rural and remote areas. The project was divided into two parts. Part - A of the Scheme was for setting up and managing infrastructure sites, and Part - B of the Scheme was for the provision of mobile services. The infrastructure provider (IP) was responsible for setting up, operationalising and maintaining infrastructure sites in the specified clusters for the whole period of the agreement. The IP was mandated to provide the following infrastructure components: Land, Tower, Electrical Connection, Power Backup, Boundary Wall and Security Cabin. The infrastructure created was to be owned by the IP and the created infrastructure was provisioned to be shared with a maximum of three (3) Universal Service Providers (USPs) to provide mobile services by installing

²⁰ Source: <https://usof.gov.in/en/genesis>

necessary equipment. The project was made effective on 01.06.2007 and was valid for six and half years.²¹

- (b) Mobile Tower Projects [Left Wing Extremism (LWE) Phase I]: The project for provisioning of mobile services (2G based) in 2199 locations in left wing extremism (LWE) affected areas was approved on 20.08.2014. The work was awarded to M/s Bharat Sanchar Nigam Limited (BSNL) on a nomination basis. Under the agreement (30.09.2014), Universal Service Obligation (USO) Fund shouldered the capital expenditure for 1836 sites and operational cost for 2199 sites for five years (1836 new towers and 363 existing towers which are already installed by M/s Bharat Sanchar Nigam Limited in these areas). Subsequently, the Ministry of Communications (MOC) and IT in June 2016 approved the provisioning of mobile services for additional 156 sites under the Left Wing Extremism (LWE) agreement.

2.49 Meanwhile, on 24.12.2023, the Telecommunications Act, 2023 has been enacted. The chapter IV (Digital Bharat Nidhi) provides, *inter-alia*, as below:

"24. (1) The Universal Service Obligation Fund created under the Indian Telegraph Act, 1885, shall, from the appointed day, be the "Digital Bharat Nidhi", under the control of the Central Government, and shall be used to discharge functions as set forth in this Act.

(2) Any sums of money attributable to the Digital Bharat Nidhi that is paid pursuant to an authorisation under section 3, shall be credited to the Digital Bharat Nidhi.

(3) The balance to the credit of the Digital Bharat Nidhi shall not lapse at the end of the financial year.

²¹ Source: <https://usof.gov.in/en/completed-projects>

(4) All amounts payable under licences granted prior to the appointed day towards the Universal Service Obligation, shall be deemed to be the amounts payable towards the Digital Bharat Nidhi.

25. The sums of money received towards the Digital Bharat Nidhi under section 24, shall first be credited to the Consolidated Fund of India, and the Central Government may, if Parliament by appropriation made by law in this behalf so provides, credit such proceeds to the Digital Bharat Nidhi from time to time for being utilised exclusively to meet any or all of the following objectives, namely:—

(a) support universal service through promoting access to and delivery of telecommunication services in underserved rural, remote and urban areas;

(b) support research and development of telecommunication services, technologies, and products;

(c) support pilot projects, consultancy assistance and advisory support towards provision of service under clause (a) of this section;

(d) support introduction of telecommunication services, technologies, and products.

26. The Digital Bharat Nidhi shall be administered in a manner, as may be prescribed.” [Emphasis supplied]

- 2.50 It is noteworthy that the appointed date of the Telecommunications Act, 2023 is yet to be notified by the Government.
- 2.51 As indicated earlier, at present, USOF projects are assigned to the TSPs either on a nomination basis, or on a tender basis. In the case of tender-based assignment, evaluation of bids is carried out, including, based on the least quoted total subsidy, that is, the subsidy that will be provided to the USP from the USO Fund. The USP, at its discretion, may share its infrastructure with other TSPs, subject to the compliance with the guidelines and instructions issued by DoT.

- 2.52 On the questions related to putting in place regulatory obligations on TSPs to share the infrastructure which has been funded, either partially or fully, by the Government through USO Fund or otherwise, with other TSPs, the Authority notes that many stakeholders have supported the mandatory infrastructure sharing, while many other stakeholders have opposed it. The proponents of mandatory infrastructure sharing have argued that a larger public good will be created from mandatory infrastructure sharing. The opponents of mandatory infrastructure sharing have contended mainly on three grounds- (a) mandatory infrastructure sharing will disincentivize the USPs as the bare minimum revenue available will get fragmented, (b) mandatory sharing will lead to anti-competitive pre-tender agreements, and (c) the USP may not have sufficient or adequate infrastructure at a site to afford sharing of infrastructure with other TSPs.
- 2.53 While examining the comments of stakeholders, the Authority took note of the fact that apart from the viability gap funding (VGF) for the USOF project, the USP receives indirect benefits in terms of the Government's support for facilitating speedy right of way (RoW) to lay telecom infrastructure, land acquisition, power connection at the site etc. The Authority is of the opinion that the sharing of infrastructure created under USOF projects would result in numerous benefits to consumers and service providers. The TSPs other than USPs would get access to the infrastructure created by the USPs under USOF. As a result, the consumers residing in such areas will receive the benefit of competition (choice, better quality of service, affordable tariffs, etc.) and the mobile subscribers visiting such places will get the benefit of roaming services from their respective home network operators. The USPs would also benefit from such sharing by way of additional revenue on account of infrastructure sharing charges received from other TSPs.
- 2.54 Based on the comments of stakeholders and further analysis, the Authority is of the view that in the future projects under USOF or Digital Bharat Nidhi, as the case may be, it may not be reasonable to restrict the benefit of such an investment to a single TSP. Accordingly, there appears to be a need for establishing a regulatory framework so that the infrastructure created under the

future projects under USOF (or Digital Bharat Nidhi), is also made available to other TSPs. The Authority is mindful of the fact that while sharing of passive infrastructure would be feasible in general, there may be technical issues involved, due to which, active infrastructure sharing may not be feasible in many cases.

- 2.55 Considering the above, the Authority is of the view that in the future projects under USOF (or Digital Bharat Nidhi), DoT should include a provision in the agreement with the USP that the USP shall not refuse the sharing of passive infrastructure laid under the project to at least two other TSPs on a transparent and non-discriminatory basis.
- 2.56 Further, the Authority is of the view that in the already assigned USOF projects also, DoT should explore the feasibility of issuing instructions to such USPs that they shall not refuse to share passive infrastructure laid under the project with at least two other TSPs on a transparent and non-discriminatory basis.
- 2.57 In case the Government agrees with the above views of the Authority, DoT may, if deemed fit, seek recommendations from TRAI on a detailed regulatory framework for sharing the passive infrastructure created by USP, including the commercial aspects considering the varying amount of funding through the Universal Service Obligation Fund (or Digital Bharat Nidhi).
- 2.58 As far as the sharing of active infrastructure laid under the projects of Universal Service Obligation Fund (or Digital Bharat Nidhi) is concerned, the Authority is of the view that it should be voluntary and based on mutual agreements.
- 2.59 In response to the Q8 of the CP dated 23.01.2023, many stakeholders proposed to provide incentives to the TSPs for sharing infrastructure with other TSPs in underserved areas. It is noteworthy that TRAI has sent its recommendations dated 08.08.2023 on 'Introduction of Digital Connectivity Infrastructure Provider (DCIP) Authorization under Unified License (UL)'. Through these recommendations, TRAI has recommended the Government to introduce a new light touch authorization named Digital Connectivity Infrastructure Provider

(DCIP) Authorization; the proposed DCIP authorization holder may create both active and passive digital connectivity infrastructure and share it with other TSPs and has to pay no license fee to the Government. The Authority is of the view that an early implementation of the afore-mentioned recommendations dated 08.08.2023 may incentivize the creation and sharing of active and passive digital connectivity infrastructure in the country, particularly in the underserved areas, where the establishment of separate infrastructure by each TSP is, generally, economically unviable.

2.60 In view of the above, **the Authority recommends that-**

- (a) In the future projects of Universal Service Obligation Fund (USOF) under the Indian Telegraph Act, 1885 (or Digital Bharat Nidhi under the Telecommunications Act, 2023), DoT should include a provision in the agreement with the Universal Service Provider (USP) that the USP shall not refuse to share the passive infrastructure laid under the project to at least two other telecom service providers on a transparent and non-discriminatory basis.**
- (b) In the already assigned projects of USOF, DoT should explore the feasibility of issuing instructions to such USPs that the USP shall not refuse to share the passive infrastructure laid under the project with at least two other telecom service providers on a transparent and non-discriminatory basis.**
- (c) In case the Government agrees, in-principle, with the above recommendations (a) and (b), DoT may, if deemed fit, seek the recommendations from TRAI on a detailed mechanism of the passive infrastructure sharing, including the commercial aspects, considering the varying amount of funding through USOF (or Digital Bharat Nidhi).**

(d) The sharing of active infrastructure laid under the projects of USOF (or Digital Bharat Nidhi) should be voluntary and based on mutual agreements.

(e) To help the creation of common digital connectivity infrastructure (passive as well as active) in underserved areas of the country, DoT should take an early decision on the TRAI's recommendations dated 08.08.2023 on 'Introduction of Digital Connectivity Infrastructure Provider (DCIP) Authorization under Unified License (UL)'.

C. Connectivity issues being faced by the subscribers in remote and far-flung areas of the country

2.61 Through another reference dated 27.04.2022, DoT had requested the Authority to examine the possibilities of including provisions in license agreements for mandatory roaming arrangements among telecom service providers in remote areas of Hill States, Left Wing Extremism (LWE)-affected areas and along International Borders, and furnish recommendations on the subject. However, through a subsequent letter dated 03.01.2023, DoT conveyed to TRAI that it has been decided to withdraw the reference dated 27.04.2022.

2.62 While the reference dated 27.04.2022 was withdrawn by DoT, the issue of subscribers facing hardships in remote and far-flung areas of the country continues to persist. In general, the number of mobile service providers at a particular location in remote and far-flung areas is, generally, quite less. It has been observed that a subscriber, using the network of a particular service provider and roaming in the remote and far-flung areas of the country, faces the problem of no telecom coverage even if the network of other service providers is present in the area. As per the extant licensing regime in the country, roaming arrangements among telecommunication service licenses are permitted, but not mandated.

2.63 In this background, stakeholders were requested to furnish their comments on the following questions:

Q9. What measures could be taken to encourage roaming arrangements among telecom service providers in remote and far-flung areas? What could be the associated regulatory concerns and what steps could be taken to address such concerns? Kindly provide details on each of the suggested measures with justification.

Q10. What could be the other ways to ease out the hardship faced by the subscribers in remote and far-flung areas due to connectivity issues of the home network provider? Kindly provide detailed response with justification.

Comments of stakeholders on the Q9

2.64 A broad summary of the comments of stakeholders in response to the Q9 regarding the measures to encourage roaming arrangements among TSPs in remote and far-flung areas is given below:

- (a) DoT should publish a list of remote and far-flung areas on its portal. For encouraging roaming arrangements between TSPs in remote and far-flung areas, DoT should provide financial incentives to TSPs.
- (b) DoT should incentivize the TSPs which permit intra-circle roaming (ICR) in the identified areas with a little access of mobile network in the form of waiver in license fee and spectrum usage charge (SUC).
- (c) The framework for the new tenders itself should encourage roaming. Considering roaming is a mutual agreement, there should be a clause dealing with the 'Reference Roaming Agreement'.

Comments of stakeholders on the Q10

- 2.65 The comments of stakeholders in response to the Q10 regarding the other ways to ease out the hardships faced by the subscribers in remote and far-flung areas due to connectivity issues of the home network provider, are summarized below:
- (a) Intra-circle roaming (ICR) should be made obligatory for the TSPs providing mobile services in remote and far-flung areas. For this purpose, remote and far-flung areas should be notified.
 - (b) Mandatory roaming should be offered by all TSPs in remote and far-flung areas on a wholesale charges basis. If TSPs fail to mutually agree on wholesale roaming charges, TRAI should prescribe ceilings for roaming charges.
- 2.66 With respect to the proposition of mandatory roaming arrangements between TSPs in the remote and far-flung areas of the country, a few stakeholders contended that the extant licensing regime already permits roaming arrangements and that should continue on a mutual basis; the mandatory roaming is not a permanent solution, and it should remain an emergency measure.

Analysis w.r.t. the Q9 and Q10

- 2.67 The Authority examined the comments of stakeholders w.r.t. the Q9 and Q10. While a few stakeholders have mainly suggested that the Government should provide financial incentives to TSPs, if they permit roaming to other TSPs in their networks in remote and far-flung areas, a few others have mainly suggested a regulatory provision of mandatory roaming to ease out the hardships faced by the subscribers in remote and far-flung areas due to connectivity issues of the home network providers. The Authority is cognizant of the fact that the Government is already in the process of making available telecom connectivity in remote and far-flung areas through Universal Service Providers (USPs), which are funded partially or fully, as the case may be, through the USOF. It is expected

that the Authority's recommendations given in para 2.60 above (with respect to the sharing of passive infrastructure laid under the USOF projects), once implemented, will help bring plurality of service providers in remote and far-flung areas; as a result, the benefits of competition (choice, better quality of service, affordable tariffs, etc.) will accrue to the consumers in remote and far-flung areas also. It, however, might take some time.

- 2.68 In the meantime, a mechanism needs to be put in place to ease the hardships faced by the subscribers in remote and far-flung areas due to connectivity issues of the home network providers. A few stakeholders have averred that, to ease out the hardship faced by the subscribers in remote and far-flung areas due to connectivity issues of the home network provider, mandatory roaming should be offered by all TSPs in the remote and far-flung areas of the country. The Authority notes that mandatory roaming is, generally, prescribed by the national regulators to facilitate new operators (green field operators), that too for a limited period. The chief argument against the provision of mandatory roaming is that it proves to be counter-productive in the long run, as there will be no incentive to a TSP to build telecommunication infrastructure, particularly in the less economically attractive areas, in case the facility of roaming is available to the TSP.
- 2.69 The Authority is of the opinion that the provision of mandatory roaming in remote and far-flung areas may provide an immediate solution to the hardships faced by the subscribers in such areas due to connectivity issues of the home network provider. However, the Authority is mindful that the provision of mandatory roaming may take away the numerous incentives of building telecommunication infrastructure such as the first movers' advantage, competitive advantage arising out of a larger footprint of network and a better quality of service etc. and thereby it may discourage the TSPs from investing in building telecom infrastructure in remote and far-flung areas. Accordingly, the Authority is of the opinion that a regulatory provision of mandatory roaming on the privately funded telecommunication infrastructure in remote and far-flung areas may not be desirable.

2.70 Having said that, the Authority is of the view that in the interest of the consumers, it would be reasonable to mandate roaming, albeit for a limited period, on the telecommunication infrastructure in remote and far-flung areas, which has been funded, either fully or partially, by the Government through USOF. Initially, such a mandate may be kept for a period of three years. Later, the Government/ TRAI may review the need for extending this mandate beyond three years.

2.71 In case the Government agrees with this proposal,- (i) DoT should identify and notify the remote and far-flung areas where telecommunication infrastructure has been funded either partially or fully by the Government through USOF, and (ii) TRAI will establish a regulatory framework for roaming charges among service providers in such remote and far-flung areas.

2.72 In view of the above, **the Authority recommends that-**

(a) In the interest of consumers, a telecom service provider, which has built mobile network infrastructure in the remote and far-flung areas of the country with full or partial funding from the Government under USOF (or Digital Bharat Nidhi), should be mandated to allow roaming to other TSPs on its network in such remote and far-flung areas initially for a period of three years. Later, the Government/ TRAI may review the need for extending this mandate beyond three years.

(b) In case the Government agrees with the recommendation in (a) above,

(i) DoT should identify and notify such remote and far-flung areas in the country, and

(ii) TRAI will establish a regulatory framework for roaming charges among service providers in such remote and far-flung areas, while adequately protecting the interest of the USP.

D. Inter-band Spectrum Sharing Among TSPs

2.73 Radio frequency spectrum is a scarce natural resource. With the growing demand for spectrum, it is necessary to ensure efficient and optimal utilization of spectrum. Spectrum sharing is one of the techniques which can be used by TSPs to provide additional network capacities in places where there is network congestion due to spectrum crunch.

2.74 Spectrum sharing can be of two types viz.- (a) intra-band spectrum sharing, and (b) inter-band spectrum sharing. Based on the TRAI's recommendations, DoT permitted intra-band spectrum sharing among access service providers and issued the 'Guidelines for Sharing of Access Spectrum by Access Service Providers' on 24.09.2015²². The stakeholders have been requesting TRAI to also permit inter-band spectrum sharing.

2.75 In this background, the stakeholders were requested to furnish their comments on the following questions:

Q11. Whether inter-band access spectrum sharing among the access service providers should be permitted in the country?

Q12. In case it is decided to permit inter-band access spectrum sharing among access service providers, please provide detailed inputs to the following questions:

(a) What measures should be put in place to avoid any potential adverse impact on competition and dynamics of spectrum auction? Kindly justify your response.

(b) Considering that surrender of spectrum has been permitted in the country, what provisions need to be included in the guidelines for

²² The 'Guidelines for Sharing of Access Spectrum by Access Service Providers' have been amended from time to time. The latest amendment in these guidelines was carried out by DoT on 11.10.2021.

inter-band access spectrum sharing so that any possible misuse by the licensees could be avoided? Kindly justify your response.

(c) What should be the broad framework for inter-band access spectrum sharing? Whether the procedure prescribed for intra-band access spectrum sharing could be made applicable to inter-band access spectrum sharing as well, or certain changes are required to be made?

(d) What should be the associated charges, and terms & conditions for inter-band access spectrum sharing?

Q13. Any other issues/ suggestions relevant to the spectrum sharing between access service providers, may be submitted with proper explanation and justification.

Comments of stakeholders on the Q11

2.76 With respect to the Q11 on the appropriateness of permitting the inter-band access spectrum²³ sharing among access service providers, most stakeholders supported inter-band spectrum sharing, one stakeholder opposed it, and another stakeholder provided a mixed response.

2.77 The comments of the stakeholders, who have supported inter-band spectrum sharing, may be summarized as below:

(a) Prior to the deployment of 4G networks in the country, specific spectrum bands were used in 2G and 3G networks. For example, only 900 MHz and 1800 MHz bands were used in GSM networks, while only 800 MHz band was used in CDMA networks. With the maturing of 4G services in the country,

²³ As per the Annexure-I to the Unified License, "ACCESS SPECTRUM means the Radio Frequency Spectrum allotted for use to carry voice or non-voice messages from subscriber terminal to the Base Station/ designated point of aggregation."

TSPs have started deploying 4G networks in multiple bands like 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz etc. As the practice of linking a particular network technology with only a specific band(s) has been discontinued, the time has come to extend spectrum sharing to 'inter-band' as well, not just limiting it to 'intra-band'.

- (b) TSPs purchase spectrum in the auctions for 20 years based on their future projections for spectrum requirement. However, it is not always possible for a TSP to utilize the entire spectrum held by it. Inter-band spectrum sharing will help TSPs in effective utilization of the unused spectrum. It will provide significant opportunities for TSPs to collaborate and make the optimum use of the spectrum.
- (c) As the spectrum is purchased at a market price through an open and transparent auction, the TSPs holding spectrum should have the right to fully exploit the commercial value of the spectrum, including through inter-band sharing.
- (d) Inter-band spectrum sharing will be a logical extension to the intra-band spectrum sharing. It will be consistent with the objective of further efficient utilization of the spectrum and will also lead to better quality of service (QoS) and wider coverage.

2.78 A broad summary of the comments of the stakeholder, who has opposed inter-band spectrum sharing, is given below:

- (a) Inter-band spectrum sharing would lead to two adverse outcomes in the form of 'end to end network sharing' and 'converging of the spectrum holdings of Provider and Seeker', which will go against the present scope of Unified License and would undermine and vitiate the spectrum auctions.
- (b) Inter-band spectrum sharing will, in turn, reduce the digital infrastructure investments by TSPs with easy access to spectrum and network without investing. This will adversely impact the competition in the sector. Permitting inter-band spectrum sharing would be not only anti-competitive

but would also seriously jeopardize the success of spectrum auctions in future, while vitiating the previous auctions.

2.79 The comments of the stakeholder, who provided a mixed response on the question of permitting inter-band sharing, are summarized below:

- (a) The global success of mobile services has been built on a foundation of exclusively licensed spectrum as it supports widespread services and the certainty needed for long term heavy network investment and high quality services. On the other hand, spectrum sharing presents a complementary approach to exclusive licensing, when well planned. While spectrum sharing has numerous benefits such as it can reduce the spectrum shortage faced in a market while also ensuring valuable spectrum does not lie fallow, there are also risks involved. For example, there could be potential implications for market competition and investment incentives.
- (b) The regulators weigh the benefits and risks of the sharing arrangements considering various factors such as-
 - (i) benefits of sharing which include cost savings, improved quality of service and coverage, better efficiency, environmental benefits etc.
 - (ii) risks which include reduced incentives for investment and network roll-out, less service differentiation, reduced retail competition, lower network resilience.

Comments of stakeholders on the Q12

2.80 In response to the Q12 (a) regarding the possible measures to avoid any potential impact on competition and dynamics of spectrum auction due to inter-band access spectrum sharing, the comments of stakeholders were quite divergent. On the one hand, a stakeholder contended that adverse outcomes of inter-band spectrum sharing cannot be prevented by any measure. On the other hand, a few stakeholders averred that there is no possibility of any adverse impact on competition and dynamics of the spectrum due to inter-band access

spectrum sharing. In the middle, many stakeholders suggested a few measures to avoid potential impact on competition and dynamics of spectrum auction due to inter-band access spectrum sharing.

2.81 One of the stakeholders, who argued that there is no possibility of any adverse impact on the competition and dynamics of the spectrum due to inter-band access spectrum sharing, stated as below:

- (a) There is no evidence that similar frameworks like intra-band spectrum sharing, spectrum trading, intra-circle roaming, and inter-circle roaming, have negatively impacted the competition, consumer, or outcome of spectrum auctions.
- (b) Since the prescribed spectrum cap would also be required to be met by the respective TSPs, there will be no impact on competition.
- (c) In any case, the Authority has the option to assess market developments and intervene with specific measures, should the need arise. The *ex-post* approach in the matter of spectrum sharing will give far better outcomes for all stakeholders.

2.82 A stakeholder, who contended that adverse outcomes of inter-band sharing cannot be prevented by any measure, stated that for inter-band sharing, the framework of intra-band sharing cannot be replicated because intra-band sharing is a simple arrangement, and is completely different from inter-band sharing.

2.83 A broad summary of the possible measures to avoid impact on the competition and dynamics of spectrum auction suggested by a few stakeholders is given below:

- (a) A lock-in period of two or three years can be put in place before the spectrum can be shared with other service providers.
- (b) The shared spectrum should be included in the statutory spectrum cap of both the sharing licensees.

- (c) Inter-band spectrum sharing should be permitted subject to the condition that there will not be any subletting of spectrum by the licensee who has taken the spectrum on a shared basis.

2.84 In response to the Q12 (b) regarding the provisions in the guidelines for inter-band spectrum sharing to avoid any possible misuse of the provision of surrender of spectrum, many stakeholders were of the view that inter-band access spectrum sharing has no relation with the surrender of spectrum. A summary of their comments is given below:

- (a) Considering the facts that (i) the surrender of spectrum is permitted only after 10 years, and (ii) the TSPs surrendering partial or complete spectrum are barred from taking part in the auctions for that LSA-band combination for a period of two years from the date of surrender of spectrum, inter-band access spectrum sharing will have no relation with the surrendering of spectrum.
- (b) Inter-band spectrum sharing would primarily work in part geographies of an LSA. The scenario wherein a TSP would surrender the spectrum in the whole LSA and would opt for inter-band spectrum sharing in a part of LSA is far-fetched.

2.85 The comments received from stakeholders, in response to the Q12 (c) with respect to a broad framework for inter-band access spectrum sharing, are summarized below:

- (a) The framework for intra-band spectrum sharing should be followed for inter-band spectrum sharing as well.
- (b) DoT may place a centralized mechanism for the implementation of the framework for inter-band access spectrum sharing and for handling any disputes between spectrum provider and spectrum seeker.

2.86 With respect to the Q12 (d) regarding the associated charges, and terms and conditions for inter-band access spectrum sharing, a summary of the stakeholders' comments is given below:

- (a) Spectrum usage charges should be levied on the TSPs who share the inter-band spectrum.
- (b) As frequency spectrum is assigned to operators through the auction at the market determined price, the operators should be allowed to enter into mutual agreements for inter-band spectrum sharing. The charges for inter-band spectrum sharing should be mutually agreed between the operators. To cater to the administrative expenses, only a nominal fee should be levied by the Government on the operators before allowing inter-band spectrum sharing.
- (c) To encourage optimum utilization of spectrum through inter-band sharing, fiscal incentives should be given like no License Fee/ Spectrum Usage Charge on the revenue received by a TSP from another TSP for inter-band spectrum sharing.

Comments of stakeholders on the Q13

2.87 A broad summary of the comments of stakeholders, in response to the Q13 regarding any other issues/ suggestions relevant to the spectrum sharing between access service providers, is given below:

- (a) There should be at least three-to-four financially strong players in the mobile access market, and inter-band spectrum sharing may be permitted subject to safeguards being provided to ensure that the market remains adequately competitive.
- (b) All types of spectrum sharing should be permitted amongst all types of service providers under various licenses/ authorizations and not limited to

access service providers. ISPs being a licensee should be allowed to participate in spectrum sharing among all licensees for IMT/ 5G Spectrum.

Analysis w.r.t. the Q11, Q12 and Q13

- 2.88 In the present consultation process, most stakeholders expressed the need for permitting inter-band access spectrum sharing, while a couple of stakeholders raised concerns about permitting inter-band access spectrum sharing. The concerns of such stakeholders against permitting inter-band spectrum sharing were mainly on the ground that inter-band spectrum sharing might adversely impact market competition, investment incentives, and spectrum auctions. The proponents of inter-band spectrum sharing, however, are of the view that concerns, if any, against inter-band spectrum sharing may be addressed with the help of suitable provisions such as a lock-in period for inter-band spectrum sharing and the reckoning of the shared spectrum in the spectrum cap of both the sharing licensees.
- 2.89 While examining the comments of stakeholders, the Authority took note of the following aspects:
- (a) The frequency spectrum is a scarce natural resource. Its demand will continue to rise with increasing digitalization and availability of data-hungry applications, which necessitates the need for promoting efficient utilization of spectrum.
 - (b) Since the year 2010, the Government has been assigning access spectrum only through the process of auction.
 - (c) Spectrum sharing enhances spectral efficiency. Therefore, the sharing of access spectrum is viewed as a complementary approach to the exclusive assignment of access spectrum.
 - (d) Based on the TRAI's recommendations, DoT, in the year 2015, permitted intra-band spectrum sharing and spectrum trading among access service

providers through separate guidelines²⁴. So far, no regulatory concerns have been brought to the attention of the Authority against the regulatory regimes of intra-band spectrum sharing and spectrum trading.

- (e) Through the National Digital Communication Policy (NDCP)-2018, the Government has envisaged the following strategy:

"Further liberalizing the spectrum sharing, leasing and trading regime"

- (f) On 24.12.2023, the Telecommunications Act, 2023 has been enacted. The chapter II (Powers of Authorisation and Assignment) provides, inter-alia, as below:

"The Central Government may permit the sharing, trading, leasing and surrender of assigned spectrum, subject to the terms and conditions, including applicable fees or charges, as may be prescribed."

[The appointed date of the Telecommunications Act, 2023 is yet to be notified by the Government.]

- (g) In case, the inter-band access spectrum sharing [which may be implemented either by way of pooling of access spectrum held by the participating access service providers in different frequency bands through common radio access networks, or by way of allowing the partnering access service providers to use the radio access networks of each other operating in the shared frequency band(s)] is permitted, access service providers will be able to reap the benefits of saving the network costs. The access service providers may opt for inter-band spectrum sharing in limited (congested) areas to improve the quality of service or meet throughput requirements, or in the entire licensed service area (LSA) where the spectrum in a desired band is not available. It may, in turn, result in significant consumer benefits in terms of improved quality of service and coverage of telecommunication networks.

²⁴ DoT issued "Guidelines for Sharing of Access Spectrum by Access Service Providers" dated 24.09.2015, and "Guidelines for Trading of Access Spectrum by Access Service Providers" dated 12.10.2015.

2.90 Considering the comments of the stakeholders and the foregoing analysis, the Authority is of the view that inter-band access spectrum sharing should be permitted in the country with suitable measures to mitigate the possibility of any misuse of the inter-band sharing. In the following paragraphs, the Authority is embarking on devising suitable measures to mitigate the possibility of any misuse of the inter-band access spectrum sharing.

2.91 At present, the Government assigns access spectrum through auction in a wide range of frequency bands beginning from sub-1 GHz bands to millimetre wave bands. The frequency bands can be, broadly, grouped into four spectrum band categories based on the similarities in the technical characteristics as below:

Spectrum band category	Short description of the category	Frequency bands under the category
Category-1	Low bands	Sub-1 GHz bands i.e., 600 MHz, 700 MHz, 800 MHz, and 900 MHz bands
Category-2	Mid bands (FDD)	1800 MHz and 2100 MHz bands
Category-3	Mid bands (TDD)	2300 MHz, 2500 MHz, and 3300-3670 MHz bands
Category-4	High bands	26 GHz and newly identified bands (37-37.5 GHz, 37.5-40 GHz, 42.5-43.5 GHz)

Table 2.1: Spectrum band categories of access spectrum

2.92 The frequency bands in a particular spectrum band category would be suitable for certain usages. For instance, the frequency bands in Category-1 are best suited to meet the coverage requirements and are suitable for providing rural connectivity and indoor coverage but are not particularly suitable for providing high data rates.

2.93 The Authority is of the opinion that in case the inter-band spectrum sharing in an LSA is restricted within the frequency bands falling within a spectrum band

category, it will take care of the concerns relating to likely adverse impact on the dynamics of spectrum auction, to a large extent. Accordingly, the Authority is of the view that inter-band spectrum sharing should be permitted only in the same spectrum band category.

- 2.94 To illustrate, if TSP-1 is holding access spectrum in the 800 MHz band and TSP-2 is holding access spectrum in the 900 MHz band, they should be allowed to share their spectrum in these two bands as these bands fall under the same spectrum band category viz. category-1. However, if TSP-1 is holding access spectrum only in the 800 MHz band and the TSP-2 is holding access spectrum only in the 2100 MHz band, they should not be allowed to share their spectrum in these two bands as these frequency bands fall in different spectrum band categories viz. category-1 and category-2.
- 2.95 At present, there are four wireless access service providers in each licensed service area (LSA). As the inter-band spectrum sharing may involve the integration of radio access networks of the participating TSPs in the LSA, it would be desirable to impose certain restrictions on the inter-band sharing to ensure the plurality of radio access networks in the LSA. Accordingly, the Authority is of the view that a TSP should not be allowed to enter into inter-band sharing with more than one TSP in a spectrum band category in an LSA. Further, inter-band spectrum sharing in an LSA should be permitted subject to the condition that post-sharing, there should be at least two independent wireless access networks in the LSA.
- 2.96 The Authority is further of the view that the frequency spectrum proposed to be shared by the access service providers should have been acquired through spectrum auction or spectrum trading, or market determined price should have been paid by the respective access service providers for acquiring such spectrum. On this aspect, DoT may impose other conditions, as provided in the DoT's 'Guidelines for Sharing of Access Spectrum by Access Service Providers' dated 11.10.2021, if specific type of cases warrant so.

2.97 The Authority noted that as per the existing provisions of notice inviting application (NIA) for auction of frequency spectrum, intra-band spectrum sharing is permitted to TSPs after a lock-in period of one year, and TSPs are allowed to trade their spectrum after a lock-in period of two years. Considering the concerns relating to competition and dynamics of spectrum auction raised by stakeholders from inter-band sharing, the Authority is of the view that it would be appropriate to keep a lock-in period of two years from the date of acquisition of such spectrum. Therefore, any frequency spectrum should be permitted to be shared under inter-band access spectrum sharing only after a lock-in period of two years from the date of its acquisition.

2.98 Regarding the measures to avoid impact on competition and dynamics of spectrum auction, a few stakeholders suggested that the shared spectrum should be included in the statutory spectrum cap of both the sharing licensees. In this regard, the Authority noted that the extant Guidelines for Sharing of Access Spectrum by Access Service Providers provide, *inter-alia*, as below:

"The prescribed limit for spectrum cap should be applicable for both the licensees individually. Further, spectrum holding of any licensee post sharing shall be counted after adding 50% of the spectrum held by the other license in the band being shared as the additional spectrum to the original spectrum held by the licensee."

2.99 The Authority is of the opinion that it may be practically difficult to assess as to whether the shared frequency spectrum is being used by both the TSPs, or largely by a single TSP. Considering the concerns related to the dynamics of spectrum auction raised by stakeholders from inter-band spectrum sharing, the Authority is of the view that in case of inter-band spectrum sharing, entire spectrum holding of the participating TSPs in the spectrum bands being shared should be counted in the spectrum holdings of both the participating TSPs, for the purpose of spectrum cap.

2.100 To illustrate, let us assume TSP-1 and TSP-2 decide to engage in inter-band spectrum sharing in an LSA, where TSP-1 is holding 10 MHz of spectrum in the

900 MHz band and TSP-2 is holding 5 MHz of spectrum in the 800 MHz band. For computing spectrum cap, it will be considered that both the TSPs are holding 10 MHz of spectrum in 900 MHz band and 5 MHz of spectrum in 800 MHz band.

2.101 However, in case a TSP involved in the inter-band spectrum sharing wishes to acquire additional access spectrum through a future spectrum auction, but the provision of spectrum cap restricts it from participating in the spectrum auction, such TSP should be permitted to participate in a future auction provided it gives an undertaking that it will bring down its spectrum holding to comply to the applicable spectrum cap within a period of one year from the date of assignment of spectrum through auction. In such a case, for the purpose of spectrum cap, only the frequency spectrum held by the licensee (without including the shared spectrum of the partnering TSP) should be considered to assess its eligibility to bid for additional frequency spectrum in the auction.

2.102 In the consultation process, a few stakeholders were of the view that the charges for inter-band spectrum sharing should be mutually agreed between the operators; to cater to the administrative expenses, only a nominal fee should be levied by the Government on the operators before allowing inter-band spectrum sharing. On the other hand, a stakeholder suggested that spectrum usage charges should be levied on the TSPs who share the inter-band spectrum. While examining the comments of stakeholders on this issue, the Authority took note of the following aspects:

(a) At present, the 'Guidelines for Sharing of Access Spectrum by Access Service Providers' dated 13.10.2015, which were amended last on 11.10.2023, govern the intra-band spectrum sharing in the country. Hereinafter, these guidelines, will also be referred as "the intra-band spectrum sharing guidelines" in this document. Under these guidelines, a non-refundable processing fee of Rs. 50,000/- is payable individually by each access service licensee for each licensed service area at the time of intimation to WPC Wing of DoT. It is noteworthy that the original intra-band spectrum sharing guidelines of 2015 provided, *inter-alia*, that "*Spectrum Usage Charge (SUC)*

rate of each licensee post-sharing shall increase by 0.5% of Adjusted Gross Revenue (AGR).” However, this condition has been removed in the revised intra-band spectrum sharing guidelines, which were notified on 11.10.2021.

- (b) The trading of access spectrum in the country is governed through the ‘Guidelines for Trading of Access Spectrum by Access Service Providers’ dated 12.10.2015 (as amended). Hereinafter, these guidelines will also be referred to as “the spectrum trading guidelines”. In respect of the charges associated with spectrum trading, these guidelines provide that “[a] *non-refundable transfer fee of one percent (1%) of the transaction amount of aforesaid trade or one percent (1%) of the prescribed market price, whichever is higher shall be imposed on all spectrum trade transactions, to cover the administrative charges incurred by Government in servicing the trade.*”
- (c) Inter-band access spectrum sharing has features which are distinct from both the intra-band access spectrum sharing and the access spectrum trading. A participating TSP, involved in the inter-band spectrum sharing, will get access to the access spectrum in a new frequency band (i.e. a frequency band, in which it does not hold access spectrum yet), in a shared manner.

2.103 Considering the above, the Authority is of the view that each participating TSP should be levied an inter-band spectrum sharing fee equivalent to 0.5% of the applicable market price of the frequency spectrum shared by the partnering TSP prorated for the term (period) of spectrum sharing. The sharing fees payable by each TSP equivalent to 0.5% of the prorated applicable market price of spectrum of the partner TSP would be reasonable considering the fact that both the participating TSPs will share the frequency spectrum unlike the case of spectrum trading, where the buyer TSP utilizes the purchased spectrum exclusively and pays 1% of prorated market price of spectrum.

2.104 For illustration, the charges payable by the TSPs involved in inter-band spectrum sharing in different scenarios are indicated in the table given below:

Scenario	Spectrum holding of TSP1 in the frequency band being shared	Spectrum holding of TSP2 in the frequency band being shared	Inter-band spectrum sharing fee payable by TSP1	Inter-band spectrum sharing fee payable by TSP2
Scenario-1	10 MHz in 700 MHz band	5 MHz in 900 MHz band	0.5% of the prorated market price of 5 MHz spectrum in 900 MHz band	0.5% of the prorated market price of 10 MHz spectrum in 700 MHz band
Scenario-2	10 MHz in 700 MHz band	No spectrum being shared. (However, TSP2 holds spectrum in one of the sub-1 GHz bands to fulfil the eligibility condition.)	Nil	0.5% of the prorated market price of 10 MHz spectrum in 700 MHz band

2.105 The Authority noted the provisions related to the computation of market price of the spectrum contained in the spectrum trading guidelines. The Authority is of the view that for the purpose of computing inter-band spectrum sharing fee, the latest market determined price available on the effective date of spectrum sharing should be made applicable; if the market determined prices are more than one year old, the prevailing market price should be applied by indexing the last market determined price using applicable Marginal Cost of funds based Lending Rate (MCLR) of SBI.

- 2.106 The Authority also noted the provisions related to the options for payment of spectrum acquisition charges in the notice inviting application (NIA) issued by DoT in 2024 for the auction of spectrum. The Authority is of the view that the TSPs involved in inter-band spectrum sharing should be given the option to make the payment of inter-band spectrum sharing fee either by way of an upfront payment or through equal annual instalments (EAIs), duly protecting the net present value (NPV) of the inter-band spectrum sharing fee at the applicable rate of interest. In case a TSP opts for equal annual instalments, each instalment should be paid in advance at the beginning of each year.
- 2.107 It is noted that considering that it may not be possible to monitor quantum of spectrum being shared at each site, while permitting intra-band spectrum sharing in the year 2015, DoT had decided that for the purpose of charging Spectrum Usage Charges (SUC), *"it will be considered that the licensees are sharing their entire spectrum holding in the particular band in the entire LSA"*. In this regard, the Authority is of the view that for the purpose of charging of inter-band spectrum sharing fee, it will be considered that the licensees are sharing their entire spectrum holding(s) in the concerned band(s) in the entire LSA.
- 2.108 The Authority is mindful of the fact that the participating TSPs, involved in the inter-band spectrum sharing, may acquire additional frequency spectrum in future in the shared frequency bands. In such a case, apart from the existing quantum of spectrum in the shared frequency bands, the newly acquired quantum of spectrum would also be shared by the participating TSPs. In this regard, the Authority is of the opinion that in case any of the participating TSP acquires additional frequency spectrum in the shared frequency bands in future,-
- (a) Inter-band spectrum sharing fee in respect of the additional frequency spectrum acquired by a TSP should be levied on the partner TSP based on the same principle as enunciated above.
 - (b) Compliance with the spectrum cap should be re-examined. In case of any violation of the provision related to spectrum cap due to the addition of

frequency spectrum, the TSPs should be given a period of one year to bring down their spectrum holdings within the prescribed spectrum cap.

- 2.109 It is noted that the spectrum trading guidelines provide, *inter-alia*, that '*the amount received from trading shall be part of Adjusted Gross Revenue (AGR) for the purpose of levy of License fee and Spectrum Usage Charges (SUC)*'. In case of inter-band spectrum sharing there could be a monetary transaction between the partnering TSPs. However, there may be a situation wherein no amount is transacted between the partnering TSPs. The Authority is of the view that the amount received by the TSPs on account of inter-band spectrum sharing, if any, should form part of their Adjusted Gross Revenue (AGR) for the purpose of levy of license fee and spectrum usage charges.
- 2.110 TRAI in its Recommendations on 'Methodology of applying Spectrum Usage Charges (SUC) under the weighted average method of SUC assessment, in cases of Spectrum Sharing' dated 17.08.2020, recommended, *inter-alia*, that "[s]uitable exit clause for intimation of termination of an existing spectrum-sharing arrangement by the TSPs should be included in the spectrum sharing guidelines." However, DoT is yet to make a suitable amendment in the spectrum sharing guidelines. In this regard, the Authority reiterates its earlier Recommendation that a suitable exit clause for intimation of termination of an existing spectrum sharing arrangement by the TSPs should be included in the access spectrum sharing guidelines.
- 2.111 The Authority is of the view that the guidelines for inter-band spectrum sharing should mandate the TSPs to provide a suitable exit clause in the inter-band spectrum sharing agreement for termination of the spectrum sharing arrangement. Further, the TSPs should be liable to intimate DoT about the termination of an existing inter-band spectrum sharing arrangement within 15 days of the termination of such agreement.
- 2.112 Apart from the above, all other terms and conditions of inter-band spectrum sharing should be kept analogous to the terms and conditions of intra-band

spectrum sharing as given in the DoT's 'Guidelines for Sharing of Access Spectrum by Access Service Providers' dated 11.10.2021.

2.113 Further, one of the stakeholders submitted that a TSP sharing the inter-band access spectrum should be allowed to procure the network equipment for the shared band, for inter-band spectrum sharing to effectively work. The Authority considered the submission and is of the view that DoT should include appropriate provisions to facilitate the TSPs to import/ purchase the required network equipment in respect of the shared frequency bands.

2.114 The Authority will monitor the developments in the wireless access services sector and may review its recommendations, as and when need arises. For this purpose, DoT should share the details of the spectrum sharing arrangements within 15 days of its effective date with the Authority.

2.115 In view of the above, **the Authority recommends that inter-band access spectrum sharing between access service providers [which may be implemented either by way of pooling of access spectrum held by the participating access service providers in different frequency bands through common radio access networks, or by way of allowing the partnering access service providers to use the radio access networks of each other operating in the shared frequency band(s)] in an LSA should be permitted subject to the following terms and conditions -**

(a) Inter-band access spectrum sharing in an LSA should be restricted within the frequency bands falling within a spectrum band category, as defined below:

(i) Category-1: Sub-1 GHz bands (600 MHz, 700 MHz, 800 MHz and 900 MHz bands);

(ii) Category-2: 1800 MHz and 2100 MHz;

(iii) Category-3: 2300 MHz, 2500 MHz and 3300-3670 MHz bands;

- (iv) Category-4: 26 GHz, and newly identified bands (37-37.5 GHz, 37.5-40 GHz, 42.5-43.5 GHz)**
- (b) A TSP should not be allowed to enter into inter-band access spectrum sharing with more than one TSP in a spectrum band category in an LSA. Further, inter-band access spectrum sharing in an LSA should be permitted subject to the condition that, post-sharing, there will be at least two independent wireless access networks in the LSA.**
- (c) Any frequency spectrum should be permitted to be shared under inter-band access spectrum sharing only after a lock-in period of two years from the date of its acquisition.**
- (d) The frequency spectrum proposed to be shared by the access service providers should have been acquired through spectrum auction or spectrum trading, or market price should have been paid by the respective access service providers for acquiring such spectrum. On this aspect, DoT may impose other conditions, as provided in the DoT's 'Guidelines for Sharing of Access Spectrum by Access Service Providers' dated 11.10.2021, if specific type of cases warrant so.**
- (e) For spectrum cap, entire holding of the access service providers in the spectrum bands being shared should be counted in both the sharing access service providers. In other words, the spectrum holding of any access service provider, post inter-band spectrum sharing should be computed by adding the frequency spectrum of the partner access service provider in the frequency band(s) being shared, to the original access spectrum held by the access service provider.**
- (f) In case a TSP, which is involved in the inter-band spectrum sharing, wishes to acquire additional access spectrum through a**

future auction, but the spectrum cap restricts it from participating in the auction, such TSP(s) should be permitted to participate in the future spectrum auction provided it furnishes an undertaking that it will bring down its spectrum holding to comply to the applicable spectrum cap within a period of one year from the date of assignment of access spectrum through auction. In such a case, for the purpose of spectrum cap, only the frequency spectrum held by the licensee (without including the shared spectrum of the partnering TSP) should be considered to assess its eligibility to bid for additional frequency spectrum in the spectrum auction.

- (g) The TSPs involved in the inter-band spectrum sharing should be liable to pay a non-refundable inter-band spectrum sharing fee to the Government. The inter-band spectrum sharing fee payable by a TSP should be 0.5% of the applicable market price of the frequency spectrum shared by the partnering TSP prorated for the term (period) of spectrum sharing. For the purpose of computing the inter-band spectrum sharing fee, the latest market determined price available on the effective date of spectrum sharing should be applicable. If the market determined prices are more than one year old, the prevailing market price should be applied by indexing the last market determined price using the applicable Marginal Cost of funds based Lending Rate (MCLR) of SBI.**
- (h) For the purpose of spectrum cap and inter-band spectrum sharing fee, it should be considered that the licensees are sharing their entire spectrum holdings in the concerned frequency bands in the entire LSA.**
- (i) The TSPs involved in the inter-band spectrum sharing should be given the option to make payment of the inter-band spectrum sharing fee either by way of an upfront payment, or equal annual**

instalments, duly protecting the Net Present Value (NPV) of the inter-band spectrum sharing fee at the applicable rate of interest. In case a TSP opts for equal annual instalments, each instalment should be paid in advance at the beginning of each year.

- (j) The amount received by the TSPs on account of inter-band spectrum sharing should form part of their Adjusted Gross Revenue (AGR) for the purpose of levy of license fee and spectrum usage charges.**
- (k) In case any of the participating TSPs acquires additional frequency spectrum in the shared frequency bands in the future,**
 - i. Inter-band spectrum sharing fee in respect of the additional frequency spectrum acquired by a TSP should be levied on the partner TSP based on the same principle as enunciated above.**
 - ii. Compliance to the spectrum cap should be re-examined. In case of any case of any violation of the provision related to spectrum cap, the TSPs should be given a period of one year to bring down their spectrum holdings within the prescribed spectrum cap.**
- (l) The TSPs should be mandated to provide a suitable exit clause in their inter-band spectrum sharing agreements for termination of the spectrum sharing arrangement.**
- (m) The TSPs should be liable to intimate DoT about the termination of an existing inter-band spectrum sharing arrangement within 15 days of the termination of such arrangement.**
- (n) DoT should include appropriate provisions to facilitate the TSPs to import/ purchase the required network equipment in respect of the shared frequency bands.**

- (o) The other terms and conditions of the inter-band spectrum sharing should be kept analogous to the terms and conditions of the intra-band spectrum sharing as given in the DoT's 'Guidelines for Sharing of Access Spectrum by Access Service Providers' dated 11.10.2021.**
- (p) The Authority will monitor the developments in the wireless access services segment and may review its recommendations, as and when need arises. In this regard, DoT should share the details of the spectrum sharing arrangements within 15 days of their effective date with the Authority.**

2.116 The Authority reiterates its earlier Recommendation that a suitable exit clause for intimation of termination of an existing spectrum sharing arrangement by the TSPs should be included in the access spectrum sharing guidelines.

E. Authorized Shared Access (ASA) of Spectrum

2.117 In India, a certain quantum of spectrum in the frequency bands which are globally harmonized for IMT services has been assigned/ earmarked for Government use and/ or other services. However, the utilization of such a spectrum may not necessarily be optimum across frequency, space, and time, i.e. the entire spectrum (frequency), at all places (space) at all times (time) may not necessarily be in use. Keeping in view the increasing data usage owing to increasing digitalization, uptake of data-hungry applications, and proliferation of IoT-based solutions, there may be a need to explore a regime of authorized shared access (ASA) of spectrum, wherein the spectrum assigned/ earmarked for Government/ other users on primary basis could be used by the access service providers on secondary basis. The ASA technique could also be used for spectrum sharing on a dynamic basis among access service providers. In case it is decided to implement the ASA technique for spectrum sharing on dynamic basis among

access service providers, an enabling framework and other terms and conditions will require to be prescribed.

2.118 In this background, the stakeholders were requested to furnish their comments on the following questions:

Q14. Whether there is a need to explore putting in place a regime to implement Authorised Shared Access (ASA), wherein an access service provider as a secondary user could use the frequency spectrum assigned to a non-TSP primary user (government agencies and other entities) on a dynamic spectrum sharing basis? Kindly justify your response.

Q15. In case it is decided to implement ASA technique for secondary use of frequency spectrum assigned to non-TSP primary users, please provide your response to the following questions with detailed justification:

- (a) What are the potential spectrum bands in which ASA implementation can be considered?*
- (b) What measures should be taken to encourage and motivate the incumbent users for participation in the spectrum sharing through ASA technique?*
- (c) What should be the broad framework for implementation of ASA technique?*
- (d) Is there a need for putting in place a mechanism for dispute handling including interference issues in case of ASA? If yes, what should be the framework?*
- (e) What methodology should be adopted for spectrum assignment to secondary users? What could be the spectrum charging mechanism for such assignment?*
- (f) Who should be entrusted the work of managing shared access of spectrum?*

Q16. Whether there is a need to permit the ASA technique-based dynamic spectrum sharing among access service providers? If yes,

- (a) What are the possible regulatory issues involved and what could be the possible solutions?*
- (b) What measures should be put in place to avoid any adverse impact on competition and dynamics of spectrum auction?*

Kindly justify your response.

Q17. In case it is decided to permit ASA technique-based dynamic spectrum sharing among access service providers in the country, please provide your response to the following questions with justification:

- (i) Whether there is a need for prescribing any framework for such shared use? If yes, what should be the framework?*
- (ii) Whether access service providers should be required to obtain approval or intimate to DoT before entering into such arrangement?*
- (iii) Whether any fee (one time, or recurring), should be prescribed on the spectrum sharing party(ies)? If yes, what should be the fee and who should be liable to pay such fee?*
- (iv) What should be the treatment of spectrum shared through ASA technique for the purpose of computation of spectrum cap?*
- (v) Whether there is a need for an independent entity for managing spectrum access? If yes, who should be entrusted this work? If not, how should the spectrum access be managed?*
- (vi) Is there a need for putting in place a mechanism for dispute handling including interference issues or should it be left to the access service providers? If yes, what should be the framework?*

(vii) What other terms and conditions should be applicable for the sharing parties?

Q18. Suggestions on any other spectrum sharing technique(s), which needs to be explored to be implemented in India, may kindly be made along with the relevant details and international practice. Details of likely regulatory issues with possible solutions, interference management, dispute handling etc. may also be provided.

Comments of stakeholders on the Q14

2.119 In response to the Q14 regarding the need to explore a regime to implement ASA for secondary use of the frequency spectrum assigned to a non-TSP primary user, many stakeholders favoured the proposed ASA regime. However, a few other stakeholders suggested to evaluate its benefits and risks before implementing it.

2.120 A broad summary of the comments of the stakeholders, who supported the regime of ASA for secondary use of the frequency spectrum assigned to a non-TSP primary user, is given below:

- (a) The proposed regime of ASA will result in an efficient utilization of the available spectrum resources. It will benefit the telecom sector by way of meeting the coverage and capacity demands in the current 4G/ 5G networks.
- (b) The main benefit of ASA is that the incumbent (Government users/ other agencies) can continue operations and do not need to vacate the bands. This enables TSPs a quicker access to the band which otherwise is not available to them. Besides, coexistence of different services is possible in a given band with a proper interference management.

2.121 The comments of stakeholders, who suggested to evaluate benefits and risks involved before considering the implementation of ASA regime are summarized below:

- (a) ASA is a useful concept, but it has implementation related challenges. The fragmented availability of spectrum at various locations will prevent its optimal use in the networks of TSPs. For carrier-grade mobile services, access service providers require a reliable spectrum free from any interference, which will be difficult to be provided under ASA.
- (b) ASA is a tiered sharing framework. Such tiered sharing solutions are still commercially unproven. However, possible opportunities for ASA can be considered in consultation with the industry and government agencies/ stakeholders together.
- (c) A measured and thoughtful approach should be taken to minimize risks associated with ASA. Proper interference study, planning, analysis, and coordination with all stakeholders can help avoid risks and ensure that the allocated spectrum is used in the best interest of all.

Comments of stakeholders on the Q15

2.122 In response to the Q15 (a) regarding the potential spectrum bands in which ASA implementation can be considered, divergent views were received from stakeholders. A few stakeholders emphasized that the spectrum in specific bands such as 470-585 MHz band (TV white spaces), mid bands, Ku-band, Ka-band etc. should be included under ASA. On the other hand, a few other stakeholders opined that all potential spectrum bands should be considered under ASA. A few other stakeholders suggested that the scope of ASA should be broadened to include the spectrum for non-IMT bands as well.

2.123 In response to the Q15 (b) regarding the measures to encourage and motivate incumbent users to participate in the spectrum sharing through ASA technique, a wide range of responses were received from stakeholders. A summary of the stakeholders' responses is given below:

- (a) There is a need to build confidence in incumbent users that there will be no compromise to their networks due to the shared access of spectrum by access service providers.
- (b) The Government may consider providing financial incentive to the incumbent operators to invest in the required infrastructure essential for spectrum sharing through the ASA technique.
- (c) The primary users can be suitably compensated from the revenue received from the allocation of the spectrum through ASA for any upgradation required at their end.
- (d) The TSP, which shares the spectrum with the incumbent users, should pay the proportional market price of the spectrum, mutually agreed between both the parties.

2.124 The stakeholders' comments in response to the Q15 (c) regarding the broad framework for the implementation of ASA are summarized below:

- (a) The Government should first provide a detailed list of the spectrum available with Government/ other users which it intends to put up for utilization under ASA, and the geographies where it is being already used or planned to be used in future (five years) by primary users.
- (b) Under ASA, the spectrum should be assigned to licensed TSPs only.
- (c) There should be a simple method for users to access spectrum in a range of frequency bands. The ASA licensee should be held responsible for managing interference according to a pre-defined criterion.
- (d) DoT should make a centralized mechanism for implementation of ASA technique. Any service provider, which wants spectrum sharing through ASA technique, should apply on this centralized platform. Spectrum sharing should be allowed on a first-come-first-served basis.

2.125 In response to the Q15 (d) regarding the need for a dispute handling mechanism, many stakeholders averred that DoT should provide a centralized platform to resolve disputes between the sharing parties in a timely manner; any dispute between Access Provider and Access Seeker may be referred for resolution by either party to the dispute handling authority such as Wireless Monitoring Organization (WMO) of WPC, DoT.

2.126 In response to the Q15 (e) regarding the methodology for spectrum assignment, quite divergent views were received from stakeholders. A summary of the stakeholders' responses is given below:

(a) The assignment of spectrum held by incumbent users to secondary users should be done on an administrative basis. This spectrum cannot be equated with spectrum acquired in auctions since the rights of the primary holder will always override the rights of secondary users. The secondary users will have to vacate the spectrum in a particular area if the primary user is expanding its network.

(b) Spectrum assignment mechanisms for such assignments can include auctioning, administratively assigned prices, or revenue-sharing arrangements based on the factors such as the amount of spectrum available, the type of service or application being used, and the level of demand for spectrum in a particular area.

(c) The methodology for assignment of spectrum for secondary usage should be based on fair and unbiased conditions without any goal of revenue maximization. It should also prevent any attempt to hoard the spectrum by any operator. The charges, if any, for the use of the spectrum through ASA should be cost-based with adequate discounting.

2.127 In response to the Q15 (f) regarding the entrustment of managing shared access of spectrum, many stakeholders suggested that a third party such as TRAI, DoT, or WPC should be entrusted with the work of managing shared access of spectrum.

Comments of stakeholders on the Q16

- 2.128 In response to the Q16 regarding the need for permitting ASA technique-based dynamic spectrum sharing among access service providers, a few stakeholders supported ASA technique-based dynamic spectrum sharing among access service providers, while a few other opposed it.
- 2.129 The supporters of ASA technique-based dynamic spectrum sharing among access service providers averred that the use of ASA between access service providers can improve the efficiency of spectrum use, increase spectrum availability, and promote competition among ASPs. On the other hand, the opponents of the use of ASA between access service providers contended that ASA is not applicable to frequency bands for which mobile network operators have acquired exclusive spectrum usage rights, and the access services providers already have the option for intra-band spectrum sharing and would also have the option of spectrum leasing going forward, thereby obviating need for any other interventions.
- 2.130 A few stakeholders contended that ASA technique-based dynamic spectrum sharing should not be restricted only among access service providers; the non-access service providers should also be permitted to obtain spectrum under ASA.
- 2.131 A broad summary of the stakeholders' comments in response to the Q16 (a) regarding possible regulatory issues involved in ASA between access service providers and possible solutions is given below:
- (a) First, there is a need to ensure that access service providers have equal access to spectrum, without any discrimination or preferential treatment. This requires a regulatory framework that promotes fair competition and prevents anti-competitive behaviour. Second, there is a need to ensure that the dynamics of spectrum auctions are not adversely impacted. Spectrum auctions are an important mechanism for allocating scarce spectrum resources, and any changes to the auction process must be carefully considered to avoid unintended consequences.

- (b) Some of the regulatory issues involved will arise due to the provision of surrender of spectrum clause in the license agreement. For this, it should be ensured that commercials for sharing of spectrum are in accordance to the market rate of the spectrum during the auction.

2.132 A broad summary of the stakeholders' comments, in response to the Q16 (b) regarding the measures to avoid any adverse impact on competition and auction of spectrum, is given below:

- (a) A regulatory framework should be developed that promotes fair competition and prevents anti-competitive behaviour. This can be achieved by establishing clear rules for spectrum allocation, setting limits on spectrum holdings, and enforcing strict antitrust regulations.
- (b) The minimum rate for sharing of spectrum should be defined which is in accordance with the market rate of the spectrum during the auction, so that the dynamics of spectrum auction may not be affected. Spectrum sharing should be restricted to sharing by licensees subject to the condition that there will not be any subletting of spectrum by a licensee who has taken the spectrum on a shared basis.
- (c) ASA should only be made available to those operators who do not already hold any spectrum in the concerned LSA to ensure new and local operators get an opportunity.

Comments of stakeholders on the Q17

2.133 A broad summary of the stakeholders' comments, in response to the Q17 (a) regarding the need for prescribing a framework for the implementation of ASA technique-based dynamic spectrum sharing among access service providers, is given below:

- (a) The framework should include various terms and conditions for the sharing, possible tenure, emission requirements and synchronization requirements

among other things and directions to arrive at the sharing charges if any to keep the cost to the operator to the lowest extent possible.

- (b) ASA framework should be based on the use of geographic locations databases for all secondary users to coordinate spectrum assignments and efficient power controlling mechanisms for secondary users to minimize noise level.

2.134 In response to the Q17 (b) regarding the need for approval or intimation to DoT before entering into ASA arrangement, a wide range of responses were received from stakeholders. At one extreme are a few stakeholders, who averred that there is no requirement to obtain approval or intimation to DoT before entering into such arrangements. On the other extreme are a few other stakeholders, who contended that the ASA arrangement should be allowed with the prior approval of the DoT since it requires a lot of coordination between primary and secondary users with the support of WPC. One stakeholder suggested a middle path of only a prior intimation to DoT.

2.135 In response to the Q17 (c) regarding fee/ charges on spectrum sharing party(ies), a wide range of comments were received from stakeholders. A few stakeholders proposed that there can be a one-time, non-refundable administrative processing fee for the ASA; it can be paid either by primary or secondary user; the fee should be reasonable and no more than the recovery cost of application processing. One stakeholder suggested that the fees, if any, for shared access should be cost-based, that is to recover the costs of administering the shared access. One stakeholder suggested a recurring fee should be prescribed on the spectrum sharing party as the spectrum sharing will be dynamically used and not fixed.

2.136 In response to the Q17 (d) regarding the treatment of spectrum shared through ASA technique for the purpose of computation of spectrum caps, stakeholders expressed quite divergent views. One stakeholder suggested that for calculation of spectrum cap, there should be four slabs- i.e., 25%, 50%, 75%, 100% depending on the area in which spectrum is available for secondary users.

Another stakeholder suggested that since ASA spectrum is not available to the service provider exclusively and in the complete geography, it should not be used for the purpose of computation of spectrum cap; however proper care must be taken to prevent spectrum hoarding. Another stakeholder suggested that the existing spectrum cap rules should be followed in respect of spectrum shared through ASA.

2.137 In response to the Q17 (e) regarding the need for an independent entity for managing spectrum access, a few stakeholders suggested that a neutral governing body under DoT such as WPC may be entrusted with the responsibility of the system administrator of ASA.

2.138 In response to the Q17 (f) regarding the need for putting in place a mechanism for dispute handling including interference issues, many stakeholders suggested that an independent authority should be designated for dispute handling and interference issues among primary and secondary users.

2.139 In response to the Q17 (g) regarding other terms and conditions applicable for the sharing parties, a couple of stakeholders proposed that sharing of spectrum should be permitted with licensed telecom service providers only. One stakeholder suggested that the terms and conditions should be reasonable, fair, and consistent without any bias. Another stakeholder suggested that the charges for spectrum sharing should be decided mutually between the licensees in accordance with the market rate of the spectrum during the auction.

Comments of stakeholders on the Q18

2.140 In response to the Q18, a few stakeholders suggested a few other approaches of spectrum sharing such as Automated Frequency Coordination (AFC) and Open Sharing Model.

Analysis w.r.t. the Q14 and Q15

2.141 As indicated earlier, a certain quantum of spectrum in the frequency bands, which are identified for IMT services, has been assigned to Government/ other

users, the utilization of which may not necessarily be optimum across frequency, space, and time. For making available such frequency spectrum to TSPs on a secondary basis, the appropriateness of establishing a regime of authorized shared access (ASA) of spectrum is being examined through this consultation process.

2.142 In the present consultation process, many stakeholders favored the proposed regime in which TSPs, on secondary basis, make use of the spectrum assigned to Government/ other users. However, a few other stakeholders suggested that its benefits and risks should be duly assessed before implementing it. The stakeholders provided detailed arguments in support of their respective contentions.

2.143 While evaluating the comments of stakeholders, the Authority took note of the following aspects:

(a) ITU in its Recommendation ITU-R SM.1132²⁵ states, *inter-alia*, that *"[s]pectrum sharing holds the potential for increasing the efficiency and effectiveness of spectrum use. ... Utilization of the radio spectrum is dependent on the dimensions of frequency, spatial location, time and signal separation. Any sharing of the spectrum will have to take into account one or more of these four dimensions. Sharing can be accomplished in a straightforward fashion when any two of these dimensions are in common and the third and/ or fourth dimension differs by a degree sufficient to ensure that all the involved services or stations (two or more) can operate satisfactorily. ... Generally speaking, multidimensional use of spectrum could obtain additional power/ spectrum and/ or orbit processing gain, even through it would make the system architecture or structure somewhat more complicated. ... Dynamic sharing of frequencies between different systems in the same similar services allows more than one system to use the same frequencies but at different times, in the same geographic region. ..."*

²⁵ Source: https://www.itu.int/dms_pubrec/itu-r/rec/sm/R-REC-SM.1132-2-200107-I!!PDF-E.pdf

Dynamic sharing requires reliance on sophisticated technologies and methodologies. ...Another type of dynamic sharing occurs between cellular providers and other users in the 900 MHz band. ... In this arrangement, the priority users have pre-emptive access to these frequencies, and as they need them, computer software programs automatically reclaim the frequencies for the priority use, excluding them from cellular access."

- (b) National Digital Communications Policy (NDCP) 2018 under its 'Connect India' mission, recognizes 'promoting the co-use/ secondary use of spectrum' as one of the action points for making adequate spectrum available to be equipped for the new broadband era.
- (c) GSMA, in its paper on Spectrum Sharing (2021) states, *inter-alia*, that "*Regulators can enable sharing by giving incumbent users the right to share their spectrum voluntarily through commercial agreements or by awarding rights to use spectrum in areas and/ or at times when the incumbent is not using it. ... Spectrum sharing can help address rising demand for mobile services by opening up access to vital new spectrum in areas where it is in-demand and where it is under-used by incumbent users. However, sharing has yet to be proven as an effective way to provide additional spectrum for mobile broadband, so careful planning is necessary to craft approaches that will offer access to sufficient amounts of spectrum under conditions that support mobile broadband.*"
- (d) Based on TRAI's recommendations, DoT in the year 2020 requested Comptroller and Auditor General of India (CAG) to audit Ministries/ Departments/ Agencies, who had been allotted spectrum administratively."²⁶ After the audit, CAG submitted its Report on Management of Spectrum Assigned on the Administrative Basis to Government Department/ Agencies²⁷ in the year 2022. In the report, CAG stated that "[t]he audit observations on utilization of spectrum by Ministries/

²⁶ Source: <https://cag.gov.in/en/audit-report/download/116503>

²⁷ *ibid*

Departments/ Agencies who had been assigned spectrum on Administrative basis, indicate that IMT bands were either suboptimally/ under-utilized or not utilized at all due to various reasons.” In the report, CAG also stated that “[s]haring of spectrum in a band by Government users with Commercial users or by a Government user with other Government user would result in efficient and optimal utilization of spectrum.”

- (e) Internationally, a few countries have either already permitted authorized shared access (ASA) of spectrum in a few frequency bands or have undertaken trials of this technique to make available frequency spectrum, held by the Government/ other users, to TSPs on secondary basis.

2.144 Based on the comments of stakeholders and further analysis, the Authority is of the view that DoT should explore the possibility of implementing ASA technique-based spectrum sharing in India, wherein spectrum assigned to the Government agencies or other entities (non-TSPs) in spectrum bands globally harmonized for IMT services, can be assigned to access service providers as secondary users.

2.145 In this regard, individual discussions may be held with the relevant incumbent spectrum holders (non-TSPs) to make them aware of the ASA-technique and the fact that their spectrum needs will not be compromised under ASA. If required, to motivate the incumbent users to participate in the spectrum sharing regime, some incentives could also be given to them from the proceeds received from the access service providers as secondary users. Once the Government takes an administrative decision in this regard, a detailed framework of ASA of spectrum can be worked out.

2.146 In view of the above, **the Authority recommends that DoT should explore the possibility of implementing authorized shared access (ASA) technique-based spectrum sharing in India, under which, the spectrum assigned to Government agencies or other entities (non-TSPs) in the globally harmonized spectrum bands for IMT services, can be assigned to access service providers as secondary users. Once the Government takes an administrative decision in this regard, DoT may, if deemed fit,**

seek recommendations of TRAI on a detailed regulatory framework for such a regime.

Analysis w.r.t. the Q16 and Q17

2.147 The Authority is cognizant of the fact that the implementation of ASA between access service providers would not be as advantageous as the implementation of ASA between Government users and access service providers, because the usage patterns of the users of different access service providers (in terms of the spatial location where the users live or work, the time period in which the users make use of telecom services, and the amount of traffic the users generate) are likely to be similar. Therefore, the benefits which would accrue on account of the difference in the usage patterns of users (in terms of spatial location, time, and frequency use) if the incumbent user is a non-TSP (Government/ other user) are not likely to accrue in case of ASA between access service providers. In short, the extent of the enhanced spectrum utilization under ASA between access service providers is likely to be less pronounced than that under ASA in which Government is the incumbent user of spectrum. Nevertheless, based on the stakeholders' comments in the consultation process, the Authority is of the opinion that the possibility of implementing ASA technique-based spectrum sharing between access service providers may also be explored.

2.148 As can be seen from the comments received from the stakeholders, ASA based dynamic sharing of spectrum could involve complexities and may require a detailed regulatory framework. Accordingly, the Authority is of the view that to assess the issues and devise a regulatory framework for such sharing, it would be appropriate to conduct a field trial of ASA of spectrum between two willing access service providers under the supervision of DoT in an LSA. The framework for ASA based spectrum sharing can be devised based on the learnings and outcome of the field trial.

2.149 In view of the above, **the Authority recommends that a field trial of ASA technique-based spectrum sharing between the willing access service**

providers should be conducted under the supervision of DoT. Based on the learnings and outcome of the field trial, a detailed regulatory framework for ASA technique-based spectrum sharing between access service providers can be devised. DoT may, if deemed fit, seek recommendations of TRAI on a detailed regulatory framework for ASA technique-based spectrum sharing between access service providers.

F. Leasing of Spectrum

2.150 In spectrum leasing, a TSP leases its excess or unutilized spectrum holding to another TSP and/ or a private entity (for localized captive use) for a specified period for a specified geographical area.

2.151 National Digital Communications Policy (NDCP) 2018, under its 'Connect India' mission, recognizes spectrum as a key natural resource for public benefit to achieve India's socio-economic goals. To make adequate spectrum available to be equipped for the new broadband era, one of the action plans is to further liberalize the spectrum sharing, leasing, and trading regime. At present, leasing of access spectrum to other TSPs is not permitted in India.

2.152 In this background, the stakeholders were requested to furnish their comments on the following questions:

Q19. Whether there is a need to permit spectrum leasing among access service providers? Kindly justify your response.

Q20. In case it is decided to permit spectrum leasing among access service providers, please provide detailed response to the following questions:

(a) Whether spectrum leasing should be permitted for short-term period only, or for both short-term as well as long-term?

(b) In case only short-term leasing is to be permitted, what should be the maximum duration for such spectrum leasing? Should there be any restrictions on renewal of such short-term lease?

- (c) *In case it is decided to permit long term leasing, please provide your response to the following questions with justification:*
- (i) *What measures should be put in place to avoid any adverse impact on competition and dynamics of spectrum auction?*
 - (ii) *Whether there should be a maximum duration for which spectrum leasing may be permitted?*
- (d) *What should be the applicable roll-out obligations for the Lessee (the access service provider which takes spectrum through leasing arrangement from the Lessor)? Whether the spectrum leasing should have any effect on the roll-out obligations applicable for the Lessor (the access service provider which has leased out the spectrum)? Whether the provisions for roll-out obligation require to be different for short-term and long-term spectrum leasing?*
- (e) *Should the spectrum leasing charges be levied on similar lines as applicable for spectrum trading? If no, what charges should be made applicable in case of spectrum leasing?*
- (f) *Should there be a lock-in period, after acquisition of spectrum, to become eligible for spectrum leasing as applicable in spectrum trading? If yes, what should be the lock-in period post which, spectrum holder would become eligible to lease it to another access service provider?*
- (g) *Whether there is a need for an approval from, or intimation to DoT before the proposed leasing of spectrum? If yes, whether prior approval/ prior intimation requirement be different for long-term and short-term spectrum leasing? What should be the timelines for approval from, or intimation to DoT in each case?*

- (h) *Whether the spectrum held by an access service provider on short-term, or long-term lease be included to calculate compliance to spectrum caps?*
- (i) *Considering that surrender of spectrum has been permitted in the country, what provisions need to be created in the guidelines for leasing of spectrum between access service providers so that any possible misuse by the licensees could be avoided?*
- (j) *What other terms and conditions need to be prescribed in respect of spectrum leasing between access service providers?*

Q21. Any other issues/ suggestions relevant to the spectrum leasing, may be submitted with proper explanation and justification.

Comments of stakeholders on the Q19

2.153 In response to the Q19 regarding the need to permit spectrum leasing among access service providers, stakeholders expressed a unanimous support to spectrum leasing. A broad summary of the stakeholders' comments on the Q19 is given below:

- (a) Spectrum leasing can increase the efficient use of spectrum. Considering that spectrum trading is already permitted, spectrum leasing can also be permitted subject to adequate safeguards.
- (b) A licensed TSP should have the flexibility to better utilize the spectrum to the best available opportunity rather than keeping it idle or under-utilized.
- (c) Spectrum leasing can be a cost effective way for the lessee to expand its service offerings and increase its coverage area, and also a way for the lessor to generate additional revenue.
- (d) Spectrum leasing can help the service providers test the waters with limited amount of spectrum in their limited areas of interest and can lead to an

increased competition for spectrum in subsequent auctions, if the lessee is able to monetize the leased spectrum.

2.154 A couple of stakeholders contended that spectrum leasing should be permitted not only amongst access service providers but also among all licensed service providers including ISPs. On the other hand, a stakeholder asserted that the scope of services which can be provided by spectrum lessee through the leased spectrum should be as per the applicable license of the spectrum lessee; spectrum leasing should not give a back door entry to any unlicensed entity or entity licensed with any other license except Unified License (Access Service).

Comments of stakeholders on the Q20

2.155 In response to the Q20 (a), most of the stakeholders were of the view that both short-term and long-term spectrum leasing should be permitted. A few stakeholders further suggested that the duration of spectrum leasing should be left to market forces; any ex-ante restriction on the duration of spectrum leasing will unnecessarily constrain the development of the leasing market. On the other hand, a stakeholder averred that spectrum leasing should be permitted from medium to long term with the minimum term being five years.

2.156 In response to the Q20 (b) regarding the maximum duration for short-term spectrum leasing, a few stakeholders were of the view that the short-term spectrum leasing should be for a period upto two to three years.

2.157 In response to the Q20 (c)(i) regarding the measures to avoid any adverse impact on the competition and dynamics of spectrum auction due to long term spectrum leasing, one of the stakeholders suggested that the minimum rate for spectrum leasing should be fixed in accordance to the auction determined price of spectrum to avoid any adverse impact on the dynamics of spectrum auction. On the other hand, most of the stakeholders were of the view that there is no possibility of any adverse impacts due to the long term spectrum leasing. One of them contended that spectrum trading, intra-band spectrum sharing and intra-circle roaming (ICR) are already permitted in India, with no known instances of

concern on competition or auction dynamics; with spectrum leasing, there should not be any cause for regulatory concern; the Government and the regulator always have mechanisms to monitor and review market dynamics and they can intervene and remedy matters should the evidence-based assessments suggest any competitive distortion.

2.158 In response to the Q20 (c)(ii) regarding the maximum duration for which long-term spectrum leasing should be permitted, one of the stakeholders suggested that the lease agreement could be upto the balance period of the license or right to use spectrum, whichever is earlier. On the other hand, most of the stakeholders were of the view that there should not be any restriction on the duration of spectrum leasing.

2.159 In response to the Q20 (d) regarding the roll-out obligations on lessee and lessor, one of the stakeholders suggested that the roll-out obligations on the lessee should be the same as applicable to the service providers which take spectrum through auction, and there should be no relaxation in the roll-out obligations to the lessor. On the other hand, most of the stakeholders contended that there should be no roll-out obligations on the lessee, as the leased spectrum would mostly be used for a limited period and a specific geography; they suggested that the rollout obligations are on the original spectrum buyer/ licensee, and it should be his responsibility only. A few stakeholders also suggested that to encourage spectrum leasing and in line with international best practices, the roll-out carried out by the lessee should be added to the roll-out of the lessor. One stakeholder proposed that, if the lessor is leasing the entire spectrum in a frequency band to the lessee for the entire service area, the applicable rollout obligations should be transferred to the lessee in line with the practice being followed in spectrum trading.

2.160 In response to the Q20 (e) regarding spectrum leasing charges, the stakeholders were generally of the view that there should be no charges for spectrum leasing, as the spectrum is acquired through auction. A few stakeholders suggested that only administrative charges on an actual basis or a maximum of Rs. 50,000 for

processing leasing applications should be applicable. A stakeholder suggested that 1% charge levied by the Government on spectrum trading should be removed, and the secondary market should be left entirely for the market to deal with subject to spectrum caps alone. One stakeholder proposed that minimum rates for leasing should be fixed in accordance to market rate of the spectrum during the auction so that the dynamics of spectrum auction is not affected.

2.161 In response to the Q20 (f) regarding the need for a lock-in period to become eligible for spectrum leasing after acquiring spectrum, quite divergent views were received from stakeholders. At one extreme, a few stakeholders contended that there should be no lock-in period for spectrum leasing after acquiring spectrum; the licensee should be able to lease spectrum as soon as it receives the spectrum assignment; spectrum leasing is a long sought-after reform and encumbering it with lock-in conditions will have the effect of restricting the benefits. On the other hand, a stakeholder suggested that spectrum leasing should be allowed only after the completion of the defined roll out obligation by the lessor. In the middle, many stakeholders suggested a lock-in period of two years after acquisition of spectrum as applicable in spectrum trading.

2.162 In response to the Q20 (g) regarding the need for an approval from, or intimation to DoT before spectrum leasing of spectrum, the stakeholders were, generally, of the opinion that there should be only a requirement for intimation to the Licensor, 15 to 45 days before the effective date of spectrum leasing. A stakeholder suggested that an advance joint intimation form should be submitted by the lessee and lessor TSPs; DoT should provide its consent to TSPs leasing spectrum with any observation/ objections/ obligations within 45 days of this intimation; this timeline should be followed irrespective of whether it is short-term or long-term leasing. Another stakeholder proposed that the intimation should include details of the geography where spectrum leasing is being carried out and such information be made public by the Government.

2.163 In response to the Q20 (h) regarding the appropriateness of the inclusion of spectrum held by the access service provider on short-term, or long-term lease

for calculating compliance to spectrum cap, most of the stakeholders were of the view that the spectrum held by the access service provider on short-term, or long-term should be included to calculate compliance to spectrum caps. However, on this aspect, a few stakeholders provided divergent views, which are summarized below:

- (a) Spectrum in a given frequency band should be included for the computation of the compliance to the spectrum cap of the lessee if leasing has been exercised in more than a significant number of districts in an LSA as it would contribute significantly to the overall spectrum holding of the lessee.
- (b) As spectrum caps are prescribed at licensed service area (LSA)-level, the calculation of spectrum caps in the scenario where spectrum is leased for a part of an LSA, even for a long term, will not be reasonable. However, in cases where spectrum is availed by a service provider under a leasing arrangement for more than five years for complete LSA, the spectrum should be added in spectrum cap of the lessee. In any case, any assigned spectrum should not be added for spectrum cap calculation of two service providers.
- (c) There is no need to impose a spectrum cap in instances of small duration of few days or weeks.

2.164 In response to the Q20 (i) regarding the need for provisions in the guidelines for spectrum leasing to avoid misuse of the facility of surrender of spectrum, a few stakeholders contended that there is no linkage between the surrender of spectrum, and the leasing of spectrum as the surrender of spectrum has been permitted only after ten years of the spectrum acquired through the 2022 auction. On the other hand, a stakeholder suggested that a minimum rate for spectrum leasing should be specified based on auction determined price of spectrum so that the lessee will not be able to take the advantage of arbitrage of cost by surrendering the spectrum.

2.165 A broad summary of the stakeholders' comments in response to the Q20 (j) regarding the need of any other terms and conditions in respect of spectrum leasing between access service providers, is given below:

- (a) The terms and conditions prescribed by DoT in the spectrum assignment should be passed on to the lessee.
- (b) Licensees can obtain spectrum on lease from other TSPs on mutually agreed terms and conditions. Subletting of spectrum should not be permitted. TSPs should submit the details of spectrum bands, quantum of spectrum in each band, period of lease, etc., within 15 days of entering into leasing agreements. Parties of the leasing agreement shall ensure that, while using the leased spectrum, no interference is caused to any public network or any other licensed user of spectrum. The revenue earned by TSP through spectrum leasing should form part of its Gross Revenue. Spectrum Usage Charge (SUC) should be applicable for the service provider who have taken the spectrum on lease based on their Adjusted Gross Revenue (AGR) to DoT. Paying of the SUC charges for the leased spectrum will be the responsibility of the service provider that has taken the spectrum on lease.
- (c) The finer business details should be left to mutually agreed commercial terms between both parties. Further, since both parties will be UASL/ UL holders, there is no need to prescribe any separate compliance requirements. The revenue accruing to a TSP from spectrum leasing and sharing should be allowed as pass through charges for the purpose of levy of LF and SUC.

Comments of stakeholders on the Q21

2.166 In response to the Q21 regarding any other issues/ suggestions relevant to spectrum leasing, a stakeholder suggested that by allowing spectrum leasing, regulators can avoid setting aside spectrum for a particular use case; set asides make it unlikely the spectrum will be used outside of the relatively small number of locations where verticals would want networks (e.g., factories, airports etc.);

set asides also have a risk that the spectrum may go unused in many areas and means less spectrum is available for public 5G services; the resultant artificial scarcity can lead to higher prices being paid at auctions, which is linked to worse coverage, slower rollouts and lower broadband speeds of mobile networks.

Analysis w.r.t. the Q19, Q20 and Q21

2.167 Under spectrum leasing, the frequency spectrum which has been assigned to a licensee on an exclusive basis can be taken on lease by another user. A primary motivation for spectrum leasing is the potential commercial benefit to lessors in terms of revenue generation and cost savings of leasing unutilised frequencies for certain uses or periods²⁸.

2.168 At present spectrum leasing is not permitted in India. With a view to examine the need for permitting spectrum leasing in the country, the Authority took note of the following reports of international bodies with respect to spectrum leasing:

(a) ITU, in its report²⁹ on 'Guidelines for the Review of Spectrum Pricing Methodologies and the Preparation of Spectrum Fees Schedules' (2016) stated, *inter-alia*, as below:

" ... In the case of auctions, where the licensee acquires the right to use spectrum through a market mechanism, the ability to trade or lease the spectrum allows the licensee also to dispose of it through a market mechanism. Such possibilities of exit will increase the option value of the spectrum.

For these reasons, the regulator should, on a step-by-step basis, allow increasing levels of secondary markets through permitted spectrum trading

²⁸ Source: <https://www.gsma.com/spectrum/wp-content/uploads/2022/01/Spectrum-Leasing-5G-Era.pdf>

²⁹ Source: https://www.itu.int/en/ITU-D/Spectrum-Broadcasting/Documents/Publications/Guidelines_SpectrumFees_Final_E.pdf

and spectrum leasing by considering requests to trade spectrum rights and lease spectrum, taking into account factors including:

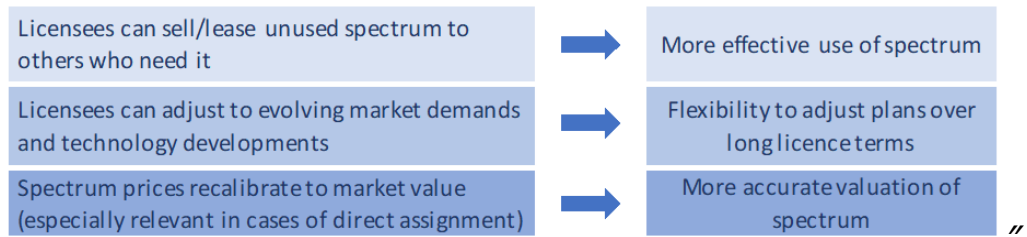
- proposed change in use of the spectrum, including whether any proposed change of technology may cause harmful interference;*
- qualification requirements, including whether the transferee meets any qualification requirements that applied to the transferor;*
- licence obligations, including how obligations associated with the spectrum rights to be transferred will be treated;*
- the impact of the transfer on competition in the market;*
- whether the transferor and transferee are in good standing under applicable laws and regulations; and*
- national security.*

When the spectrum manager is satisfied that a proposed trade or lease is not likely to lead to more harm than the benefit it should be allowed to proceed.”

- (b) The Digital Regulation Platform, which is a collaboration between the ITU and the World Bank stated, *inter-alia*, as below in its publication³⁰ on ‘Spectrum Pricing and Trading’ (2020):

“Establishing a secondary market for spectrum trading and allowing spectrum leasing provides many benefits:

³⁰ Source: <https://digitalregulation.org/spectrum-pricing-and-trading/#:~:text=Spectrum%20prices%20defined%20in%20auctions,for%20a%20block%20of%20spectrum.>



(c) GSMA in its publication³¹ on 'Spectrum leasing in the 5G era' (2022) states, *inter-alia*, as below:

"Our mapping of the regulatory landscape points to significant variation in where spectrum leasing is and is not allowed, both within and between regions. For instance, leasing is a key secondary spectrum market initiative in the US, but it is not currently permitted in certain European markets and in most markets in Asia, Latin America, Africa and the Middle East.

... However, there are some examples that appear to have yielded positive market outcomes in terms of delivering additional coverage and strengthening services for consumers. These have tended to originate from higher income markets, such as the US and Europe. In other regions (e.g. Sub-Saharan Africa), insufficient spectrum availability is cited as a major impediment to leasing. Leases have often been agreed on a regional or local basis where operators are not using their spectrum holdings to full capacity (specifically, certain bands).

2.169 The Authority also took note of the following developments in the Indian telecommunication sector:

- (a) Based on the TRAI's recommendations, DoT, in the year 2015, permitted -
 - (i) intra-band access spectrum sharing among access service providers, and
 - (ii) trading of access spectrum by access service providers.
- (b) For making adequate spectrum available to be equipped for the new broadband era, one of the action plans under National Digital

³¹ Source: <https://www.gsma.com/spectrum/wp-content/uploads/2022/01/Spectrum-Leasing-5G-Era.pdf>

Communications Policy (NDCP) 2018³² is “*further liberalizing the spectrum sharing, leasing and trading regime*”.

- (c) Based on the TRAI’s recommendations, DoT, in the year 2022, permitted the TSPs with Access Service License/ Authorization to lease access spectrum to Captive Non-Public Network (CNPN) licensees.
- (d) On 24.12.2023, the Telecommunications Act, 2023 has been enacted. The chapter II (Powers of Authorisation and Assignment) provides, *inter-alia*, as below:

"The Central Government may permit the sharing, trading, leasing and surrender of assigned spectrum, subject to the terms and conditions, including applicable fees or charges, as may be prescribed."

[The appointed date of the Telecommunications Act, 2023 is yet to be notified by the Government.]

2.170 In the present consultation process, stakeholders expressed a unanimous support for spectrum leasing among access service providers. A few stakeholders also proposed to expand the scope of spectrum leasing among all licensed service providers including internet service providers (ISPs). While a few stakeholders suggested certain measures to encourage spectrum leasing in the country, a few other stakeholders suggested certain measures to avoid any possible adverse effect of spectrum leasing on the competition and the dynamics of spectrum auction.

2.171 The frequency spectrum is a scarce natural resource. Unlike other natural resources, the frequency spectrum is not consumed upon its usage. It gets wasted whenever it is not used optimally and efficiently³³. In India, the access spectrum, which is a crucial input resource for the delivery of wireless access services (wireless telephony, wireless internet etc.), is assigned to eligible entities

³² Source: https://dot.gov.in/sites/default/files/Final%20NDCP-2018_0.pdf

³³ Source: https://cenjows.in/wp-content/uploads/2022/03/Re-Spectrum-Allocation_Refiesign-by-Brig-Navjot-Singh.pdf

on a licensed service area (LSA)-basis for a period of 20 years through a process of auction. The intending service providers acquire access spectrum in various frequency bands in an LSA keeping in view their long-term business projection in the LSA. However, in the short-to-medium run, not all access spectrum held by an access service provider may necessarily be fully used. This is where an enabling regime for leasing of spectrum could be of help.

2.172 The Authority is of the opinion that in case the leasing of access spectrum is permitted in the country, a TSP holding access spectrum could lease the unused access spectrum (in frequency, space, and time domain) to other TSPs who need it. This would be a win-win proposition for both the lessor and the lessee. On the one hand, a TSP holding access spectrum in an LSA, depending upon its business case, will be able to generate additional revenue by leasing a part of its access spectrum (frequency domain) in a certain geographical area in the LSA (space domain) for a certain period of time (time domain) to another TSP. On the other hand, the lessee will be able to enhance its service offering (by way of a higher traffic throughput capacity) and/ or increase the reach of its network (by way of a larger coverage footprint) in the LSA. In a nutshell, a regime of access spectrum leasing would enable an optimal utilization of the access spectrum for the delivery of access services to consumers.

2.173 Keeping in view the comments of stakeholders and the foregoing analysis, the Authority is of the view that the leasing of access spectrum should be permitted in India with suitable measures to mitigate the possibility of any adverse impact on the competition and the dynamics of spectrum auctions. In the ensuing paragraphs, the Authority is embarking to devise a comprehensive regulatory framework for access spectrum leasing.

To whom the access spectrum can be leased

2.174 At present, DoT assigns access spectrum to eligible entities through the process of auction. In the Notice Inviting Application (NIA) for the auction of spectrum

dated 08.03.2024³⁴ issued by DoT, the eligibility criteria to participate in the auction is as below:

"(i) Any licensee that holds a UASL/ UL with authorization for Access Services for that LSA; or

(ii) Any licensee that fulfils the eligibility criteria for obtaining a Unified License with authorization for Access Services, and gives an undertaking to obtain a Unified License with authorization for Access Services and an undertaking regarding compliance to FDI guidelines; or

(iii) Any entity that gives an undertaking to obtain a Unified License with authorization for Access Services through a New Entrant Nominee as per the DoT guidelines/ license conditions, and an undertaking regarding compliance to FDI guidelines, can bid for the Spectrum in 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz, and 26 GHz Bands subject to other provisions of the Notice."

2.175 Further, as per the 'Guidelines for Trading of Access Spectrum by Access Service providers' dated 12.10.2015³⁵, *"[s]pectrum trading shall be allowed only between two access service providers, holding Cellular Mobile Telephone Service (CMTS) License, Unified Access Service License (UASL), Unified License (Access Service) (UL(AS)) and Unified License with authorization of Access Service in a licensed service area."*

2.176 In essence, only access service providers can obtain access spectrum in an LSA through auction or through spectrum trading. In light of this fact, the Authority examined the contention of a few stakeholders that spectrum leasing should be permitted not only among access service providers but also among all licensed service providers including ISPs. As mentioned above, a regime of spectrum leasing is being contemplated with a view to enable an optimal utilization of the

³⁴ Source: <https://dot.gov.in/sites/default/files/Notice%20Inviting%20Applications%202023-24.pdf>

³⁵Source: https://dot.gov.in/sites/default/files/2015_10_13%20Trading-WPC_0.pdf?download=1

access spectrum for the delivery of access services to consumers. Therefore, a licensee, who is not authorized to provide access services and, therefore, is not permitted to acquire access spectrum through spectrum auction or spectrum trading, should not be permitted to obtain access spectrum through the spectrum leasing route. Essentially, the right to use of the access spectrum should be given to the access service providers only. Accordingly, the Authority is of the view that access spectrum in an LSA should be permitted to be leased to only the licensed access service providers in the LSA.

Duration of spectrum leasing

2.177 In the consultation process, most stakeholders suggested that there should be no restriction on the duration of spectrum leasing as there would be numerous use cases requiring spectrum leasing of short term as well as long term. Keeping this in mind, the Authority proceeded to examine the maximum duration for which spectrum leasing should be permitted. In this regard, the Authority noted that the DoT's Guidelines for Sharing of Access Spectrum by Access Service Providers dated 11.10.2021³⁶ provides that "*[s]pectrum sharing shall be available for upto the balance period of the licence or upto the period of right to use spectrum, whichever is earlier.*"

2.178 Considering the above, the Authority is of the view that the access service providers should be permitted to lease the access spectrum in an LSA for upto the balance period of the access service license or upto the period of right to use the relevant access spectrum in the LSA, whichever is earlier.

How much spectrum can be leased

2.179 The extant regulatory framework for spectrum trading in India provides a flexibility to access service licensees to trade their excess or unutilized access spectrum in an LSA to access service licensees in the LSA. The regulatory framework for spectrum leasing, which is being proposed through these

³⁶ Source: <https://dot.gov.in/sites/default/files/Sharing%20Guidelines%2011%20Oct%202021.pdf?download=1>

recommendations, would provide a further flexibility to access service licensees to lease their excess or unutilized access spectrum in the entire LSA or in limited geographical area(s) of the LSA for a specific period. With a view to ensure that a service provider does not acquire the access spectrum (through spectrum auction or spectrum trading) with the spectrum leasing as the key objective, the Authority is of the opinion that service providers should not be permitted to lease more than 50% of their qualifying spectrum holding (i.e., that meets the condition of lock-in period) in a frequency band in an LSA.

Condition for leasing of spectrum

- 2.180 In the present consultation process, many stakeholders suggested that for leasing of spectrum, there should be a lock-in period of two years from the date of its acquisition; a stakeholder proposed that the leasing of spectrum should be allowed only after the completion of the defined roll-out obligations by the lessor; a few other stakeholders proposed that there should be no lock-in period for leasing of spectrum.
- 2.181 The Authority examined the appropriateness of permitting the leasing of spectrum only after the completion of the defined roll-out obligations by the lessor. In this regard, the Authority noted that in the Notice Inviting Application for auction of spectrum dated 08.03.2024³⁷, different frequency bands are subjected to different minimum roll out obligations. While band-specific minimum roll out obligations have been imposed for 3300s-3670 MHz band 24.25-27.5 GHz band, for all other frequency bands, the NIA dated 08.03.2204 provides, *inter-alia*, that "[t]he requirement of rollout obligation shall be treated as fulfilled once the required numbers of DHQs/ BHQs/ Rural SDCAs are covered by the licensees using any technology in any band." Accordingly, the Authority is of the opinion that prescribing the fulfilment of roll out obligations as a condition for the leasing of spectrum would not be appropriate.

³⁷ Source: <https://dot.gov.in/sites/default/files/Notice%20Inviting%20Applications%202023-24.pdf>

2.182 The Authority also examined the appropriateness of not mandating any lock-in period for the leasing of spectrum. The Authority is of the view that in case no lock-in period is prescribed for the leasing of spectrum, the possibility of the TSPs entering into informal pre-auction agreements for spectrum leasing cannot be ruled out, which may pose difficulties in determining the market price for the spectrum in the auctions.

2.183 The Authority further examined the appropriateness of mandating a lock-in period of two years from the date of acquisition of the spectrum as a condition for spectrum leasing. In this regard, the Authority took note of the following aspects:

- (a) As per the extant regulatory framework³⁸ for trading of access spectrum, access service providers are permitted to trade their spectrum, acquired through auction or for which market price has been paid, after a lock-in period of two years from the date of acquisition of the spectrum.
- (b) The possibility of a TSP using spectrum leasing route in place of spectrum trading cannot be ruled out. Similar to the case of spectrum trading, the lessee can potentially hold the leased spectrum until the validity period of the spectrum.

2.184 Considering the above, the Authority is of the view that a lock-in period of two years, as applicable in the case of spectrum trading, should be made applicable for spectrum leasing among access service providers. Such a condition will also discourage a TSP from acquiring access spectrum with spectrum leasing as a key objective.

2.185 The Authority is also of the view that the frequency spectrum proposed to be leased by the lessor should have been acquired through spectrum auction or spectrum trading, or market determined price should have been paid by the lessor for acquiring such spectrum. On this aspect, DoT may impose other

³⁸ Source: https://dot.gov.in/sites/default/files/2015_10_13%20Trading-WPC_0.pdf?download=1

conditions, as provided in the DoT's 'Guidelines for Sharing of Access Spectrum by Access Service Providers' dated 11.10.2021, if specific type of cases warrant so.

Sub-leasing of the leased spectrum

2.186 The Authority is of the view that sub-leasing of the leased spectrum by a lessee should not be permitted. To prevent any circumvention, the lessee, who has taken spectrum on lease in a spectrum band in an LSA, should not be permitted to lease out spectrum in that band in that LSA to another access service provider.

Block size for the leasing of spectrum

2.187 Considering that the frequency spectrum can be acquired through the auction in a prescribed block size, the Authority is of the view that spectrum leasing should be permitted in the block size for the relevant spectrum band as prescribed in the latest Notice Inviting Application (NIA) for spectrum auction, in which, the relevant spectrum band was put to auction. Further, the Authority is of the view that the conditions related to the use of technology for the leased frequency spectrum should also be governed by the latest NIA for spectrum Auction, in which, the relevant frequency band was put to auction.

Roll-out obligations for the lessee

2.188 With regard to roll-out obligations for the lessee, the stakeholders were, generally, of the view that there should be no roll-out obligations on the lessee as the leased spectrum will mostly be used for a limited period and a specific geography, therefore, the rollout obligations of the leased spectrum should remain with the lessor only. From the stakeholders' comments, it appears that spectrum leasing will mostly be used in limited geographies. In such cases, it will not be practically possible for the lessee to fulfil roll out obligations. Accordingly, the Authority is of the opinion that it would not be appropriate to impose roll out obligations on the lessee.

Roll out obligations for the lessor

2.189 In the present consultation process, the stakeholders were, generally, of the view that the roll-out obligations should be the responsibility of the lessor. However, a few stakeholders contended that to encourage spectrum leasing, the roll out carried out by the lessee should be added to the roll out of lessor.

2.190 While examining the appropriateness of adding the roll out carried out by the lessee in the roll out of lessor, the Authority took note of the following aspects:

- (a) At present, the roll out obligations associated with a frequency band have no linkage with the quantum of frequency spectrum held by the service provider. In other words, the same roll out obligations would be applicable on a service provider irrespective of the quantum of frequency spectrum held by it.
- (b) Using the frequency spectrum taken on lease, the lessee would build its own network, which will not be a part of the network of the lessor.

2.191 Considering the above, the Authority is of the view that it would not be appropriate to add the roll out carried out by the lessee in the roll out of lessor.

2.192 The Authority also noted the proposal of a stakeholder that in the event that the lessor leases its entire spectrum for the entire service area, the applicable roll-out obligations should be transferred to the lessee in line with the practice followed in case of spectrum trading. However, considering that the lessor will not be permitted to lease more than 50% of its spectrum holding in a frequency band, the lessor would continue to be responsible for the compliance of roll out obligations associated with the concerned frequency band.

Spectrum Cap

2.193 As per the extant regulatory framework, the access service providers can hold access spectrum only within stipulated spectrum caps. The spectrum cap is the maximum limit on the access spectrum (generally, in terms of percentage of the

total access spectrum) to which an access service provider can hold in an LSA. The objective of prescribing spectrum cap is to prevent large holdings and hoarding of access spectrum by one or a few TSPs, which otherwise may create concerns for the competition in the market.

2.194 In the present consultation process, most of the stakeholders were of the view that the access spectrum taken by any TSP on lease should be added with the TSP's own access spectrum holding for the purpose of ascertaining the compliance to the spectrum cap. However, a few stakeholders provided divergent views. A stakeholder suggested that the access spectrum taken by a TSP on lease should be added for the purpose of spectrum cap only if it has taken access spectrum on lease for more than five years for the entire LSA.

2.195 The Authority examined the comments of stakeholders and is of the view that considering the objective of prescribing a spectrum cap, TSPs, in no condition, should be permitted to hold the access spectrum more than the applicable spectrum caps. The Authority is of the opinion that in case a condition is prescribed that the leased spectrum will be counted for the purpose of spectrum only if it has been leased for the entire LSA, the possibility of the misuse of such a condition cannot be ruled out. In this case, if a TSP takes access spectrum on lease in an LSA leaving only certain areas, which are uninhabited or do not have a strong business potential, such a spectrum would not be counted for the purpose of spectrum cap even though the lessee has taken access spectrum on lease in nearly complete LSA. Thereby, such a regime would permit the lessee to practically hold more access spectrum in a frequency band in nearly the complete LSA than what is permitted to be obtained through spectrum auction or spectrum trading.

2.196 The Authority also examined the proposition of excluding the quantum of access spectrum, which has been leased to other TSPs, from the spectrum holding of the lessor. In this regard, the Authority notes that the legal ownership of the leased spectrum remains with the lessor and the leased spectrum will revert to the lessor after the validity period of the leasing agreement.

2.197 In view of the foregoing discussion, the Authority is of the view that for the purpose of computation of spectrum cap, the quantum of access spectrum leased by the lessor to the lessee should continue to be counted in the spectrum holding of the lessor; besides, the quantum of access spectrum taken on lease by the lessee from the lessor should be counted in the spectrum holding of the lessee for the relevant geographical area i.e., the area in which access spectrum has been taken on lease. The Authority is of the opinion that in case the lessee wishes to acquire access spectrum in the concerned frequency band through a future auctions but the spectrum cap restricts it from participating in the auction, the lessee should be permitted to participate in the future auctions provided that it gives an undertaking to the Government that it will bring down its spectrum holding within a period of one year from the date of assignment of such spectrum to comply to the applicable spectrum cap. Therefore, in such a case, the frequency spectrum held by the licensee on lease from another TSP should not be counted for computing spectrum cap to assess its eligibility to bid for frequency spectrum in the auction process.

Intimation to the Licensor

2.198 While examining the comments of stakeholders in respect of the need for an approval from, or intimation to DoT before leasing the access spectrum, the Authority took note of the following aspects:

- (a) As per the Guidelines for Trading of Access Spectrum by Access Service Providers dated 12.10.2015³⁹, both the licensees trading the spectrum are required to give a prior intimation for trading the right to use the spectrum at least 45 days before the proposed effective date of trading.
- (b) As per the Guidelines for Sharing of Access Spectrum by Access Service Providers dated 11.10.2021⁴⁰, both the licensees sharing the spectrum are

³⁹ Source: https://dot.gov.in/sites/default/files/2015_10_13%20Trading-WPC_0.pdf?download=1

⁴⁰ Source: <https://dot.gov.in/sites/default/files/Sharing%20Guidelines%2011%20Oct%202021.pdf>

required to jointly give a prior for sharing the right to use the spectrum at least 45 days before the proposed effective date of the sharing.

2.199 Keeping the above in mind, the Authority is of the view that the TSPs should be required to give a prior joint intimation of 45 days before the date from which spectrum leasing is proposed to become effective, through an online portal. DoT should raise objections, if any, within 30 days of receipt of the joint intimation with details thereof and offer an opportunity to the TSPs to respond to the objections raised by DoT. While intimating the about proposed spectrum leasing, the involved TSPs should provide the relevant details such as spectrum band, quantum of spectrum proposed to be leased, date of acquisition of such spectrum by the lessor, geographical boundaries of the area of spectrum lease, proposed effective date of spectrum leasing, period of lease (in number of days), spectrum held by the lessor and lessee before the proposed spectrum leasing and post such spectrum leasing, details of any other existing and proposed spectrum leasing agreements of lessor and lessee, etc.

Spectrum leasing fee

2.200 In the present consultation process, stakeholders were, generally, of the view that no spectrum leasing charges should be levied as access spectrum is acquired through auction. A few stakeholders submitted that only administrative charges for processing spectrum leasing applications may be applicable.

2.201 The Authority notes that as per the extant regulatory regime for access spectrum trading, the buyer of access spectrum is required to pay to the Government a transfer fee of 1% of the transaction amount of the trade or 1% of the applicable market price, whichever is higher. To avoid any possibility of arbitrage opportunity which may arise upon permitting spectrum leasing, wherein a TSP could choose to lease its excess spectrum instead of trading it, the Authority is of the opinion that similar transaction charges should be made applicable for spectrum leasing as well. However, considering that spectrum leasing may take place in small geographies also, the market price of the leased spectrum prorated for the relevant geographical area should be taken into consideration.

Accordingly, the Authority is of the view that the TSP taking the access spectrum on lease should pay to the Government a non-refundable leasing fee of 1% of the transaction amount of spectrum leasing or 1% of the applicable market determined price prorated on the principle enunciated in the NIA for auction of spectrum for the population of the area for which spectrum is to be leased and the term (period) of such spectrum leasing, whichever is higher. For the purpose of computing spectrum leasing fee, the latest market determined price available at the time of spectrum leasing becoming effective, should be applicable. If the market determined prices are more than one year old, the prevailing market price should be applied by indexing the last market determined price using applicable Marginal Cost of funds based Lending Rate (MCLR) of SBI. The lessee should be given the option to make payment of leasing fee either by way of an upfront payment or equal annual instalments, duly protecting the net present value (NPV) of the leasing fee at the applicable rate of interest. In case the Lessee opts for annual instalments, each instalment should be paid in advance at the beginning of each year.

- 2.202 It is noted that the spectrum trading guidelines dated 12.10.2015 provides, *inter-alia*, that the amount received from trading shall be part of Adjusted Gross Revenue (AGR) for the purpose of levy of License fee and Spectrum Usage Charges (SUC). Considering that the possibility of use of spectrum leasing in place of spectrum trading by a TSP cannot be ruled out, the Authority is of the view that the amount received by Lessor from leasing of spectrum should form part of Adjusted Gross Revenue (AGR) of the Lessor for the purpose of levy of license fee and spectrum usage charges.

Other precautionary conditions

- 2.203 Based on the recommendations of the Authority, certain precautionary provisions relating to 'bar to take part in auction and lock-in period' to mitigate misuse of such provision have been included in the guidelines for surrender of access spectrum. Since the surrender of access spectrum has been permitted, the possibility of a TSP surrendering its access spectrum and taking it on lease from

another TSP cannot be ruled out. Accordingly, the Authority is of the view that following precautionary conditions should also be included in spectrum leasing guidelines:

- (a) In case a TSP surrenders partial or complete access spectrum in an LSA-band combination, it will be barred to take access spectrum on lease in that LSA-band combination for a period of two years from the date of surrender of access spectrum.
- (b) In case a TSP has taken spectrum on lease in an LSA-band combination, a lock-in period of two years from the effective date of spectrum leasing will be applicable, before becoming eligible to surrender the qualifying spectrum in the LSA-band combination acquired earlier.

2.204 The Authority is of the view that the guidelines for spectrum leasing among access service providers should mandate the TSPs to provide a suitable exit clause in the spectrum leasing agreement for termination of the spectrum leasing arrangement. Further, the TSPs should be liable to intimate DoT about the termination of an existing spectrum leasing arrangement within 15 days of the termination of such agreement.

2.205 The Authority will monitor the developments in the wireless access services segment and may review its recommendations, as and when need arises. In this regard, DoT should share with the Authority the details of the spectrum leasing arrangements within 15 days of their effective date, and the details of terminations of spectrum leasing arrangements.

2.206 In view of the above, **the Authority recommends that the leasing of access spectrum should be permitted among access service providers. The following terms and conditions should be made applicable on the leasing of access spectrum:**

- (a) **Access service providers should be permitted to lease their access spectrum, acquired through spectrum auction or spectrum trading, or for which market price has been paid, to**

other access service providers in a licensed service area. On this aspect, DoT may impose other conditions, as provided in the DoT's 'Guidelines for Sharing of Access Spectrum by Access Service Providers' dated 11.10.2021, if specific type of cases warrant so.

- (b) A licensee should be permitted to lease its frequency spectrum to another licensee only after a lock-in period of two years from the date of acquisition of the spectrum.**
- (c) A service provider should not be permitted to lease more than 50% of its qualifying spectrum holding (i.e., that meets the condition of lock-in period) in a frequency band in an LSA.**
- (d) A service provider should be permitted to lease its access spectrum in a frequency band in an LSA upto the balance period of the access service license or upto the period of right to use the relevant access spectrum, whichever is earlier.**
- (e) The lessee, who has taken access spectrum on lease in a frequency band in an LSA, should not be permitted to lease out spectrum in that frequency band in that LSA to any other access service provider.**
- (f) Spectrum leasing should be permitted in the block size for the relevant frequency band as prescribed in the latest Notice Inviting Applications (NIA) for spectrum Auction, in which, the relevant frequency band was put to auction.**
- (g) The condition related to the use of technology for the leased frequency spectrum should be governed by the latest NIA for spectrum Auction, in which the relevant frequency band was put to auction.**

- (h) The lessor will continue to be responsible for compliance of the roll out obligations associated with the concerned frequency band.**
- (i) For the purpose of spectrum cap, the quantum of access spectrum leased by the lessor to the lessee should continue to be counted in the spectrum holding of the lessor and it should also be counted in the spectrum holding of the lessee for the relevant geographical area i.e., the area where spectrum leasing is agreed.**
- (j) In case the lessee wishes to acquire access spectrum in the concerned frequency band through a future auction, but the spectrum cap limits it from participating in the auction, the lessee should be permitted to participate in a future auction provided it gives an undertaking that it will bring down its spectrum holding to comply to the applicable spectrum cap within a period of one year from the date of assignment of such spectrum. In such a case, the frequency spectrum held by the licensee on lease from another TSP should not be counted for the purpose of spectrum cap to assess its eligibility to bid for frequency spectrum in the auction process.**
- (k) For entering into spectrum leasing, the participating TSPs should be required to submit a prior joint intimation of 45 days before the date from which spectrum leasing is proposed to become effective. While giving the joint intimation, the TSPs should provide the details of spectrum leasing such as frequency band, quantum of spectrum proposed to be leased, date of acquisition of such spectrum by the lessor, geographical boundaries of the area of spectrum lease, proposed effective date of spectrum leasing, period of lease (in number of days), spectrum held by the lessor and lessee before the proposed spectrum leasing and**

post such spectrum leasing, details of any other existing and proposed spectrum leasing agreements of lessor and lessee, etc. DoT should raise objections, if any, within 30 days of receipt of the joint intimation with details thereof and offer an opportunity to the TSPs to respond to the objections raised by DoT.

- (l) The TSP taking spectrum on lease should pay to the Government a non-refundable leasing fee of 1% of the transaction amount of spectrum leasing or 1% of the applicable market price prorated on the principle enunciated in the NIA for auction of spectrum for the population of the area for which spectrum has been leased and the term (period) of such spectrum leasing, whichever is higher. For the purpose of computation of spectrum leasing fee, the latest market determined price, available at the time of spectrum leasing becoming effective, should be applicable. If the market determined prices are more than one year old, the prevailing market price should be applied by indexing the last market determined price using applicable Marginal Cost of funds based Lending Rate (MCLR) of SBI.**
- (m) The lessee should be given the option to make payment of leasing fee either by way of an upfront payment or equal annual instalments, duly protecting the net present value (NPV) of the leasing fee at the applicable rate of interest. In case the Lessee opts for annual instalments, each instalment should be paid in advance at the beginning of each year.**
- (n) The amount received by the Lessor from the leasing of spectrum should form part of Adjusted Gross Revenue (AGR) of the Lessor for the purpose of levy of license fee and spectrum usage charges.**
- (o) In case a TSP surrenders a partial or complete spectrum in an LSA-band combination, it should be barred to take spectrum on**

lease in that LSA-band combination for a period of two years from the date of surrender of spectrum.

- (p) In case a TSP has taken spectrum on lease in an LSA-band combination, a lock-in period of two years from the effective date of spectrum leasing will be applicable, before becoming eligible to surrender the qualifying spectrum in the LSA-band combination acquired earlier.**
- (q) The TSPs should be mandated to provide a suitable exit clause in the spectrum leasing agreement for termination of the spectrum leasing arrangement.**
- (r) The TSPs should be liable to intimate DoT about the termination of an existing spectrum leasing arrangement within 15 days of the termination of such leasing arrangement.**
- (s) The Authority will monitor the developments in the wireless access services segment and may review its recommendations, as and when need arises. In this regard, DoT should share with the Authority the details of spectrum leasing arrangements within 15 days of the effective date, and the details of terminations of spectrum leasing arrangements.**

CHAPTER-III: SUMMARY OF RECOMMENDATIONS

A. Telecommunication Infrastructure Sharing

3.1 The Authority recommends that-

- (a) Telecommunication service licensees should be allowed to share the passive infrastructure such as building, tower, electrical equipment including battery and power plant, dark fiber, duct space, Right of Way, etc. owned, established, and operated by them under the respective licenses with all types of telecommunication service licensees.
- (b) Telecommunication service licensees should be allowed to share all types of active infrastructure elements owned, established, and operated by them under respective licenses with all types of telecommunication service licensees as per the scope of their services.
- (c) However, the sharing of core network elements shall not be done if the number of independent core networks held by the licensees for the concerned telecommunication service is reduced to less than two by such sharing.
- (d) DoT should review the provisions of all stand-alone telecommunication service licenses and may include a provision like clause 33.3 of the Unified License viz. "*The Licensee may share its own active and passive infrastructure for providing other services authorized to it under any other telecom license issued by Licensor*" in the stand-alone telecommunication service licenses.
- (e) Sharing of the Lawful Interception System (LIS) held by a licensee company with other licensee companies may be allowed with the

permission of DoT on a case-to-case basis, provided there are no security concerns in such sharing.

- (f) The telecommunication service licensees participating in the sharing of core network should be mandated to furnish a joint intimation about core network sharing to the Licensor within seven days of the effective date of such sharing, and a statement of compliance to the condition in the recommendation (c) above, through an online portal.
- (g) DoT should review all types of telecommunication service licenses/ authorizations to ensure that clear and unambiguous provisions relating to passive and active infrastructure sharing are contained in them. The enabling provisions related to passive infrastructure sharing should be uniform across all telecommunications service licenses/ authorizations, to the extent possible.

[Para 2.34]

B. Need for mandatory sharing of Government funded infrastructure

3.2 The Authority recommends that-

- (a) In the future projects of Universal Service Obligation Fund (USOF) under the Indian Telegraph Act, 1885 (or Digital Bharat Nidhi under the Telecommunications Act, 2023), DoT should include a provision in the agreement with the Universal Service Provider (USP) that the USP shall not refuse to share the passive infrastructure laid under the project to at least two other telecom service providers on a transparent and non-discriminatory basis.
- (b) In the already assigned projects of USOF, DoT should explore the feasibility of issuing instructions to such USPs that the USP shall not refuse to share the passive infrastructure laid under the

project with at least two other telecom service providers on a transparent and non-discriminatory basis.

- (c) In case the Government agrees, in-principle, with the above recommendations (a) and (b), DoT may, if deemed fit, seek the recommendations from TRAI on a detailed mechanism of the passive infrastructure sharing, including the commercial aspects, considering the varying amount of funding through USOF (or Digital Bharat Nidhi).
- (d) The sharing of active infrastructure laid under the projects of USOF (or Digital Bharat Nidhi) should be voluntary and based on mutual agreements.
- (e) To help the creation of common digital connectivity infrastructure (passive as well as active) in underserved areas of the country, DoT should take an early decision on the TRAI's recommendations dated 08.08.2023 on 'Introduction of Digital Connectivity Infrastructure Provider (DCIP) Authorization under Unified License (UL)'.

[Para 2.60]

C. Connectivity issues being faced by the subscribers in remote and far-flung areas of the country

3.3 The Authority recommends that-

- (a) In the interest of consumers, a telecom service provider, which has built mobile network infrastructure in the remote and far-flung areas of the country with full or partial funding from the Government under USOF (or Digital Bharat Nidhi), should be mandated to allow roaming to other TSPs on its network in such remote and far-flung areas initially for a period of three years.

Later, the Government/ TRAI may review the need for extending this mandate beyond three years.

- (b) In case the Government agrees with the recommendation in (a) above, -**
 - (i) DoT should identify and notify such remote and far-flung areas in the country, and**
 - (ii) TRAI will establish a regulatory framework for roaming charges among service providers in such remote and far-flung areas, while adequately protecting the interest of the USP.**

[Para 2.72]

D. Inter-band Spectrum Sharing Among TSPs

3.4 The Authority recommends that inter-band access spectrum sharing between access service providers [which may be implemented either by way of pooling of access spectrum held by the participating access service providers in different frequency bands through common radio access networks, or by way of allowing the partnering access service providers to use the radio access networks of each other operating in the shared frequency band(s)] in an LSA should be permitted subject to the following terms and conditions -

- (a) Inter-band access spectrum sharing in an LSA should be restricted within the frequency bands falling within a spectrum band category as defined below:**
 - (i) Category-1: Sub-1 GHz bands (600 MHz, 700 MHz, 800 MHz and 900 MHz bands);**
 - (ii) Category-2: 1800 MHz and 2100 MHz;**

- (f) In case a TSP, which is involved in the inter-band spectrum sharing, wishes to acquire additional access spectrum through a future auction, but the spectrum cap restricts it from participating in the auction, such TSP(s) should be permitted to participate in the future spectrum auction provided it furnishes an undertaking that it will bring down its spectrum holding to comply to the applicable spectrum cap within a period of one year from the date of assignment of access spectrum through auction. In such a case, for the purpose of spectrum cap, only the frequency spectrum held by the licensee (without including the shared spectrum of the partnering TSP) should be considered to assess its eligibility to bid for additional frequency spectrum in the spectrum auction.**
- (g) The TSPs involved in the inter-band spectrum sharing should be liable to pay a non-refundable inter-band spectrum sharing fee to the Government. The inter-band spectrum sharing fee payable by a TSP should be 0.5% of the applicable market price of the frequency spectrum shared by the partnering TSP prorated for the term (period) of spectrum sharing. For the purpose of computing the inter-band spectrum sharing fee, the latest market determined price available on the effective date of spectrum sharing should be applicable. If the market determined prices are more than one year old, the prevailing market price should be applied by indexing the last market determined price using the applicable Marginal Cost of funds based Lending Rate (MCLR) of SBI.**
- (h) For the purpose of spectrum cap and inter-band spectrum sharing fee, it should be considered that the licensees are sharing their entire spectrum holdings in the concerned frequency bands in the entire LSA.**

- (i) The TSPs involved in the inter-band spectrum sharing should be given the option to make payment of the inter-band spectrum sharing fee either by way of an upfront payment, or equal annual instalments, duly protecting the Net Present Value (NPV) of the inter-band spectrum sharing fee at the applicable rate of interest. In case a TSP opts for equal annual instalments, each instalment should be paid in advance at the beginning of each year.**
- (j) The amount received by the TSPs on account of inter-band spectrum sharing should form part of their Adjusted Gross Revenue (AGR) for the purpose of levy of license fee and spectrum usage charges.**
- (k) In case any of the participating TSPs acquires additional frequency spectrum in the shared frequency bands in the future,**

 - i. Inter-band spectrum sharing fee in respect of the additional frequency spectrum acquired by a TSP should be levied on the partner TSP based on the same principle as enunciated above.**
 - ii. Compliance to the spectrum cap should be re-examined. In case of any case of any violation of the provision related to spectrum cap, the TSPs should be given a period of one year to bring down their spectrum holdings within the prescribed spectrum cap.**
- (l) The TSPs should be mandated to provide a suitable exit clause in their inter-band spectrum sharing agreements for termination of the spectrum sharing arrangement.**
- (m) The TSPs should be liable to intimate DoT about the termination of an existing inter-band spectrum sharing arrangement within 15 days of the termination of such arrangement.**

- (n) DoT should include appropriate provisions to facilitate the TSPs to import/ purchase the required network equipment in respect of the shared frequency bands.**
- (o) The other terms and conditions of the inter-band spectrum sharing should be kept analogous to the terms and conditions of the intra-band spectrum sharing as given in the DoT's 'Guidelines for Sharing of Access Spectrum by Access Service Providers' dated 11.10.2021.**
- (p) The Authority will monitor the developments in the wireless access services segment and may review its recommendations, as and when need arises. In this regard, DoT should share the details of the spectrum sharing arrangements within 15 days of their effective date with the Authority.**

[Para 2.115]

3.5 The Authority reiterates its earlier Recommendation that a suitable exit clause for intimation of termination of an existing spectrum sharing arrangement by the TSPs should be included in the access spectrum sharing guidelines.

[Para 2.116]

E. Authorized Shared Access (ASA) of Spectrum

3.6 The Authority recommends that DoT should explore the possibility of implementing authorized shared access (ASA) technique-based spectrum sharing in India, under which, the spectrum assigned to Government agencies or other entities (non-TSPs) in the globally harmonized spectrum bands for IMT services, can be assigned to access service providers as secondary users. Once the Government takes an administrative decision in this regard, DoT may, if deemed fit,

seek recommendations of TRAI on a detailed regulatory framework for such a regime.

[Para 2.146]

- 3.7** The Authority recommends that that a field trial of ASA technique-based spectrum sharing between the willing access service providers should be conducted under the supervision of DoT. Based on the learnings and outcome of the field trial, a detailed regulatory framework for ASA technique-based spectrum sharing between access service providers can be devised. DoT may, if deemed fit, seek recommendations of TRAI on a detailed regulatory framework for ASA technique-based spectrum sharing between access service providers.

[Para 2.149]

F. Leasing of spectrum

- 3.8** The Authority recommends that the leasing of access spectrum should be permitted among access service providers. The following terms and conditions should be made applicable on the leasing of access spectrum:

- (a) Access service providers should be permitted to lease their access spectrum, acquired through spectrum auction or spectrum trading, or for which market price has been paid, to other access service providers in a licensed service area. On this aspect, DoT may impose other conditions, as provided in the DoT's 'Guidelines for Sharing of Access Spectrum by Access Service Providers' dated 11.10.2021, if specific type of cases warrant so.
- (b) A licensee should be permitted to lease its frequency spectrum to another licensee only after a lock-in period of two years from the date of acquisition of the spectrum.

- (c) A service provider should not be permitted to lease more than 50% of its qualifying spectrum holding (i.e., that meets the condition of lock-in period) in a frequency band in an LSA.**
- (d) A service provider should be permitted to lease its access spectrum in a frequency band in an LSA upto the balance period of the access service license or upto the period of right to use the relevant access spectrum, whichever is earlier.**
- (e) The lessee, who has taken access spectrum on lease in a frequency band in an LSA, should not be permitted to lease out spectrum in that frequency band in that LSA to any other access service provider.**
- (f) Spectrum leasing should be permitted in the block size for the relevant frequency band as prescribed in the latest Notice Inviting Applications (NIA) for spectrum Auction, in which, the relevant frequency band was put to auction.**
- (g) The condition related to the use of technology for the leased frequency spectrum should be governed by the latest NIA for spectrum Auction, in which the relevant frequency band was put to auction.**
- (h) The lessor will continue to be responsible for compliance of the roll out obligations associated with the concerned frequency band.**
- (i) For the purpose of spectrum cap, the quantum of access spectrum leased by the lessor to the lessee should continue to be counted in the spectrum holding of the lessor and it should also be counted in the spectrum holding of the lessee for the relevant geographical area i.e., the area where spectrum leasing is agreed.**

- (j) In case the lessee wishes to acquire access spectrum in the concerned frequency band through a future auction, but the spectrum cap limits it from participating in the auction, the lessee should be permitted to participate in a future auction provided it gives an undertaking that it will bring down its spectrum holding to comply to the applicable spectrum cap within a period of one year from the date of assignment of such spectrum. In such a case, the frequency spectrum held by the licensee on lease from another TSP should not be counted for the purpose of spectrum cap to assess its eligibility to bid for frequency spectrum in the auction process.**
- (k) For entering into spectrum leasing, the participating TSPs should be required to submit a prior joint intimation of 45 days before the date from which spectrum leasing is proposed to become effective. While giving the joint intimation, the TSPs should provide the details of spectrum leasing such as frequency band, quantum of spectrum proposed to be leased, date of acquisition of such spectrum by the lessor, geographical boundaries of the area of spectrum lease, proposed effective date of spectrum leasing, period of lease (in number of days), spectrum held by the lessor and lessee before the proposed spectrum leasing and post such spectrum leasing, details of any other existing and proposed spectrum leasing agreements of lessor and lessee, etc. DoT should raise objections, if any, within 30 days of receipt of the joint intimation with details thereof and offer an opportunity to the TSPs to respond to the objections raised by DoT.**
- (l) The TSP taking spectrum on lease should pay to the Government a non-refundable leasing fee of 1% of the transaction amount of spectrum leasing or 1% of the applicable market price prorated on the principle enunciated in the NIA for auction of spectrum for the population of the area for which spectrum has been leased**

and the term (period) of such spectrum leasing, whichever is higher. For the purpose of computation of spectrum leasing fee, the latest market determined price, available at the time of spectrum leasing becoming effective, should be applicable. If the market determined prices are more than one year old, the prevailing market price should be applied by indexing the last market determined price using applicable Marginal Cost of funds based Lending Rate (MCLR) of SBI.

- (m) The lessee should be given the option to make payment of leasing fee either by way of an upfront payment or equal annual instalments, duly protecting the net present value (NPV) of the leasing fee at the applicable rate of interest. In case the Lessee opts for annual instalments, each instalment should be paid in advance at the beginning of each year.**
- (n) The amount received by the Lessor from the leasing of spectrum should form part of Adjusted Gross Revenue (AGR) of the Lessor for the purpose of levy of license fee and spectrum usage charges.**
- (o) In case a TSP surrenders a partial or complete spectrum in an LSA-band combination, it should be barred to take spectrum on lease in that LSA-band combination for a period of two years from the date of surrender of spectrum.**
- (p) In case a TSP has taken spectrum on lease in an LSA-band combination, a lock-in period of two years from the effective date of spectrum leasing will be applicable, before becoming eligible to surrender the qualifying spectrum in the LSA-band combination acquired earlier.**

- (q) The TSPs should be mandated to provide a suitable exit clause in the spectrum leasing agreement for termination of the spectrum leasing arrangement.**
- (r) The TSPs should be liable to intimate DoT about the termination of an existing spectrum leasing arrangement within 15 days of the termination of such leasing arrangement.**
- (s) The Authority will monitor the developments in the wireless access services segment and may review its recommendations, as and when need arises. In this regard, DoT should share with the Authority the details of spectrum leasing arrangements within 15 days of the effective date, and the details of terminations of spectrum leasing arrangements.**

[Para 2.206]

Annexure-I: DoT's reference dated 07.12.2021

F. No. 20-405/2013 AS-I
Ministry of Communications
Department of Telecommunications
(Access Service Wing)
20, Ashoka Road, Sanchar Bhawan, New Delhi

Dated the 07th December, 2021

Subject: COAI reference on "Facilitating the Infrastructure Sharing between the Telecom Operators- seeking recommendations of TRAI- reg

The Department of Telecommunications has received request from Cellular Operator Association of India (COAI) for allowing sharing of core network elements also such as Mobile Switching Centre (MSC), Home Location Register (HLR), Intelligent Network (IN), etc., among telecom operators. The copy of COAI reference is enclosed.

2. At present, as per the provisions contained in Unified License, the sharing of active infrastructure is limited to antenna, feeder cable, Node B, Radio Access Network (RAN) and transmission system only. The relevant condition of Unified License Agreement is reproduced as under:

"33. Sharing of infrastructure:

33.1 Sharing of active/passive infrastructure shall be governed by the terms and conditions of respective service authorization and amendment/guidelines to be issued by the Licensor from time to time.


33.2 Sharing of Active infrastructure amongst Service Providers based on the mutual agreements entered amongst them is permitted. Active infrastructure sharing will be limited to antenna, feeder cable, Node B, Radio Access Network (RAN) and transmission system only. Sharing of infrastructure related to Wi-Fi equipment such as Wi-Fi router, Access Point etc. is allowed. Sharing of backhaul is also permitted.

33.3 The Licensee may share its own active and passive infrastructure for providing other services authorized to it under any other telecom license issued by Licensor.

33.4 An authorized Gateway hub operated by the satellite provider itself is permitted to be shared with the satellite bandwidth seeker."

3. In view of above, TRAI is requested to submit its recommendations under Section 11 (1) (a) of TRAI Act, 1997 (as amended) on allowing sharing of core network elements also such as MSC, HLR, IN etc., among telecom operators.

Encl.: As above.


(S.B. Singh) 7/12/21

Deputy Director General (AS)
Phone: 23036918

To

The Secretary
Telecom Regulatory Authority of India,
Mahanagar Doorsanchar Bhawan,
Jawaharlal Nehru Marg (Old Minto Road)
New Delhi – 110002.



10/c

DG/COAI/2021/371
November 29, 2021

Sh. K. Rajaraman, IAS,
Secretary,
Department of Telecommunications,
Sanchar Bhawan, 20 Ashoka Road,
New Delhi 110 001

Handwritten notes:
K(T)
Let's have a print on the TRAI sec. in this
DDG (AS)
30/11

Subject: Facilitating the Infrastructure Sharing between the Telecom Operators

- Reference: 1. COAI letter no. SPK/COAI/2020/310 dated 12th Nov 2020 (Copy enclosed)
 2. COAI letter no. DG/COAI/2021/038 dated 26th Feb 2021 (Copy enclosed)
 3. COAI letter no. DG/COAI/2021/139 dated 19th May 2021 (Copy enclosed)

Dear Sir,

This is with reference to our above cited letters vide which we had requested your good office to allow infrastructure sharing between telecom operators. In this regard, we wish to humbly reiterate the following:

- a. Telecom being capital intensive needs huge investments for growth and expansion of service. Therefore it is important for TSPs to have a model which enables them to share infrastructure i.e. Passive, Active and Core, to reduce CAPEX, OPEX and maximise network capacity and capabilities.
- b. As per BEREC³ there can be a cost saving of 16%-35% in passive Infrastructure sharing in both CAPEX and OPEX, while for Active Infrastructure sharing, the cost savings can be as much as 45%.
- c. In addition to the cost savings, sharing the active Infrastructure will provide the following benefits:
 - i. Avoid duplication of investment by the TSPs
 - ii. Improved Quality of Service
 - iii. Positive incentives to provide services in underserved areas
 - iv. Attract investments from the entities providing Infrastructure Funds

Handwritten notes:
Pls discuss
Dir (AS-2)
2/12/21
1/12/21

³ https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/8164-berec-report-on-infrastructure-sharing_0.pdf

14, Bhal Veer Singh Marg, New Delhi – 110 001

tel: +91-11-23349275 fax: +91-11-23349276 email: contact@coai.in website: www.coai.in

Handwritten notes:
DDM (AS-2)
Subscribed
07/12/21



- v. Help TSPs to concentrate on their Core Business /Competency
- vi. Accelerate roll out of digital services
- d. Moreover, currently active Infrastructure sharing is allowed to TSPs for only antenna, feeder cable, Node B and transmission systems.
- e. The policy on infrastructure sharing should be further liberalized to allow sharing of core infrastructure such as MSC, HLR, IN etc. among licensees having UL (Access Authorization).
- f. Sharing of core network elements such as MSC, HLR, IN etc. among the TSPs will reduce cost for the TSPs and facilitate faster rollout.
- g. Considering the above, we humbly request DoT to allow sharing of core network elements, such as such as MSC, HLR, IN etc. between the Telecom operators.

We request for your kind consideration and support on this issue.

Thanking you,

Yours faithfully,

Lt. Gen. Dr. S. P. Kochhar
Director General

Cc: 1. Sh. Hari Ranjan Rao, Jt. Secy. (Telecom), DoT, Sanchar Bhawan, New Delhi
2. Sh. S.B. Singh, DDG (AS), DoT, Sanchar Bhawan, New Delhi
3. Sh. R.K. Sahu, Director (Policy), DoT, Sanchar Bhawan, New Delhi

Annexure-II: DoT's reference dated 10.02.2022

**F. No. 20-405/2013 AS-I
Ministry of Communications
Department of Telecommunications
(Access Service Wing)
20, Ashoka Road, Sanchar Bhawan, New Delhi**

Dated the 10th February, 2022

Subject: Facilitating the Infrastructure Sharing amongst the Telecom Operators- seeking recommendations of TRAI- reg

This has reference to this office letter of even number dated 07.12.2021 (copy enclosed) wherein, the Department of Telecommunications requested TRAI to submit its recommendations under Section 11 (1) (a) of TRAI Act, 1997 (as amended) on allowing sharing of core network elements also such as MSC, HLR, IN etc., among telecom operators.

2. In order to promote optimum resource utilization among the licensees, it is proposed to allow sharing of all kinds of telecom infrastructure and network elements among all categories of service providers, licensed under the Section 4 of Indian Telegraph, Act, 1885, for provision of authorized telecom services.

3. Therefore, TRAI is requested to submit its recommendations under Section 11 (1) (a) of TRAI Act, 1997 (as amended) on this issue.

Encl.: As above.


(S.B. Singh)

**Deputy Director General (AS)
Phone: 23036918**

To

**The Secretary
Telecom Regulatory Authority of India,
Mahanagar Doorsanchar Bhawan,
Jawaharlal Nehru Marg (Old Minto Road)
New Delhi - 110002.**

ACRONYMS

Acronyms	Description
3GPP	3rd Generation Partnership Project
4G	Fourth Generation
5G	Fifth Generation
AFC	Automated Frequency Coordination
AGR	Adjusted Gross Revenue
AS	Access Service
ASA	Authorized Shared Access
ASP	Access Service Provider
BEREC	Body of European Regulators for Electronic Communications
BSNL	Bharat Sanchar Nigam Limited
CAG	Comptroller and Auditor General of India
CAPEX	Capital Expenditure
CDMA	Code Division Multiple Access
CMTS	Cellular Mobile Telephone Service
CNPN	Captive Non-Public Network
COAI	Cellular Operator Association of India
CP	Consultation Paper
CUG	Closed User Group
DCIP	Digital Connectivity Infrastructure Provider
DoT	Department of Telecommunications
EAI	Equal Annual Instalment
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission
GMPCS	Global Mobile Personal Communications by Satellite
GSM	Global System for Mobile communication

Acronyms	Description
GSMA	GSM Association
GWCN	Gateway Core Network
HLR	Home Location Register
ICR	Intra-Circle Roaming
ICT	Information and Communication Technology
IFC	International Finance Corporation
IMT	International Mobile Telecommunications
IN	Intelligent Network
IP	Infrastructure Provider
ISP	Internet Service Provider
ITU	International Telecommunication Union
LI	Lawful Interception
LIS	Lawful Interception System
LSA	Licensed Service Area
LTE	Long-Term Evolution
LWE	Left Wing Extremism
MCLR	Marginal Cost of Funds based Lending Rate
MOC	Ministry of Communications
MSC	Mobile Switching Center
NDCP	National Digital Communication Policy
NIA	Notice Inviting Applications
NPV	Net Present Value
NSO	Network Service Operators
OHD	Open House Discussion
OPEX	Operating Expenditure
PLMN	Public Land Mobile Network

Acronyms	Description
PMRTS	Public Mobile Radio Trunking Service
QoS	Quality of Service
RAN	Radio Access Network
RoW	Right of Way
SUC	Spectrum Usage Charges
TRAI	Telcom Regulatory Authority of India
TS	Technical Specifications
TSP	Telecom Service Provider
UASL	Unified Access Service License
UL	Unified License
UL (VNO)	Unified License for VNO
UMTS	Universal Mobile Telecommunications Service
USO	Universal Service Obligation
USOF	Universal Service Obligation Fund
USP	Universal Service Provider
VGf	Viability Gap Funding
VNO	Virtual Network Operator
VSAT	Very Small Aperture Terminal
Wi-Fi	Wireless Fidelity
WPC	Wireless Planning and Coordination