सत्यमेव जयते

Telecom Regulatory Authority of India

Recommendations

on

USE OF STREET FURNITURE FOR SMALL CELL AND AERIAL FIBER DEPLOYMENT

New Delhi, India

29.11.2022

Mahanagar Door Sanchar Bhawan,

Jawahar Lal Nehru Marg,

New Delhi – 110002

CONTENTS

Chapters	Description	Page No.
Chapter 1	Introduction	**1**
Chapter 2	Use of Street Furniture for Small Cell and Aerial Fiber Deployment	**8**
Chapter 3	Summary of the Recommendations	**103**

TABLES

Table 2.1	The Schedule provided in the Right of Way (Amendment) Rules, 2022	**31**
Table 2.2	Suggestions of small cell and site wise permit exemption criteria	**61**
Table 2.3	Simplified assessment criteria as per No: Tec 13019: 202	**66**
Table 2.4	ICNIRP Reference levels for local exposure, averaged over 6 min, to electromagnetic fields from 100 kHz to 300 GHz	**67**

ANNEXURES

Annexure I	DoT clarification on Indian Telegraph RoW rules, 2016	**114**
Annexure II	DPIIT letter (dated 24th June 2022) instructing to include additional data layers in the State Master plan	**115**

Annexure III	TRAI letter to DoT on Streamlining the guidelines of passive and active infrastructure sharing	**117**
Annexure IV	DOT's Instructions on the Review of EMF Audit Biennial Self-certification	**121**
Annexure V	Recommendations of the Working Group to FOIR	**122**
	List of Acronyms	**137**

CHAPTER 1
INTRODUCTION

1.1 The consumer demand for smarter devices like mobile phones, pads, tablets, smart watches, and gaming consoles that support smart applications is rising immensely. With the Covid pandemic, the digital landscape has further changed. There is insistence on the quality of data usage and the need for the swift adoption of next generation communication services to support work, entertainment and learning from anywhere. A large ecosystem of application vendors reliant on high speed, low-latency and ubiquitous wireless connectivity has also emerged. Over 812 million internet wireless internet subscribers in India, consuming about 17.68 Gb average data per subscriber per month[1] is a testimony to the changing digital landscape in India.

1.2 Data consumption will further increase with rollout of next generation technologies as 5G is expected to better support new services and advanced technologies such as IoT, Artificial Intelligence (AI), Virtual Reality (VR) etc. It is imperative that the 5G networks are designed to keep up with the changing demands of citizens, industries, and cities. New age requirements are forcing the use of higher frequency bands to ensure support for ultra-high speeds. However, the use of higher frequency bands for 5G rollout poses the downside of shorter coverage and lower cell radii which in turn forces the need for densification of the network to ensure consistent coverage. Densification of the network means Telecom Service Providers (TSPs) must install a greater number of radio equipment and associated infrastructure. This poses a major economic and operational challenge for them. To handle this densification challenge, they need to have equipment that is small enough to be mounted on any structure, yet capable of supporting new age applications. The financial viability will also be kept in mind. Supplementing macro cells with a large number of small cells due to its

[1] July 2022 TRAI internal data analysis reports

portable and easy to deploy nature makes it a promising solution to achieve network densification.

1.3 Small cells are low-powered radio access nodes or base stations (BS) operating in licensed or unlicensed spectrum that have a coverage range from a few meters up to a few hundred meters[2]. The attributes of small cells (radio, antenna) are compressed such that they are portable and easy to deploy. Small cells intend to provide localized coverage in households and hotspot services especially in areas like city centres and transport hubs. Small cells provide coverage only for a very short distance and therefore they are installed in a dense or hyper dense manner, i.e., a very large number (even more than 200 per square kilometer) for good geographical coverage to provide highly reliable and high-capacity broadband. Due to its lower level of radiation, small cells require less stringent security and installation practices so easy to install and operate. Also, there are suitable to be mounted on any existing street furniture like poles, bus stands, traffic lights, buildings, etc. Despite being low on physical footprint these radio units provide huge data capacities to their users.

1.4 The Small Cell Forum (SCF), through its Market Forecast Report 2022[3] predicts that there will be steady growth in small cell deployment between 2020 and 2027. Figure 1.1 displays the forecasted growth of small cells in enterprises, urban areas, rural and remote areas for the whole global market. The sharpest growth is expected to take place till 2024 as major rollouts will be completed and much of this growth is driven by an uptick in deployment of urban small cells. Figure 1.2 represents the forecasted deployment growth of small cells in regional terms. The Asia-Pacific region is expected to become the chief deployment engine owing to the large-scale rollout in China, South

[2] https://www.gsma.com/publicpolicy/wp-content/uploads/2016/12/GSMA_Small_Cell_Deployment_Booklet.pdf

[3] https://scf.io/en/documents/050_-_Small_cells_market_forecast.php

Korea, Japan including India with its growing investment in 5G small cells.

Figure 1.1: Forecasted trends of deployment of small cells at the Global level

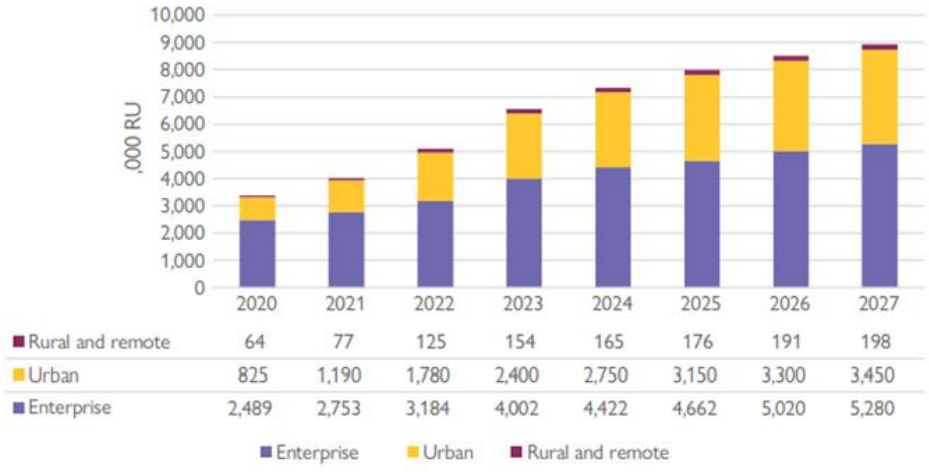


Figure 1-1. New deployments and upgrades of small cells and DAS by environment 2020-27 (by numbers of radio units deployed or upgraded)[3]

(Source: Small cell Forum market forecast, July 2022)

Figure 1.2: Region wise comparison of forecasted trends of deployment of small cells

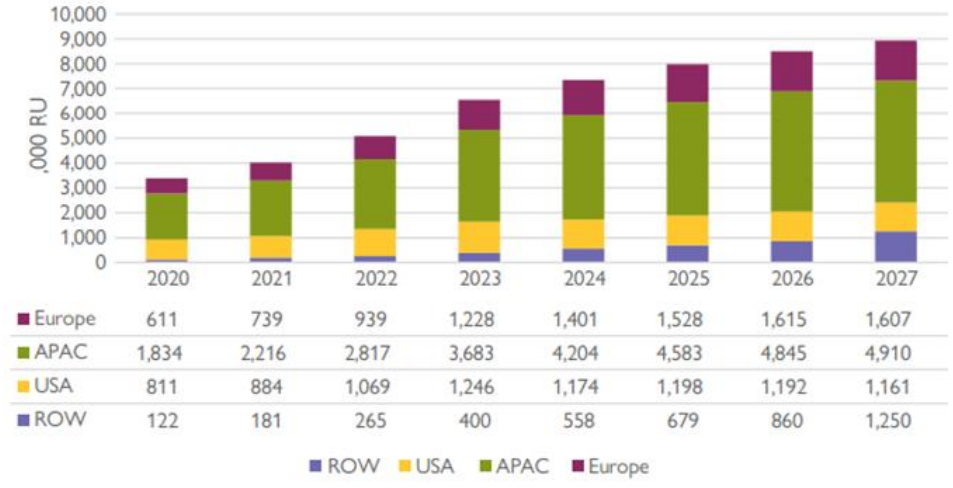


Figure 1-2. New deployments and upgrades of small cells and DAS by region 2020-27 (by numbers of radio units deployed or upgraded)

APAC – Asia –Pacific, ROW- Rest of World
(Source: Small cell Forum market forecast, July 2022)

1.5 For densification of the 5G network infrastructure, making use of the wide variety of Street Furniture (SF) (publicly owned structures like

utility poles, billboards, lamp posts, traffic signals, and public structures like gazebos, bus stops, etc.) to place small cell and aerial fiber equipment can act as the most economically feasible and sustainable mechanism for large-scale deployment of small cells. It can provide a win-win situation to the public and the authorities owning the street structures as they can benefit and gain from 5G use cases. On the other hand, TSPs can benefit from lower deployment costs.

1.6 This potential solution of making use of street furniture for small cell and aerial fiber deployment has its own challenges. These include regulatory and public concerns such as that related to local approval, Right of Way access, aesthetics and safety, availability of backhaul and power at SF. Collaboration between several stakeholders like administrators, local/municipal councils, power sector entities, service providers, infrastructure providers, vendors shall be essential to the success of this deployment model.

1.7 In the telecom sector, collaboration is not a new phenomenon. It has proven its worth when the need of more towers to provide 3G services and increasing pressure on the bottom-line, the TSPs started collaborating within the sector for infrastructure co-creation and sharing. Independent infrastructure providers (IP-I) created towers and ducts that were shared and used by multiple TSPs. Now the outlook needs to shift from within the sector to collaboration with cross-sectoral partners like Smart Cities, City Municipalities, Airport/Port owners, DISCOMs etc. to use their street furniture for network deployment.

1.8 Internationally there are many lessons which can be studied and used to develop India specific deployment models. Several countries have adopted different mechanisms to tackle various regulatory and technical challenges. USA has adopted stipulated timelines for review and acceptance of permits and specification of the types of fees that can be collected for small cell deployment. EU is one of the first regions to have clearly defined the permit free physical and technical characteristics of

small cells and adopted the installation classes as per the International Electrotechnical Commission (IEC).

1.9 While 5G rollout can certainly keep up with the promises of a reliable and high-speed connectivity to support the upcoming technologies, bringing in a structured pathway to achieve large scale densification for 5G rollout seems to be the first and foremost step. The Authority realized the importance of small cells in 5G network rollouts and in its broadband recommendations dated 31st August 2021, the Authority had mentioned that there is a need to evolve a regulatory framework regarding the use of public places and street furniture that is fair, transparent, and effective, ensuring standardized guidelines to make street furniture ready to deploy small cells. In view of the deliberation in the broadband recommendations dated 31st August 2021, the Authority released a Consultation Paper on the topic "Use of Street Furniture for Small Cell and Aerial Fiber Deployment" on 23rd March 2022. This is hereinafter referred to as CP in these recommendations.

1.10 During consultation process, the Authority sought inputs from the stakeholders on issues like RoW, power, permit exemption, challenges of commercial deployment, sharing of street furniture and the need to define and adopt a regulatory and legal framework for the use of street furniture for small cells and aerial fiber deployment for the successful rollout of next generation networks in the country. In response to the CP, TRAI received 17 comments and 2 counter comments from stakeholders. These were placed on TRAI's website: www.trai.gov.in. Open house discussion (OHD) with stakeholders in respect of the CP was organized on 24.08.2022.

1.11 In addition to floating of the Consultation Paper, TRAI has simultaneously initiated pilots at Bhopal Smart City, GMR International Airport New Delhi, Deendayal Port Kandla and Namma Metro Bengaluru on use of street furniture for Small Cells and aerial fiber deployment. Major Telecom Service Providers and Infrastructure Providers like Bharti

Airtel, Reliance Jio, Vodafone-Idea and BSNL are participating in these Pilots at different locations.

1.12 The objective of these pilot projects was to understand and analyze the technical and logistical challenges in future deployment of small cells over street furniture and to ensure complete synergy among all stakeholders. For each Pilot, a working group has been constituted by TRAI. Significant progress has been achieved in the Pilots in a short time with the active support from working groups included officers from TRAI Regional Offices, BMRCL, Deendayal Port Authority, Bhopal Smart City, GMR, Ministry of Housing & Urban Affairs (MoHUA), Department of Telecommunications, Telecom Service Providers (TSP) and Infrastructure Providers (IPs).

1.13 These pilots were designed to explore challenges in using brownfield infrastructure created by entities belonging to sectors other than telecom like electricity poles owned by DISCOMs, traffic lights owned by traffic police, etc. These pilots, which were in the spirit of the objectives of the PM GatiShakti programme, were thus expected to help develop a suggestive cross-sector participative framework particularly for the use of street furniture for deployment of small cells on it. While finalizing these recommendations, the Authority has also taken into consideration the practical on-ground difficulties faced and the learnings from these pilots.

1.14 After analyzing the various issues involved and considering the comments received from stakeholders from written responses and OHD and in consideration of the learnings from the pilot, the Authority has finalized these recommendations.

1.15 The objective of these recommendations is to develop and recommend a structured and uniform system to the Government for deployment of small cells and aerial fiber using SF. A well-streamlined approval process inculcated in the legal framework, along with properly defined physical and technical characteristics for equipment usage and EMF emissions

will simplify the administrative process and reduce the time to market of the TSPs/IPs and optimize resource utilization for the 5G rollout.

1.16 Therefore, the recommendations intend to pave a path on the subject while taking into consideration the regulatory and technical concerns of multiple stakeholders like the Administrators, TSPs, ISPs, IPs, OEMs, street structure owners and citizens of the country at the same time. Appreciating that the policy measures suggested in these recommendations are linked to each other and all together form a coordinated approach, an integrated approach wherein all these recommendations are considered in their entirety would be best to ensure a positive result in the deployment of small cells using street furniture.

1.17 These recommendations are broadly categorized into following:

A. Right of Way (RoW) Issues and adequacy of current provisions in ROW rules 2016
B. Infrastructure sharing by the Controlling Administrative Authorities (CAA) with TSPs and IP1s
C. Street furniture and small cell sharing among TSPs and IP-Is
D. Process Simplification, Permission Exemption for small cells and standardization of small cells and installation practices
E. Power related issues and solutions
F. Institutional mechanism for enabling Collaboration between Controlling Administrative Authorities and TSPs/IP-Is

1.18 Chapter 1 introduces the background and objective of the recommendations. Chapter 2 discusses the issues related to the deployment of small cells and aerial fiber on street furniture, comments of the stakeholders and recommendations of Authority based on the analysis and learnings from the pilots. Finally, Chapter 3 summarizes the various recommendations.

CHAPTER 2

USE OF STREET FURNITURE FOR SMALL CELL AND AERIAL FIBER DEPLOYMENT

2.1 The CP released on 23rd March 2022 discussed the potential challenges for the use of street furniture for small cells and aerial fiber deployment in the country. Questions were raised to seek inputs from the stakeholders on several important issues. These issues, comments of stakeholders, analysis of these comments, and the views of the Authority are presented in the following sections.

A. Right of Way (RoW) Issues and Adequacy of current provisions in RoW Rules 2016

2.2 The RoW permissions are governed by the Indian Telegraph Act, 1885 and rules made thereunder. With an objective to ensure uniform adoption of RoW rules across all the states and streamlining the process of RoW approvals, the Indian Telegraph RoW rules were notified in 2016. These RoW rules were further amended in 2021 to facilitate laying aerial optical fiber cables[4]. After issuing this Consultation Paper, DoT had come out with another amendment to RoW rules in August 2022 that addresses some of the issues that were flagged in TRAI's CP. This amendment to Right of Way Rules had made the charges for RoW permissions reasonable and a ceiling for RoW charges for installation of 5G small cells and optical fiber cable on street furniture has been fixed. These amendments will facilitate deployment of 5G small cells on existing street infrastructure.

2.3 Rollout of 5G network will require increasing number of radio and backhaul equipment that will need to be installed on street furniture infrastructure that are under the control of multiple authorities. These Controlling Administrative Authorities (CAAs) have their different RoW

[4] https://dot.gov.in/sites/default/files/Gazette%20Notification%20dated%2021

policies. In addition to varying RoW policy framework at State/UT level, another issue is of different policies being followed by central departments for granting RoW permissions. Absence of specific provisions for seeking permissions for deployment of small cells is another issue. In the CP, the Authority has discussed the issues related to provisions related to the use of street furniture for small cell deployment, uniform definition, fees, and timelines. The Authority has raised the following questions for seeking the response from the stakeholders:

i) *Is there a requirement for any modification in existing RoW Rules as notified by DoT to accommodate small cell deployment on street furniture? If yes, please provide the changes required.*

ii) *Are the amendments issued to RoW rules able to take care of the needs of aerial fiber deployment? If not, what further amendments are suggested? Please provide the exact text with justification.*

iii) *What are the suggestions of stakeholders for aligning RoW policies issued by various other Central Government Bodies with existing DoT RoW policy?*

Comments of Stakeholders on modification in RoW rules to accommodate small cell deployment on street furniture

On modification in Indian Telegraph RoW Rules, stakeholders have submitted the following –

2.4 Inclusion of specific definition for Small Cells and Street Furniture - Most of the stakeholders said that the present RoW rules are more aligned towards overground mobile towers and underground fiber deployment. These rules are silent on small cell deployment and access to street furniture. So, the details about small cells should be explicitly captured in a technology neutral way as part of overground (OG) infrastructure besides mobile towers and telegraph lines, in the opening paragraph of the rules. Inclusion of a dedicated section for street furniture use with enforceable provisions is another suggestion that has been put forward for the same. On the contrary, some stakeholders are

also of the view that there is no requirement for any modification as the existing RoW policy provides sufficient directions to enable telecom operators to execute all telecom infra projects.

2.5 Provision of single Online RoW portal – Several stakeholders have opined that for RoW clearances, a single pan India portal should be developed by the Central Government. State Governments and all appropriate authorities under the Central Government should be encouraged to join the portal rather than having portals for each authority or state separately. The portal should implement features like:

a. a user-friendly 'end-to-end digitized process'.

b. the concept of deemed approval.

c. Single window clearance within 30 days.

d. Empowered centralized coordinating agencies can be established to fast-track and smoothen the process of permissions for usage and upgradation of existing SF in the portal.

e. Submission of RoW applications for approvals (including suitable alerts/notifications/notices to users, receipts, acknowledgement, Service-level agreements (SLAs), contact details of relevant technical officials and 1st/2nd level of escalations).

f. Display of stages of approvals and status of a particular application.

g. Clearly defined roles for central, state, and local authorities.

h. The portal should cater to all aspects of the approvals including fiber, power, and access to street furniture.

i. The list of applicable street furniture shall be maintained by the CAAs on the portal with defined uniform norms, terms, and rate schedule along with relevant details like height, design, weight bearing capacity, location coordinates etc.

j. Creation of a national GIS (Geographical Information System) by the DoT which could be used by all the common agencies to coordinate for issuing RoW permissions. It should comprise State/UT wise GIS data for the applicant.

k. The applicant should be required to submit to the Authority a self-declared intimation on the portal for the usage of street furniture.

l. Provision to issue notices through digitized process on RoW portal before taking any adverse action like fiber cutting.

m. The details of authorized structural engineers shall be made available on a portal attesting to the structural safety of the street furniture where the small cells are proposed to be deployed. However, some stakeholders have suggested that provisions of the structural stability certificates should not be made applicable for the small cells.

2.6 Streamlining of RoW charges and authorization procedures - One of the biggest bottlenecks for speedy rollout of telecom infra, as pointed out by the stakeholders, is high RoW charges. In the opinion of a stakeholder, existing RoW charges are unreasonable and not based on the actual work done principle. It was added by the stakeholder that there are certain states like Odisha which have prescribed forward looking and technology supportive charges for utilization of street furniture, but majority of the states and municipal bodies treat RoW permissions as a "cash cow". Few stakeholders have put forward request that no application fee or compensation should be levied for installing the poles for providing support to over-ground telecom lines over the immovable property of the Local/ Government Authority. For establishment of poles over private land and buildings, it was suggested that application fee and one-time charge should not exceed Rs. 100. One of the service providers has submitted that the compensation for usage of immovable property for establishment of telecom infrastructure should be fixed for a minimum period of five years irrespective of whether the ownership of

the land resides with Central or State Government. One stakeholder was of the opinion that the fee of Rs.1000 per application as per the RoW rules of DoT should be further rationalized. Another stakeholder has submitted that in cases any agency like a CPSE/private distribution company desires a fee, the fee charged should be nominal (not more than Rs. 100/annum). A couple of stakeholders said that the charging schedule should be fixed based on defined area and street furniture category. Another stakeholder suggested that the Authority can recommend slabs based on the number of small cells deployed on the street furniture.

2.7 There is a submission that seeking Bank Guarantees (BGs) should not be insisted on for small cell deployment since this will result in blocking huge working capital and impacting TSPs financially and operationally.

2.8 Other suggestions –

- Stakeholders have suggested including instant or fast one-time bulk RoW permissions at zero cost.
- One service provider suggested that the respective authority/agency/ department should request for the removal of small cells only by giving a 30-day notice and providing an alternative location for re-installation.
- Compliance with RoW Rules and mandatory access to small cells for mounting telecom infra should be a precondition while issuing permissions to erect street furniture.

Comments on provisions of RoW Rules (Amendment) 2021, related to aerial fiber

2.9 In response to the query on whether the 2021 RoW amendment has been able to address various aerial fiber deployment issues, few stakeholders have opined that the 2021 amendments had the right intent to address the issues of aerial fiber proliferation, however, it is the lack of enforceability provisions that have impacted the effectiveness of the

rules as all the states are yet to incorporate the same in their policies. To tackle the issue of enforceability, some stakeholders have suggested that the amendments must be brought as a parliamentary law, so that they may be made mandatorily applicable to every central/state/local agency. Another stakeholder has suggested the inclusion of key Government agencies like Railways, Defense, Gas pipeline network, forests, ports etc. under the DoT RoW rules.

2.10 Stakeholders have suggested that the annual compensation for using existing poles to establish an OFC should not exceed Rs. 100 and Rs. 50 per pole in urban and non-urban areas, respectively. CAAs should be restricted from charging any additional fee other than that prescribed in DoT RoW rules schedule. In line with no RoW charge for BharatNet, the same must also be applied to the rollout of aerial fiber for any telecom infra project.

2.11 A few stakeholders have suggested that a list of street furniture which can be used for deployment of aerial fiber can be uploaded on the respective State's RoW Portal/Central Authority's portal by the CAAs. One stakeholder has proposed that all state electricity poles, municipal poles can be allowed for laying of aerial fiber. The use of existing billboards, metro pillars, gas pipelines etc., for lightweight aerial fiber, clamped with the right accessories, can also be permitted. Mandating/encouraging the sharing of aerial fiber as much as possible was suggested by a few stakeholders. The need to define rules by the local authority to maintain aesthetics of the area was another suggestion.

Comments on Alignment of Central RoW rules across states/local bodies/ agencies

2.12 Several stakeholders have made suggestions to bring consistency in RoW related procedures and general principles related to RoW permission, fees, compensation, charges etc. The basis of some of the suggestions is that 'telecom' is a central subject, and that the Center has

exclusive privilege to provide for guiding principles in relation to establishment of telecom infrastructure in the country. One of the stakeholders has stated that the Central Government can exercise their powers and mandate adoption of RoW rules by the central government bodies and states in their respective policies/ by-laws.

2.13 A stakeholder has suggested that the term 'Central Government Authorities' should be expanded to include any central agency, department, ministry, and their assets. Many stakeholders have suggested that all central government bodies, agencies, ministries, departments, and the authorities under these CPSEs, PSUs falling under the Union ministries/departments, Airports should operate under DoT RoW Rules. Any Smart City, municipality, state body getting financial support through Union Government funding must also facilitate deployment of Small Cells and telecom infrastructure by way of suitable amendments in their respective policies.

Analysis of the issues and views of the Authority

2.14 The Department of Telecom (DoT) notified the Indian Telegraph RoW Rules[5] on 15th November 2016 to ensure uniform adoption and streamlining of the process of RoW approvals across all the states. The Authority recognizes that the issue of RoW permissions can potentially hamper the proliferation of small cells in India. The adequacy of provisions of existing RoW rules needs to be ascertained for the use of street furniture for deployment of small cells and telecom infrastructure. Given the important role that small cells will play in enhancement of coverage and capacity, it needs to be ensured that the RoW permissions for small cells are not affected due to tedious application processes, delayed/denied permissions by the authorities, site restrictions, and arbitrary charges.

2.15 After this Consultation Paper was issued, DoT had come out with another amendment to RoW rules on 17.08.2022 that addressed some

[5] https://dot.gov.in/actrules/indian-telegraph-row-rules-2016

of the issues that were flagged in TRAI's CP. This amendment to Right of Way Rules has made the charges for RoW permissions reasonable and a ceiling for RoW charges for installation of 5G small cells and optical fiber cable on street furniture has been fixed. These amendments will facilitate deployment of 5G small cells on existing street infrastructure.

2.16 After analyzing the comments, the major concerns related to RoW provisions and views of the Authority are as follows:

i) **Inclusion of definition for small cell and street furniture in RoW Rules**

2.17 When the Indian Telegraph Right of Way (RoW) Rules 2016 were first notified on 15th November 2016, the opening paragraph mentioned that:

> *"In exercise of the powers conferred by sub-section (1) and clause (e) of sub-section (2) of section 7 read with sections 10, 12 and 15 of the Indian Telegraph Act, 1885 (13 of 1885), the Central Government hereby makes the following rules to regulate underground infrastructure (optical fiber) and overground infrastructure (mobile towers), namely……"*

2.18 The rules did not have a definition of underground infrastructure and overground infrastructure. The Rules rather had definition for "underground telegraph infrastructure[6]" and "overground telegraph infrastructure[7]" which was quite wide and inclusive definition. However, the G.S.R part of the RoW, 2016 rules included just optical fiber as part of the underground infrastructure and mobile towers alone as part of the overground infrastructure. This created a confusion amongst stakeholders and Appropriate Authorities. The Authority thus felt that amending the G.S.R part would broaden the scope of the rules for

[6] "Underground telegraph infrastructure" means a telegraph line laid under the ground and includes manholes, marker stones, appliances, and apparatus for the purposes of establishment or maintenance of the telegraph line.

[7] "Overground telegraph infrastructure" means a telegraph or a telegraph line established over the ground and includes posts or other above ground contrivances, appliances and apparatus for the purpose of establishment or maintenance of the telegraph or the telegraph line.

inclusion of aerial fiber on poles and installation of small cells on street furniture for rollout of emerging technologies i.e., 5G. In TRAI's Response dated 25.07.2022 to DoT back reference on Recommendations on 'Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed', the Authority therefore recommended amending the opening paragraph of Indian Telegraph Right of Way Rules, 2016 as follows:

> *"G.S.R. 1070(E). —In exercise of the powers conferred by subsection (1) and clause (e) of sub-section (2) of section 7 read with sections 10, 12 and 15 of the Indian Telegraph Act, 1885(13 of 1885), the Central Government hereby makes the following rules to regulate underground telegraph infrastructure and overground telegraph infrastructure, namely"*

2.19 DoT has recently amended the ROW Rules 2016 on 17.08.2022 and have incorporated provisions for faster processing of RoW permissions, predetermined charges for granting RoW permissions for installation of 5G small cells and optical fiber cable on street furniture, etc. In this amendment, DoT has omitted the brackets and words (optical fiber) and (mobile towers and telegraph line) from the opening paragraph. Subsequent to the amendment, the opening paragraph of Indian Telegraph Right of Way Rules, 2016 reads as follows:

> *"G.S.R. 1070(E). — In exercise of the powers conferred by sub-section (1) and clause (e) of sub-section (2) of section 7 read with sections 10, 12 and 15 of the Indian Telegraph Act, 1885(13 of 1885), the Central Government hereby makes the following rules to regulate underground infrastructure and overground infrastructure, namely"*

2.20 Thus, DoT has already modified the opening G.S.R part to broaden the scope of the rules. This has dealt the issue of otherwise restrictive interpretation that someone could have made and has removed any

scope for confusion for inclusion of aerial fiber on poles and installation of small cells on street furniture for rollout of emerging technologies.

2.21 In the opinion of Authority, the definition of "overground telegraph infrastructure" in the Indian Telegraph Right of Way Rules as *'a telegraph or a telegraph line established over the ground and includes posts or other above ground contrivances, appliances and apparatus for the purpose of establishment or maintenance of the telegraph or the telegraph line;'* is wide enough and sufficiently covers various telegraph infrastructure like small cells and aerial optical fiber cable. Any further inclusion of definition or clarification was not required.

2.22 However, Authority has noted that vide Indian Telegraph Right of Way (Amendment) Rules, 2022, following definitions have been added in Sub-rule (5) in Rule 10 of Chapter III:

> (5) For the purposes of this rule, and rule 10B and the Schedule, the expression,
>
> (a) "mobile tower" means any above-ground contrivance for carrying, suspending or supporting a telegraph and does not include pole;
>
> (b) "pole" means any above-ground contrivance of height not exceeding eight meters for carrying, suspending or supporting a telegraph and does not include mobile tower;
>
> (c) "small cell" means a low powered cellular radio access node that has a coverage of distance from ten meters to two kilometers.

2.23 Further, DoT vide letter (attached as **Annexure I**) dated 26th October 2022 has clarified that the term "Street furniture" mentioned in the Right of Way (Amendment) Rules, 2022 includes "post/pole used for electricity, streetlight, traffic light, traffic sign, bus stop, tram stop, taxi stand, public lavatory. memorial, public sculpture, utility pole or any other structure or contrivance of such nature established over the property of an appropriate authority". This has obviated the need for a

further definition/clarification. But the Authority is of the opinion that this clarification should be subsequently made part of the RoW rules through an amendment in relevant Gazette Notification.

2.24 **Therefore, the Authority recommends that the DoT clarification dated 26.10.2022 on Indian Telegraph RoW rules 2016 regarding the term "street furniture", should be made part of the Indian Telegraph RoW rules through a suitable amendment in a relevant Gazette Notification.**

ii) Online Central RoW portal

2.25 For a faster and efficient deployment of 5G in the country, a single-window clearance through online application process for all RoW proposals at the level of the states/UTs as well as in the Central Government/Departments can avoid administrative hindrances like multiple applications, different rules by different departments, permission delays etc. The Authority agrees with the industry inputs on the importance of a National RoW portal. In its recommendations on 'Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed' dated 31.08.2021, the Authority has emphasized for creation of National Portal for RoW permissions to facilitate expeditious rollout of telecom and other essential utilities infrastructure.

2.26 Various appropriate authorities like those dealing with Irrigation, PWD, Forest, Railways, Defense Estate, Power, National Highways, State Highways, and other bigger entities having land parcels under their control like Universities, Industrial Park, Logistic Parks, Ports, Airports etc., have already instituted mechanisms for granting RoWs permission to service providers and infrastructure providers for Telegraph Services. Some of these entities are using their own portals for giving such permissions. Recognizing that multiplicity of portals at several levels can further increase the complexity rather than reduce it, in the 31st August 2021 recommendations, the Authority had also recommended that

"*wherever Appropriate Authorities, i.e. different Central Government Departments, States, Union Territories, Local Authorities and their agencies, have already established the web based portals for grant of RoW permissions, the same should be integrated with the proposed national portal for RoW permissions."*

2.27 The Authority is happy to note that in sync with its thought process, the Sub-rule (2) of Rule 4 of the RoW rules 2016 has been amended as follows in the RoW (Amendment) Rules 2022:

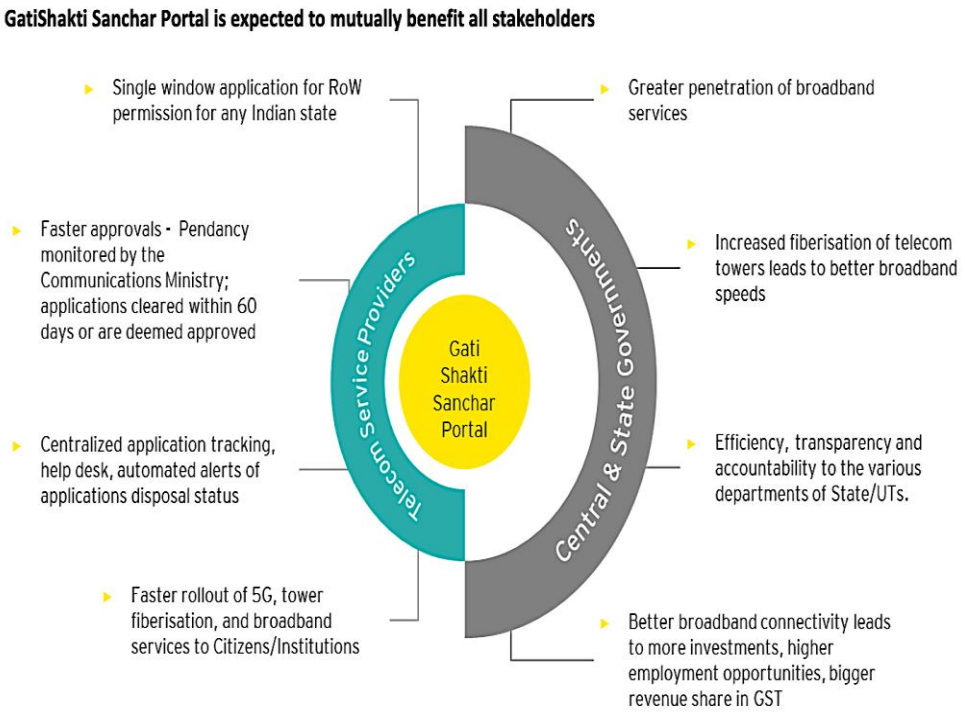
> ***4. Nodal officer to be designated by local authority, etc.-***
>
> *(1) Every appropriate authority shall designate a nodal officer for the purposes of these rules.*
>
> *(2) Every application for permission under these rules shall be made by the licensee on an electronic portal developed by the Central Government.*

2.28 The above amendment is an important initiation to integrate the central/state/local level applications on a single portal. The IT systems of all States/UTs and major infrastructure central ministries such as Railway, Highways have been integrated with the portal to make India ready for 5G launch. This can aid the State Governments & Union Territories in RoW policy alignment and can greatly reduce the complexity of multiple permissions. In addition to the above, the launch of a new 5G RoW application 'form' on GatiShakti Sanchar Portal in August 2022 is another big leap to enable faster 5G rollout in India.

2.29 For making the PM GatiShakti initiative successful, it is necessary that right of way permission needs to be approached in a holistic manner. Given the complexity of the numerous NOC's, physical documents, and permissions that would increase with the use of small cells, the establishment of the portal will act as a single window clearance is a need of the hour. The Authority appreciates the efforts of DoT launching the **"GatiShakti Sanchar Portal" (https://sugamsanchar.gov.in/)** in May 2022, in line with Hon'ble PM's vision of development of

infrastructure services in an integrated manner. This is a collaborative institutional mechanism between all stakeholders including Central and State/UT Government(s), Local bodies, and Service Providers to facilitate the Right of Way (RoW) Application Process through a single interface. This portal envisages bringing transparency, accountability and responsiveness to all stakeholders while processing the application. This is also a giant leap towards "Ease of Doing Business" as this can take care of the delay in the application process for installation of Digital Connectivity Infrastructure (DCI) due to inconsistency and uncertainty of policy through the maintenance of a fast-tracking application process. Figure 2.1 shows the various provisions of the portal and the benefits it can provide for both TSPs and the Government.

Figure 2.1: Provisions in the GatiShakti Sanchar portal



2.30 Power sector contributes to majority of accessible street furniture like electric poles/lines/supply pillars/cabinets/posts, which can be utilized by the telecom operators for the deployment of 5G Small cells. Appreciating that a huge number of applications for power connection at several poles/SF shall also be an integral part of the deployment

process, the Authority had previously recommended the following in its 31.08.2022 recommendations.

> 7.14. National RoW Portal
>
> (iii) *In order to facilitate cross-sector collaboration for RoW permissions with other utility providers like water, electricity, gas etc. and co-deployment of telegraph lines with other utility infrastructure creation, at later date, it should be possible to expand the scope of the proposed national portal to grant RoW permissions to other utility providers also.*

2.31 Currently the "GatiShakti Sanchar Portal" does not have a provision for power related applications and permissions. Considering the above;

2.32 **The Authority reiterates its earlier recommendations issued in the context of Broadband Recommendations dated 31.08.2022 vide Para 7.14.iii that the scope of the proposed national portal should be expanded to grant RoW permissions from utility providers like water, electricity, gas etc. also. More specifically, since most of the SF assets are under the control of the power sector, the portal shall also include a facility to process RoW falling under the jurisdiction of power sector including DISCOMS.**

iii) Provision of Bulk approval for small cells:

2.33 The Sub-rule (1) of Rule 10A under 'Application by a licensee for Establishment Of Overground Telegraph Infrastructure' provisions that *"A licensee shall for the purpose of installation of small cell and telegraph line submit an application, along with details of street furniture and a copy of certification by a structural engineer authorized by appropriate authority, attesting to the structural safety of the street furniture where installation of small cells and telegraph line is proposed to be deployed, to the appropriate authority for permission to use street furniture for*

installation of small cells and telegraph line." The Authority feels that adding a provision for bulk approval and bulk processing for small cell applications along with the above rule would be required to serve the needs of the licensees who want to establish small cells in large numbers. Some countries don't require approvals in the first place. For instance, in Australia, only a consultation with the councils is required. But currently in the context of India and in view of avoiding administrative delays, the Authority supports the idea of batch processing for groups of small cells.

2.34 Considering the above, **the Authority recommends the following amendments to the Indian Telegraph Right of Way (Amendment) Rules, 2022:**

Sub-rule (1) of Rule 10A of the Indian Telegraph Right of Way (Amendment) Rules, 2022 should be amended as:

A licensee shall for the purpose of installation of small cell and telegraph line submit an application, along with details of street furniture and a copy of certification by a structural engineer authorized by appropriate authority, attesting to the structural safety of the street furniture where installation of small cells and telegraph line is proposed to be deployed, to the appropriate authority for permission to use street furniture for installation of small cells and telegraph lines.

Provided that licensee may have option to submit single application for multiple sites and appropriate authority shall make due provisions for accepting such applications and issuing single permission for multiple sites accordingly for establishment of small Cells.

2.35 **The Authority also recommends that DoT should make provision in the GatiShakti Sanchar Portal for accepting single application for bulk processing of sites for granting various permissions, including RoW and power connection.**

iv) Cataloguing street furniture and GIS Mapping

2.36 GIS mapping is one of the crucial instruments to monitor and assess the infrastructure deployment and utilization. GIS is prevalent in several nations for ICT development. Availability of details of the street furniture and all the passive infra that individual TSP/ISP/IP-I intends to offer for sharing along with its location on common GIS platform will help in bridging the information gap. To facilitate sharing of passive infrastructure such as ducts, optical fibers, posts, etc., the Authority had earlier recommended cataloguing of telegraph related passive infrastructure, establishment of an e-marketplace and suggested that the available passive infra can be mapped by each TSP/ISP/IP-I using a common GIS platform which should be maintained by the Government. The relevant extracts of the recommendations dated 31.08.2021 are as follows:

7.31 To facilitate the sharing of passive infrastructure such as ducts, optical fibers, posts etc. the Authority recommends that:

In order to ensure common standards for mapping of available passive infrastructure using the Geographic Information System (GIS), Telecom Engineering Centre (TEC) should notify the standards for this purpose.

The passive infrastructure available in the country should be mapped by each service provider and infrastructure provider using the GIS standardized by TEC.

After mapping of the passive infrastructure details by individual service provider and infrastructure provider, the same should be aggregated on the common GIS, which should be maintained by the Central Government or the Regulator. Passive infrastructure of individual service provider and infrastructure provider which is available for sharing and selling should be clearly delineated on this system.

To facilitate leasing and trading of passive infrastructure in an efficient manner, the Central Government should enable establishment of e-marketplace(s) for this purpose. Such e-marketplace should be able to access the details of the passive infrastructure of individual service provider and infrastructure provider which is delineated for sharing and selling on the common GIS platform.

2.37 PM GatiShakti National Master Plan has been developed as a Digital Master Planning tool by Logistics Division, Ministry of Commerce. The plan has been prepared in a dynamic GIS platform wherein data on specific action plan of various Ministries/Departments have been incorporated within a comprehensive database. Dynamic mapping of all infrastructure projects with real-time updation will be provided by way of a map developed by BISAG-N. The map is built on open-source technologies and hosted securely on Meghraj (Government of India's cloud service). It will also use Satellite imagery available from ISRO and base maps from Survey of India. Once the individual Ministries update their data in the software using its separate user identification, all the data will be integrated in one platform which will be available for planning, review, and monitoring. The Logistics Division, Ministry of Commerce will further assist all the stakeholders through BISAG-N, in creating and updating their required layers in the system and update their database through Application Programming Interface (APIs). Analysis by providing the entire data at one place with GIS based spatial planning and analytical tools having large number of layers like land

use, existing structures (e.g., bridge, railway crossing, culvert), soil quality, infrastructure (Road, Rail, Waterway etc.), elevation data/3D (contour and gradient), habitation sprawl etc. enabling better visibility to the executing agency.

2.38 The Department for Promotion of Industry and Internal trade (DPIIT) has requested the states and UTs for integration of various data layers related to different infrastructure assets on State Master Plan portal. Subsequently, in a significant move, the DPIIT vide letter (attached as **Annexure II**) dated 24th June 2022 has further requested the states to map additional data layers namely electric poles, traffic light poles, bus terminal / bus shelters and Government buildings (State Govt/Central Govt, PSU) which are thought to be used for mounting 5G small cells. This is an important initiative for creating the infrastructure suitable for supporting the 5G rollout in the country.

2.39 Using the data being collected in the master plan, if the Government can facilitate a platform dedicated for street furniture, the TSP/ISP/IP-I's will be able to immediately know the availability of SF at a location where they intend to deploy small cells. Both the SF provider and seeker will be benefitted by the existence of such an e-marketplace/ GIS platform. This can facilitate faster small cell and 5G network rollouts. The Authority feels that cataloguing and maintaining a list of applicable street furniture on the national RoW portal as suggested by most stakeholders, can add to expanding the scope of the portal multifold. The list can be uploaded by the CAAs with terms of sharing and rate schedule along with relevant details like height, design, weight bearing capacity, location coordinates etc.

2.40 There are immense benefits for street furniture owning agencies to do GIS mapping of their assets. This will enable them to offer their assets for utilization by TSPs and other third parties on digital platforms in the most efficient and cost-effective manner. Cost savings resulting from greater efficiency, better decision making, better geographic information recordkeeping etc. can be other advantages. This will go a long way in

improving the penetration of 5G and its technologies, thereby benefiting the economy as a whole. Further, the development of 5G for their citizens, enterprises, and city governance, could be possible by transforming the city's DCI. Use of drones for GIS mapping of large terrain is commercially viable and now being used widely by various industries of geotagging of their critical assets. These 5G enabled drones can go beyond visual range and can collect huge amounts of vital data about the subjects of interest in most efficient and cost-effective manner.

2.41 **The Authority recommends that a Catalogue of GIS mapped Street furniture assets in the National RoW portal should be created with the following specifications:**

a) **Height, load bearing, and wind load capability of structure**
b) **Wattage, type of power (AC/DC), voltage etc. if power is available.**
c) **Picture of SF**
d) **Non-discriminatory terms and conditions offered for hiring**
e) **Contact details (Mobile number, landline number and email ID) of the nodal person for the particular Street Furniture.**

2.42 **The Authority also recommends that use of Drone based mapping in the GIS system should be considered for quick assessment of the location of small cell infrastructure and for the creation of the street furniture catalogue.**

v) **Safety of equipment:**

2.43 As stated by the stakeholders, vandalism of the communications infrastructure is a prevalent problem that requires immediate attention The cases of vandalism can take many forms including siphoning of fuel from the generators, stealing of back-up batteries solar panels, and

lightning arrestors, fiber cable cuts (deliberate or otherwise), stealing of copper rods from masts. In certain cases, communications infrastructure is vandalized accidentally during excavations, road repairs and constructions. Since vandalism increases the operational and maintenance costs and may discourage prospective investors, it is important that legal provisions regarding vandalism of telecom equipment shall be put in place.

2.44 The recently released Draft Telecommunications Bill 2022 has tried to address the security of Telecommunications Assets through the provision imbued under clauses of Chapter 10 and Chapter 11 as follows:

38. Civil liability

The Central Government may prescribe civil liabilities, including compensation payable by any person causing damage to telecommunication network or telecommunication infrastructure, to the licensee or registered entity, as the case may be, and the applicable penalties.

47. General provisions related to offences

(1) Any person or entity committing any offence listed in Schedule 3 shall be punished with fine or imprisonment, or through suspension of telecommunication service, or through a combination thereof, as specified in Schedule 3. The provisions of Schedule 3 shall apply to the abetment of, or attempt to commit, an offence as they apply to the offence.

Schedule – 3: Offences and Penalties

S. No	Offence under the Act	Penalty	Cognizable or Non-cognizable	Compoundable or Non-compoundable
5	Willfully removing or tampering with or causing damage to telecommunication infrastructure or telecommunication network.	Imprisonment for a term which may extend to one year, or with fine up to rupees one crore, or both.	Cognizable	Compoundable
6	Causing damage through negligence to telecommunication infrastructure or telecommunication network.	Fine up to rupees fifty lakhs	Non-cognizable	Compoundable

The Authority is of the opinion that the provisions of the draft bill can take care of the issues of vandalism once it is passed as an act by the Parliament. However, the Authority is of the opinion that till the bill becomes a law, the Government should specifically monitor action taken by the state police (in collaboration with MHA) through a joint committee to address the security of Telecommunications Assets.

2.45 **The Authority recommends that till the Draft Telecommunications Bill 2022 is passed as a law, the Government should specifically monitor action taken by the state police, for security of Telecommunications Asset, through a DoT and MHA joint committee.**

vi) **Access to use of private and public infrastructure for small cell and aerial fiber deployment**

2.46 In the absence of a holistic policy framework between and within states, the deployment progress of small cells may vary from city to city. A streamlined policy on access to use of private and public infrastructure for small cell and aerial fiber deployment and rationalized uniform charges are important to ensure a level playing field and equitable development across the nation. Many stakeholders have commented that small cell installation on government owned structures and street furniture should be allowed at no cost. For privately owned infrastructure, this access should be allowed at a reasonable fixed cost.

2.47 The Authority has noted that the RoW (amendment) rules 2022 has included two new sections (10A and 10B). The sub-rules 3 of rule 10A provisions the following:

> *"(5) The appropriate central authority may permit installation of small cells on their buildings and structures.*
>
> *(6) For the purposes of sub-rule (5), the "appropriate central authority" means the Central Government or the authority, body, company or institution, incorporated or established by the Central Government, in respect of property, under, over, along, across, in or upon which underground or overground telegraph infrastructure, is to be established or maintained, vested in, or under, the control or management of such Government, authority, body, company or institution."*

2.48 The Authority is of the opinion that the term "appropriate central authority" defined as above will help in specifying the role of central bodies different from state authorities which are included as per the definition of "appropriate authority" laid in clause (e) of rule 2. The amendment to Rules has thus taken care of installations of small cells on central government buildings and structures.

2.49 As far as access to private owned infrastructure is concerned, the following has been provisioned as per the new rule 10B in the RoW (amendment) rules 2022:

> *"10B. Establishment of telegraph infrastructure over private property. – Where the licensee proposes the establishment of overground telegraph infrastructure over any private property, the licensee shall not require any permission from the appropriate authority:*
>
> *Provided that in case of establishment of mobile tower or pole over a private building or structure, the licensee shall submit an intimation, in writing, to the appropriate authority, prior to commencement of such establishment:*
>
> *Provided further that along with the intimation, he shall also submit the details of the building or structure, where the establishment of mobile tower or pole is proposed, and a copy of certification by a structural engineer, authorized by the appropriate authority, attesting to the structural safety of the building or structure, where the mobile tower or pole is proposed to be established."*

2.50 Subsequent to these amendments to RoW rules by the DoT, the Authority is of the opinion that new rules 10A and 10B are expected to ensure equitable access at reasonable cost to the operators. As far as access within the buildings is concerned, the Authority is handling the issue separately and has floated a Consultation Paper on "Rating of Buildings or Areas for Digital Connectivity" dated 25th March 2022.

vii) **Rationalizing fees and charges**

2.51 Complicated and time-consuming processes and excessive charges for RoW can result in delays in network rollouts. The Authority agrees with the stakeholders that high RoW charges levied for the street furniture will make the rollout of 5G small cells un-viable and hence will become the biggest roadblock in early deployment of 5G in the country, if not resolved timely. Indian states, cities and towns cannot afford to lose the

benefits of 5G accruing to their people and enterprises because of deployment delays. The Authority also agree with the viewpoint that CAAs should look at ROW permissions for DCI creation from the perspective of essential service delivery and overall economic development rather than considering it as a source of revenue generation.

2.52 The Authority has noted that DoT, vide the latest amendments to RoW rules, has already introduced provisions to rationalize the charges for RoW permissions across the country. A schedule has been added to the rules defining the fee, charges for restoration, and compensation for different items. The following table represents the schedule as provided in the RoW (amendment) rules 2022.

Table 2.1: The Schedule provided in the RoW Amendment rules 2022

Rule	Item	Amount
Part-I FEE		
5(3)	For establishment of overground telegraph infrastructure	One thousand rupees per kilometer.
9(3)	For establishment of overground telegraph infrastructure	(i)Ten thousand rupees for establishment of mobile towers (ii)One thousand rupees per kilometer for establishment of overground telegraph line. (iii) Nil for establishment of poles, for installation of small cells and telegraph line, on the immovable property vested in, or under control or management of appropriate central authority (iv)One thousand rupees per pole for establishment of poles, for installation of small cells and telegraph line, on the immovable property vested in, or under control or management of appropriate authority, other than appropriate central authority.
10A(2)	For installation of small cells and telegraph line using the street furniture	Nil.

Rule	Item	Amount
Part-II Charges for restoration		
6(2)(a)	Establishment of underground telegraph infrastructure where undertaking is not given by the licensee to discharge the responsibility to restore the damages	Sum required to restore immovable property as per the rate prescribed by central public works department for that area or as per the rate prescribed by state public works department for that area, if no rate has been prescribed by central public works department for that area.
6(3)	Bank guarantee as security for performance in case of establishment of underground telegraph infrastructure where undertaking is given by the licensee to discharge the responsibility to restore the damages	20% of the sum required to restore immovable property as per the rate prescribed by central public works department for that area or as per the rate prescribed by state public works department for that area, if no rate has been prescribed by central public works department for that area.
10(3)(a)	Establishment of overground telegraph infrastructure	Sum required to restore immovable property as per the rate prescribed by central public works department for that area or as per the rate prescribed by state public works department for that area, if no rate has been prescribed by central public works department for that area. Further, licensee shall restore the damage incurred in case of establishment of poles for installation of Small Cells and telegraph line.

Rule	Item	Amount
Part-III Compensation		
6(1)(B)	Establishment of underground telegraph infrastructure	Nil.
10(2)	Establishment of poles for installation of small cells and telegraph line	Nil.
10A(4)	Usage of street furniture for installation of small cells and telegraph line	(i)For installation of small cells: Three hundred rupees per annum for urban area and one hundred and fifty rupees per annum for rural areas per street

		furniture. (ii)For installation of telegraph line: One hundred rupees per annum per street furniture.

2.53 Regarding the application for the establishment of overground telegraph line, sub-rule 3 of rule 9 of the amendment rules 2022 provides the following:

> *"Every application under sub-rule (1) shall be accompanied with such fee to meet administrative expenses for examination of the application and the proposed work as the appropriate authority may, by general order, deem fit:*
> *Provided that the one-time fee, to meet administrative expenses, accompanying every application shall not exceed the amount specified in Part-I of the Schedule."*

2.54 As can be observed from part I of the schedule, the one-time fee for establishment of poles, for installation of small cells and telegraph line, on the immovable property vested in, or under control or management of appropriate central authority has been prescribed to be Nil and for establishment of poles for installation of small cells and telegraph line, on the immovable property vested in, or under control or management of appropriate authority, other than appropriate central authority has been specified to be Rs. 1000per pole.

2.55 Besides the one-time charges, the following amendment of sub-rule (2) of rule 10 is another also rationalizes and uniformizes the compensation for use of infrastructure

> *"10. Grant of permission by appropriate authority. -(1) The appropriate authority shall examine the application with respect to the following parameters, namely: -*
>
> *.....*

(2) Where the establishment of the overground telegraph infrastructure renders the immoveable property, vested in the control or management of any appropriate authority over which such overground telegraph infrastructure is established, unlikely to be used for any other purpose, the appropriate authority shall be entitled to compensation for the value of the immoveable property, either once or annually, assessed on such rates as that appropriate authority may, by general order, specify.

Provided that the compensation payable for the immovable property for the establishment of poles for installation of small cells and telegraph line shall not exceed the amount specified in Part-III of the Schedule."

2.56 For charges related to restoration, the clause a of sub-rule (3) of rule 10 has been amended as follows:

"(3) The appropriate authority shall, within a period not exceeding sixty days from the date of application made under rule 9 -
(a) grant permission on such conditions including, but not limited to, the time, mode of execution, measures to mitigate public inconvenience or enhance public safety or structural safety and payment of restoration charge, not exceeding the amount specified in Part-II of the Schedule, or compensation, as specified in sub-rule (2); or
(b) reject the application for reasons to be recorded in writing:"

2.57 Further, while the ceiling of the fee to be collected from the licensee was limited to establishing overground telegraph infrastructure in RoW rules 2016, in the latest amendment, the scope has been expanded to include maintaining, working, repairing, transferring, or shifting overground telegraph infrastructure as can be seen from following proviso:

"10. Grant of permission by appropriate authority.
(4) The appropriate authority shall not charge any fee and compensation other than those mentioned under sub-rule (3) of rule

9, sub-rule (2) and clause (a) of sub-rule (3) from the licensee for establishing, maintaining, working, repairing, transferring, or shifting overground telegraph infrastructure."

2.58 The Authority applauds the efforts of DoT in significantly rationalizing various ROW related charges. The Authority feels that no further intervention is required in this regard currently.

viii) **Aerial fiber related amendments**

2.59 Aerial fiber is a widely used, quick and easy backhauling solution. It plays an important role in meeting the requirement of exponential data growth. But the extensive approval process and the large number of document submissions demanded by the authorities for grant for permission has been hindering the high-speed deployment of aerial fiber. Even with the RoW amendment of 2021 which intended to address the issue of laying aerial optical fiber cables, majority of the stakeholders are of the opinion that these set of guidelines have not pervasively covered the issues of aerial fiber deployment.

2.60 The RoW Amendment rules 2022 through rule 9 has provisioned–the following

9. Application by a licensee. —

…….

Provided that the documents mentioned in clauses (ii), (iii), (v) (ix), (x) and (xi) shall not be required in case of application made for establishment of overground telegraph line—:

10. Grant of permission by appropriate authority. –

…..

Provided that the parameters mentioned in clauses (a), (b), (c), (g) and (h) shall not be necessary for examination of the application made for establishment of overground telegraph line:

2.61 With the above provisions in place, issues like longer timeframe, involvement of large number of authorities, and higher costs for aerial fiber deployment, have been addressed. The approval process has been simplified to a large extent because a lot of steps that were previously applicable in the 2016 RoW rules have been reduced to just the examination of the route plan of the overground telegraph line by the appropriate authority. Therefore, the Authority is of the opinion that no further intervention is required regarding simplification of the procedures involved in approval for the installation of the overground telegraph line.

2.62 Apart from the permission process, in the absence of a holistic policy framework earlier, aerial fiber charges also varied from state to state. Some states are taking a one-time charge, some recurring and some both. The basis of charging is also not explained or unclear. The high fragmentation and in some cases, exorbitant state wise RoW charges for small cells and aerial fiber can end up becoming a significant input cost towards digital connectivity. This may lead to a situation where the TSPs may not be able to deliver services to their full potential and create gaps between the network connectivity achieved among different states and between rural and urban areas, thereby widening the digital divide.

2.63 DoT through the RoW (amendment) rules 2022 has tried to resolve the above issue through specification of one-time fee, restoration charges and compensation charges that can be levied for the establishment and usage of telegraph infrastructure. Sub rule 3 of Rule 9 has specified the upper limit for the one-time fee for establishment of overground telegraph line. The restoration charge for establishment of over ground telegraph infrastructure has been specified in Part II of the schedule as per Rule 10(3)(a). The compensation for the establishment of poles for installation of small cells and telegraph line has been specified to be Nil and usage of street furniture for installation of telegraph line has been rationalized as per rules 10(2) and 10(A)(4) respectively. With this amendment in place, the charges fixed thereof will reduce the state-wise

disparity. Therefore, the Authority is of the view that no further intervention is required in this regard at this stage.

B. Infrastructure sharing by the Controlling Administrative Authorities with TSPs and IPs

2.64 To improve quality of service, ensure availability of services from multiple TSPs, and reduce the cost of infrastructure creation/usage, it is important that infrastructure sharing policies be encouraged. It is equally important to provide access to telecom infrastructure at all locations including airports, metro hubs, railway stations, ports, residential buildings etc. for service providers in a non-discriminatory manner. This will require the creation of standardized guidelines mandating access, regulating access, and sharing of telecom infrastructure. In this context, following questions were raised in the CP regarding creating a framework related to encouraging and provisioning asset sharing:

iv) Whether it should be mandated that certain public infrastructure (municipality buildings, post offices, bus, and railway stations, etc.) be earmarked to have dedicated spaces that allow service providers to deploy macro/small cells? If yes, what can be the possibilities and under what legal framework this can be done? What should be the terms and conditions of use of such infrastructure? Please provide detailed inputs.

v) Can some of the street furniture like traffic lights, metro pillars etc. be earmarked for mandatory sharing between controlling administrative authority and Telecom Service/Infrastructure providers for deployment of small cells and aerial fiber? Does the existing legal framework support such mandating? What should be the terms and conditions of such sharing? Please provide details.

vi) How can infrastructure mutualization and infrastructure collaboration be ensured to avoid exclusive right of ways? What legal provisions can support mandating these? Provide full details.

Comments on mandating earmarking of dedicated spaces for provisioning of telecom infra on public land/other infrastructure

2.65 Majority of stakeholders have put forward that there is an immediate need to design a legal framework to mandate certain public infrastructure to have dedicated spaces to deploy small cells, through suitable insertions in RoW rules. But there are a few other stakeholders who have proposed that this should be facilitated through a mutual agreement. One stakeholder has submitted that all private and Government utility providers while putting up new assets such as gas pipelines, HT power lines, streetlights etc. should be required to create corridors for accommodating telecom infrastructure.

2.66 A couple of associations have suggested that standard designed cabinets of specific dimensions on street light poles/traffic lights along with 24x7 power availability can be made available as dedicated space. Availability of reliable AC power and feasible space for battery backup, security for the protection of the installed equipment, and accessibility for maintenance on 24x7 basis are some of the primary requirements suggested for identifying dedicated spaces. Two of the stakeholders, after their assessments, have specifically provided that the required space for pole and infra (SMPS & Battery Bank) may be 1.5 x 1.5 meter to accommodate power, antenna and associated cabling equipment.

2.67 Following are the other suggestions prescribing terms and conditions for earmarking and use of dedicated spaces on public land/other infra:

- General terms and conditions need to be worked out by DoT so that certain minimum fees for using dedicated spaces may be prescribed.
- Proper advanced notification by TSPs indicating their network plan and timeline to CAAs.
- Guidelines containing rules related to the size and number of small cells that can be deployed on any single piece of street furniture may be prepared.

2.68 Common Telecom Infrastructure (CTI): One of the most common suggestions that has been put forth by most stakeholders is to amend the National Building Code. Ensuring compliance of provision of DAS/IBS and CTI for telecom services in all upcoming complexes should be a condition for grant of Building Completion certificate. One stakeholder suggested that TRAI may recommend the Government to form an expert group under TEC to design standards/guidelines for IBS.

Comments on mandating sharing of SF with TSPs/IPs for deployment of small cells

2.69 Majority of the stakeholders have suggested that all government owned SF shall be extended for deployment of small cells on a non-discriminatory, non-exclusive basis. One of them suggested that suitable amendments should be made in the current RoW Rules to mandate SF sharing.

2.70 To ensure easy access, stakeholders are of the opinion that the CAAs should be encouraged to come up with their own guidelines providing for SF infrastructures free of cost or bare minimum charges. Some stakeholders have pointed out the necessity of assessing the structural fitness of the structures prior to sharing.

2.71 Many stakeholders have proposed that CAAs can be incentivized to encourage them to share their assets with the operators. One of the associations has stated that CAAs can be incentivized by providing complimentary services for them through small cell networks deployed on their SF assets (like installation of surveillance cameras). Another service provider has put forth that the traffic light poles could be changed to smart connected traffic light poles (with a provision for mounting small cells) as a part of smart city initiative.

2.72 Regarding mandating of sharing of SF by the CAAs, a few terms and conditions have been suggested by the stakeholders:

- Green field Street furniture can have inbuilt provision for mounting small cells/Aerial fiber. However, if brownfield street furniture is

utilized, then TRAI can issue regulations and guidelines for mounting the small cells and aerial fiber on it.

- The list of street furniture can be cataloged in the centralized online portal with info about wind load and structural stability. There should be no requirement to take separate individual permissions for use of spaces of cataloged SF, only intimation may be required.
- A long lease option with bare minimum recurring charges for space usage can be prescribed. Simple, nominal, uniform charges depending on the number/ size/weight of equipment and per km in case of fiber needs to be fixed and charges should not be benchmarked with local area land rates/ commercial rates.
- Equitable access to SF with a spirit of accommodating all operators may be followed.

Comments on Infrastructure Mutualization and Collaboration

2.73 Most stakeholders are of the opinion that infrastructure mutualization must be made mandatory and exclusive RoW should not be given to anyone. This is to avoid any market distortions, monopoly on street furniture assets and to optimize the utilization of such street furniture across multiple TSPs. As per an association, in order to ensure co-existing ownership rights, service providers should be allowed to erect street furniture in collaboration with administrative authority.

2.74 Few of the service providers have provided a detailed interpretation of the two concepts of infrastructure mutualization and collaboration –

a. Infrastructure mutualization strategy will operate successfully when a common infrastructure is built, operated, and maintained by an infrastructure provider, and jointly used by TSPs, with each leasing a portion of the mutualized infrastructure and paying for it at a wholesale price.
b. Infrastructure collaboration/cooperation occurs when utility operators share RoW with broadband operators, or when telecom operators that provide different services share the same physical infrastructure. Cooperation differs from mutualization because

agents are not competing in the same market and, as a result, are more willing to share.

2.75 Few other stakeholders are of the opinion that the state of infrastructure in an urban area should be the factor considered to decide whether infrastructure mutualization is a suitable model to infrastructure collaboration. For instance, PPP model of infrastructure mutualization will be more useful for already built cities where the common infrastructure upgrade has been completed, whereas infrastructure collaboration will be a more suitable model for cities which are undertaking infrastructure upgrade projects or upcoming smart city projects. One of the smart cities corporations is of the view that in either of the scenarios, there should be a legal binding agreement on the shared infrastructure and the way it is being used. This is to monitor multiple agencies from the point of view of operation and maintenance.

2.76 To prevent exclusivity and ensure transparency of approvals, the following were suggested by one of the service providers:

- Suitable terms and conditions should be introduced in the Unified license and IP-I registrations, mandating the licensee/registration holder not to get into an exclusive tie-up for taking rights over street furniture.
- Fees must be publicly disclosed, competitively neutral, technology neutral, and based on actual and direct costs.
- Permits must be approved or denied on publicly available criteria that are reasonable, objective, and non-discriminatory.

Analysis of the issues and views of the Authority

2.77 The Authority is of the view that mandating dedicated spaces at public infrastructure and sharing of street furniture by CAAs can significantly speed up 5G network rollouts, particularly considering that India has a high density of street furniture structures. With such mandating, existing government structures (with or without minor modification or upgradation) can be used for rolling out 5G services. This would slash

the outlays required for building new structures and lower the costs. The Authority is of the view that Central and State Government authorities, statutory bodies, defense/cantonment areas, PSUs, educational institutes, public infrastructure project area which are developed in PPP model such as airports, seaports, metro rail, highways etc. should also permit the deployment of DCI like small/macro cells on government buildings and structures. Further, mandating provision of government spaces for DCI would save huge time and efforts of TSPs that might go in negotiating with the owners or CAAs.

2.78 The biggest beneficiaries of these small cell deployments would be administrative units which control critical infrastructure like ports, airports, metro trains and smart cities. One of the major benefits to these administrative units would come from immensely improved coverage in these areas where due to many technical and other reasons establishing big mobile towers has some limitations and patchy mobile coverage cost them in terms of customer experience and competitiveness. 5G small cell deployment can overcome these limitations.

2.79 Another big advantage for these administrative units is that small cells network, will transform their enterprise communication landscape in a big way. They stand to benefit from deployment of 5G small cells as the same will enable them to deploy various enterprise level applications which will enhance efficiency of their operations, reduce turnaround time of their critical operational activities, thereby reducing costs and increasing their profitability. This will also give them a huge competitive advantage over other competitors. 5G small cells will enable those Industry 4.0 technologies like Industrial Internet of Things (IIoT), Automation, Artificial intelligence, Digital Twining, Robotics, Edge Computing etc. which in coming years will become bedrock of next industrial transformation. Apart from Industry 4.0 applications, some of the use cases which are going to be enabled by these technologies are assistive driving, public safety and surveillance, emergency response and smart ambulances.

2.80 Among others one of the biggest beneficiaries of 5G small Cells will be the large number of Smart Cities across the country. The purpose of the Smart Cities Mission is to drive economic growth and improve the quality of life by harnessing technology. 5G networks in general and small cells in particular will play a pivotal role in Smart Cities development, due to its capacity to offer next generation solutions to meet the needs of Smart City dwellers. A 5G network with Small Cells can transport data from a massive number of small IoT devices embedded in roads and pavements to City Control Center which will result in better traffic management by reducing the idling time at traffic lights. There is a need for high bandwidth and a secure and dependable data flow for provision of smart services like public safety even in hard-to-reach locations such as underground car parks or pavements. The 5G use cases that smart cities can implement, will help them in adopting innovative approach to promote sustainable and inclusive cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions.

2.81 Some countries like UK, Singapore, US have already provisioned for such sharing or access to street furniture structures through state laws/codes. The German Telecommunications Act[8] entitles operators of public telecom to use trafficways free of charge. Further, under the Act, the owner of a property cannot prohibit the setting up, operation and renewal of telecommunications lines on his property subject to certain conditions. Japan Government has allowed its service providers to set up 5G base stations on traffic signals, hoping to reduce the cost and time it takes to roll out the ultrafast networks[9]. Roughly 200,000 traffic signals administered by local governments can be used. For incentivizing the local authorities, they have been allowed to use the networks for self-driving vehicle projects and emergency communications in natural disasters. It is also expected that the cost of

[8] https://rm.coe.int/16806af19e

[9] https://asia.nikkei.com/Spotlight/5G-networks/Japan-to-greenlight-5G-base-stations-on-200-000-traffic-signals

using the traffic signals would be split with the local governments. The Punjab draft policy for small cells has provisions for infrastructure sharing to all mobile network operators on an open access basis.

2.82 Town and Country Planning Organization under Ministry of Housing and Urban Affairs has issued guidelines, through addendum to Model Building Byelaws, 2016[10], to mandate charging infrastructure provisions in various buildings. Based on the occupancy pattern and the total parking provisions in the premises of the various building types, charging infrastructures is to be provided for electric vehicles, which is currently assumed to be 20% of all 'vehicle holding capacity' at the premises. Additionally, the building premises must have an additional power load, equivalent to the power of all the charging points operated simultaneously. The Authority is of the view that in a similar way provisions can be made in different acts so that buildings, public spaces, etc. can be mandated to have dedicated spaces earmarked for placement of DCI like small cells.

2.83 One of the most common suggestions given by stakeholders is regarding provision of DAS/IBS and Common DCI for telecom services in all upcoming complexes. As mentioned in the CP, the Authority is handling the issue of inbuilding access through a separate consultation paper on "Rating of Buildings or Areas for Digital Connectivity" that has been released on 25th March 2022. Keeping in mind the exponential growth in communication network expansion and introduction of new technologies especially in the wireless segment, this Consultation Paper discusses the importance of creating a well-defined system to ensure availability of reliable and robust digital connectivity infrastructure in every building.

2.84 The Authority agrees with the view of stakeholders, that for faster deployment of small cells certain street furniture should be mandated for use for small cell deployment as has been done in Japan. This will

[10] https://archive.pib.gov.in/documents/rlink/2019/feb/p201921501.pdf

ensure the available infrastructure is readily available for deploying small cells and will reduce the hassle of getting ROW permissions. Therefore, the Authority feels that if CAAs can be mandated to (a) share certain street furniture and (b) earmark certain dedicated spaces in government buildings, this can help in the rollout of 5G services at much lower costs. The CAAs in turn will be benefited by availability of 5G networks and services.

2.85 In view of the above, **the Authority recommends that:**

i **DoT should issue advisory guidelines to States for mandating CAAs that own/control traffic lights to share these assets with TSPs/IP-Is for deployment of small cells subject to structural stability.**

ii **All Central Government entities should earmark dedicated spaces in their existing and planned buildings/structures for installing DCI including small and macro cells. Dedicated spaces on rooftops should be identified for deploying small/macro cells. All such spaces should be GIS mapped and made available on GatiShakti Sanchar portal for charge free use by TSPs/IP-Is on non-discriminatory basis.**

iii **Advisory guidelines should also be issued to State Governments for similar action by their entities and local bodies. DoT should also follow up with State Government for implementing the guidelines.**

2.86 In the Pilot project conducted by TRAI at Bhopal Smart city, some of the identified street furniture such as electricity pole, metro pillar and overhead water tanks could not be used for small cell deployment due to feasibility issues. For example, some of the electric poles could not be used for deploying small cells because of safety concerns and unavailability of sufficient space at desired height for antenna and RF module. Similarly, overhead tanks were not found suitable due to

unavailability of mounting provisions at required height. Since there are lot of variations in the specifications of street furniture across locations, GIS mapping, image of street furniture and cataloging the street furniture online along with their specifications can serve as an effective and simpler process to know about availability and suitability of street furniture. The Authority is in sync with the stakeholders' suggestion that the list of suitable street furniture can be shared in the centralized online portal after assessing their structural stability (for weight and wind load) and availability of power supply. Recommendations in this regard have already been made above.

2.87 As far as infrastructure mutualization and collaboration is concerned, the Authority has always advocated infrastructure sharing for the sector's growth. Infrastructure sharing enables economies of scale, improves affordability, and avoids duplication of networks where possible. It allows faster rollout of networks and services. World Bank has also advocated that for governments, sharing is an opportunity to expand the knowledge society faster and at lower costs[11]. The Authority in its recommendation on "Infrastructure sharing" dated 11th April 2007 had advocated for sharing of passive and active infrastructure. TRAI has also recommended that infrastructure providers (IP-I) should be allowed provisioning of various active network elements. These recommendations have been made through the recommendations on 'Enhancement of Scope of Infrastructure Providers Category-I (IP-I) Registration' dated 13th March 2020 and reiterated through Recommendations on 'Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed' dated 31st August 2021. Recently, TRAI vide letter (attached as **Annexure III**) to the DoT dated 1st February 2022 had pointed out that infrastructure sharing provisions in Unified License mentioned in the chapters related to generic conditions and authorization specific chapters are at contradiction. Thereby it was

11 https://thedocs.worldbank.org/en/doc/5332/original/WDR16BPInfrastructureMutualisationGarcia.pdf

requested that the DoT should bring clarity on the provisions of sharing of infrastructure under different licenses.

2.88 Infrastructure sharing in the telecom sector has sometimes led to exclusive arrangements entered into by stakeholders. Therefore, apart from mandating sharing of SF, it is also important to ensure equality and non-discrimination in sharing. Exclusive arrangements in the infrastructure sharing needs to be avoided for a level playing field. This would go a long way in ensuring optimum uptake of street furniture for small cell deployment, thereby helping in densification of networks.

2.89 The Authority agrees with the stakeholders' opinion that in case of limited SF availability against demand, equitable distribution with a spirit of accommodating all operators should be followed. When any asset controlling authority is offering their infrastructure, sharing by all possible candidates should be ensured to the extent possible. The Authority therefore feels that apart from cataloguing the available street furniture for sharing, respective CAAs should also ensure that such SF is made available on a shareable and non-exclusive basis. The Authority firmly believes that no exclusive rights of street furniture be given to any TSP.

2.90 **The Authority therefore recommends that enabling provisions or suitable terms and conditions shall be introduced in all telecom licenses and IP-I registration agreement prohibiting the TSPs/IP-I providers from entering into any exclusive contract or right of ways with infrastructure owners/CAAs or any other authority.**

2.91 **The Authority also recommends that DoT should include the following in their advisory guidelines to States:**

i All CAAs or asset controlling authorities should prohibit entering into exclusive rights/exclusive tie-up with any

licensee/registration holder. SF infrastructure should be offered in a non-exclusive and non-discriminatory manner.

ii **In future, tenders for setting up new SF structures by the appropriate authorities, the possibility of sharing of SF on non-exclusive basis, for hosting DCI like small cells and aerial fiber should be kept in mind. The terms and conditions for offering all assets that are catalogued and uploaded on GIS portal, should have a mention that the SF is being offered on non-exclusive basis and will be shared with other eligible entities.**

iii **In line with GatiShakti initiative, in all future projects of utility providers that are partially or fully funded by government to put-up new assets (such as gas pipelines, HT power lines, streetlights) or expand existing assets, provisions to host/support DCI such as small cells, towers, and aerial fiber should be in-built.**

2.92 **The Authority also recommends that DoT should immediately act on TRAI's letter dated 1st February 2022 (attached as Annexure III) and 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.**

2.93 The Authority as per its Recommendations on Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed dated 31st August 2021 had suggested the formation of an agency for undertaking the planning and development of common ducts and posts infrastructure across the country on a non-exclusive basis as below:

7.23 For planning and development of common ducts and posts infrastructure across the country, a central entity, namely

'Common Ducts and Posts Development Agency (CDPDA)', on nonexclusive basis, should be established by the Central Government with the following functions: —

i. *Planning, development, and management of sharable common ducts for laying underground optical fiber cables;*
ii. *Planning, development, and management of sharable common posts for laying overground aerial optical fiber cables and hosting of small cells equipment;*
iii. *Coordinate with Appropriate Authorities to identify an exclusive strip of land of about 0.5 Meter width along public pathways for laying common ducts;*
iv. *Formulating and implementing schemes, including in Public-Private Partnership (PPP) mode, for development of sharable common ducts and posts;*
v. *Coordinate with Appropriate Authorities to exempt RoW charges for development of sharable common ducts and posts;*
vi. *Cross-sector collaboration with other utility providers i.e., roadways, railways, water, electricity, gas etc. for co-deployment of common ducts;*
vii. *Declare terms and conditions of sale/ leasing of common ducts and posts in non-discriminatory manner to service providers and infrastructure providers;*
viii. *Developing and providing consultancy and construction services for common ducts and posts on a national and international level.*

2.94 'Common Ducts and Posts Development Agency' (CDPDA), is expected to coordinate and collaborate with providers as well as seekers of common ducts and posts for creation of common ducts in the country. The back-reference dated 28th June 2022, received from DoT on TRAI's recommendations on "Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed", had suggested that the co-deployment of common telecom duct may be managed by the proposed National Fiber Authority (NFA). TRAI had agreed to the same through its response dated 25th July 2022, thereby replacing CDPDA with NFA. Regarding the above

recommendation, the Authority is of the opinion that the scope of the NFA should be expanded beyond common ducts and telegraph posts, to undertake responsibilities related to above-ground contrivances, appliances, and apparatus. Further, the agency should also be given the responsibility of ensuring that CAAs share street furniture assets on a non-exclusive basis to the extent possible.

2.95 The Authority has observed that the Hong Kong Authority Guidelines[12] on the use of public payphone kiosks/bus stops for the installation of Radio Base Stations (RBSs) for provision of Public Mobile Services, provision has been made for that in case more than one MNOs have made requests to use the same structure and there is insufficient space available to meet the demands of all the MNOs concerned, the Bus company/kiosk owner (CAAs) advises the mobile network operator (MNO) that they should coordinate among themselves to work out a technically feasible solution for the shared use of the structure for the installation of RBSs. In case the MNOs concerned fail to reach agreement for the shared use of a specific structure, they should accept the decision of the CAA which may use a fair and reasonable method to determine the MNO(s) selected to make use of the structure for installation of RBSs.

2.96 The Authority in its earlier recommendations on 'Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed' dated 31.08.2021 vide para 7.11, *inter alia*, has emphasized that the Central Government in coordination with the State Governments should consider constitution of a National RoW Council so that in timebound manner the policy and legal framework for RoW permissions could be put-in-place.

The Authority is of the opinion that the proposed council can oversee the RoW matters concerning access to street furniture as well for small cell deployment. Now that the latest RoW Amendment Rules 2022 have included specific provisions for access to street furniture for small cell

[12] https://www.coms-auth.hk/filemanager/statement/en/upload/567/gn122021.pdf

deployment, the proposed council can monitor the implementation of these rules.

2.97 Considering the above, **the Authority reiterates that its earlier recommendations on 'Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed' dated 31.08.2021 (para 7.23) may be implemented at the earliest. National Fiber Authority (NFA) should be formed in priority to undertake the planning and development of common duct and posts infrastructure. The scope of the agency should be expanded beyond common ducts and telegraph posts, to undertake responsibilities related to above-ground contrivances, appliances, and apparatus. Further, NFA should also be given responsibility of ensuring, in consultation with State Governments that CAAs share street furniture assets on non-discriminatory, transparent, and non-exclusive basis.**

2.98 **The Authority also recommends that in case more than one TSP makes requests to use the same SF and there is insufficient space available to meet the demands of all the requesting TSPs, they should coordinate among themselves to work out a technically feasible solution for shared use of the structure for the installation of equipment. In case the TSPs fail to reach an agreement, they should accept the decision of the CAA which may use a fair and reasonable method to select the TSP(s) who will use the SF**

The above provision should be made part of the Indian Telegraph Right of Way Rules, 2016 through a suitable amendment by issuing a Gazette notification.

2.99 **The Authority reiterates its earlier recommendation on 'Roadmap to Promote Broadband Connectivity and Enhanced**

Broadband Speed' dated 31.08.2021 (para 7.11) for formation of a National RoW Council. All the RoW matters related to street furniture should also be placed before this council.

C. Street furniture and small cell sharing among TSPs and IP-Is

2.100 Infrastructure sharing is critical for small cell networks due to the required density of deployment[13]. In absence of appropriate framework to promote sharing amongst TSPs, it will be difficult to achieve the required small cell densities. SF sharing practices will help India's small cell deployment scenario in terms of enabling economies of scale and affordability. In the discussions related to sharing of street furniture and also active infrastructure through the possibility of a MO-RAN model, the following question was raised in the CP to solicit the opinion of the stakeholders.

vii) How can sharing street furniture for small cell deployment be mandated or incentivized? What operational, regulatory, and licensing related issues are expected to be involved in sharing of small cells through various techniques in the Indian context and what are the suggested measures to deal with the same?

Comments on sharing of street furniture and small cells among TSPs/IPs

Sharing of street furniture

2.101 A couple of stakeholders have suggested that sharing of street furniture should be mandated/incentivized through insertions of suitable clauses in the tenders for all the PPP projects. One stakeholder suggested that the scope of IP should be enhanced and TSPs should be asked to avail the facility provided by the IPs instead of developing their own system.

[13] https://ec.europa.eu/downloadPublic?documentIds=PPGMS

This will reduce the cost, enhance the utility of small cells, ease the maintenance of networks at street furniture, thus leading to a full expansion of 5G services and fair competition between TSPs. An association had added that IP-Is should be the first one to be offered development of common infrastructure. Exclusive rights of laying infrastructure should be given to ensure some long-term business viability

2.102 In order to encourage sharing of street furniture, a few incentivization strategies were shared by the stakeholders. One suggestion was on providing financial incentives in payment of Spectrum usage charges (SUC)/License fee (LF). Another suggestion was that there should be both fiscal and non-fiscal incentives for the operators. A stakeholder suggested that wherever suitable, sharing should be incentivized and any revenue from such sharing should be allowed to be deducted from Gross Revenue while calculating the AGR/ApGR. Currently IP-Is who provide overground infrastructure already follow a mechanism of subsidizing the fees based on the number of tenants on a particular site. A similar process could be adopted for incentivizing the services providers while sharing the street furniture. The application of the Plan Build Operate (PBO) model which provides land use rights to TSPs/IPs to create and share the infrastructure among themselves was another suggestion put forward by a service provider.

2.103 One of the service providers is against mandating sharing of street furniture because sharing of the same structure by multiple TSPs would make the individual site bulky and it will be difficult to maintain the aesthetic appeal. Further, the current stringent EMF requirements, if unchanged for small cells, would be a massive deterrent for small cell sites to be co-located. Further, it might be difficult to accommodate all the independent requirements of TSPs at a single location. The following alternate solutions were provided to tackle the same:

i. TSPs to deploy at alternate site locations rather than co-locating at a single location.

ii. Smart Poles can be deployed by the TSPs which will cater to all the TSPs and city requirements which can be incentivized by offering OFC RoW and waiver of some fees.

Sharing of small cells

2.104 Stakeholders have expressed varied opinions regarding small cell sharing. As per majority of the comments, sharing of small cells among telecom licensees should be left to mutual negotiations, and no regulatory intervention is required. Out of those in favor of small cell sharing, two of them are of the opinion that there is no issue in such sharing since it does not entail spectrum sharing and hence no licensing or regulatory hurdle is envisaged for a telecom licensee. Some stakeholders have suggested encouraging MO-RAN based sharing as discussed in the CP. It has been suggested that the capital cost involved in installation of network shall be borne by all TSPs equally, but operational cost may be apportioned amongst TSPs according to the share of total traffic by each TSP.

Analysis of the issues and views of the Authority

2.105 In a pilot study conducted at Amsterdam, a TSP collaborated with a global leading company which owns over 100,000 street furniture assets in the Netherlands. The SF owning company had existing agreements with the local authorities, with contracts of 10-20 years already in place. By leveraging these existing permits, the said TSP and other operators were able to significantly speed up their small cell rollouts. The street furniture used included facilities for powering the small cells and terminating fibers that were laid on the street, thus eliminating or reducing the need for additional civil works and providing future-proofed high-speed backhauling capable of supporting upgrades to 5G. One additional major benefit of the same was that it enabled multi-operator passive sharing (MO-RAN) by accommodating up to four separate small cells within the same street furniture asset. This is an example of how

street furniture sharing, and small cell sharing can speed up the deployment.

2.106 Some stakeholders have suggested adoption of MO-RAN model in case small cell sharing is to be done. For this, the Authority points out that the DoT has already enabled sharing of radio elements for Access and ISP authorizations under the UL and UL-VNO licenses 2022, in Operating conditions for 'Sharing of Infrastructure' stated as under:

> *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.*

The Authority opines that MO-RAN sharing can be adopted on a mutually agreed basis by licensees as per their license terms and conditions and no additional action or separate provision for small cells radio equipment is required at this moment.

2.107 The Authority is of the view that actual deployment scenarios for small cells scenarios are still emerging. The involved cost structures in different deployment scenarios are still uncertain. This also came out from the pilot study conducted by TRAI. Sharing will happen only in such deployment scenarios where cost savings are substantial. The Authority agrees with submissions of stakeholders that sharing of small cells should be left to mutual negotiations for the time being and that no regulatory intervention for sharing of small cell radio equipment is required at this stage. This may however be later reviewed when clear deployment scenarios emerge and there is better understanding of costs involved in different deployment scenarios.

2.108 The Authority agrees with stakeholders that sharing telecom infrastructure helps in expanding network coverage, reducing CAPEX

and OPEX and minimizing duplication of infrastructure. The possibility that sharing can be mediated by a neutral third party (e.g., IP-I companies), which serve multiple service providers in each site, even as their individual networks remain competitively independent of each other, makes sharing an interesting option. Currently IP-Is who provide overground infrastructure already follow a mechanism of subsidizing the fees based on the number of tenants on a particular site. Thus, sharing has an inherent incentivization mechanism whereby the participating entities gain through reduced costs. Despite that, the Authority has observed during the four Pilot projects that TSPs were not very keen on adopting to sharing. The Authority is of the opinion that in a market where there are large number of players, the inherent or inbuilt incentives of cost reductions can promote infrastructure sharing. However, in a market which has only a few players, some players may look at building exclusive networks to gain competitive advantage. This may not be in the overall interest of the country where large investments are still required to build DCI in every nook and corner of the country. The Authority thus feels that there is a need for a nudge intervention whereby there should be incentives for those Telecom Service Providers who build infrastructure and come forward to share it with others. TSPs who lease their infrastructure for sharing (lessor) should get some incentives. One of the ways of offering them an incentive is by way of allowing deduction of revenues earned by the lessor TSP by way of the payments received from the lessee (the other TSP who seeks to use the infrastructure of lessor TSPs for sharing) from their Gross Revenues (GR) for arriving at Applicable Gross Revenues (ApGR).

2.109 IP-Is are the main players to be offered development of common sharing infrastructure, as their business model is based on sharing on a non-discriminatory manner. The revised guidelines[14] for registration of IP-I, 2021 provisions that the registration of IP-I shall be on a non-exclusive

[14] https://dot.gov.in/sites/default/files/RevisedIP-1Guidlines22122021.pdf?download=1

basis without any restriction on the number of tenants and shall provide for the use of infrastructure in a non-discriminatory manner.

2.110 The following are the relevant extracts from the IP-I registration guidelines:

"The Infrastructure Providers Category-I are those Infrastructure Providers who provide assets such as dark fibers, Right of Way, duct space & tower.

.....

8. The IP-I registered company shall provide dark fibers, Right of Way, duct space, towers on lease / rent out / sale basis to the licensees of telecom services on mutually agreed terms and conditions."

.....

2.111 The following are the relevant extracts from the IP-I registration certificate

"This is to certify that M/s ----------with registered office at ---------- is registered as Infrastructure Provider Category I (IP-I) to establish and maintain the assets such as Dark Fibers, Right of Way, Duct Space and Tower for the purpose to grant on lease/rent/sale basis to the licensees of Telecom Services licensed under Section 4 of Indian Telegraph Act, 1885 on mutually agreed terms and conditions."

2.112 The existing guidelines as quoted above are focused on macro cells. With the evolution of 5G services, the Authority is of the opinion that these guidelines should be modified to include the term 'poles' as defined in the RoW-2016 rules, (as amended in 17.08.2022).

2.113 **In view of the aforesaid, the Authority recommends that charges paid by lessee TSP to lessor TSP for use of shared infrastructure should be reduced from the Gross Revenues of**

the lessor TSP to arrive at Applicable Gross Revenue (ApGR) of such Lessor TSP. To implement this, a new item named as "Revenue earned from other licensed TSPs from sharing/leasing of infrastructure" should be inserted under existing license condition named as "List of other items to be excluded from GR to arrive at ApGR". This modification may be carried out in UL, UL(VNO) and ISP licenses. Also, the information collected in the "Format of Statement of Revenue and License Fee" that is attached with each authorization chapter in UL, UL(VNO) and with ISP licenses needs to be modified to capture information from such revenues under a separate head.

2.114 **The Authority also recommends that the guidelines and registration agreement of IP-I providers should be modified to exclusively mention the term 'poles' in their scope of work.**

D. Process Simplification, Permission Exemption, Standardization of small cells and Installation practices

2.115 The use of higher frequency bands, lower penetration of those frequencies, large bandwidth and low latency requirements of 5G use cases will require thousands of small cells in an area. Accordingly, the EU Staff Commission document, 2020 states that "If the current rules on deployment of macro-cells remain applicable also to small cells, without exceptions, this would have a multiplicative effect on the administrative effort to request, assess and grant individual permits. The resource burden both on the operators' side and on the public administrations' side would become excessive and thus cause long delays and finally stifle investment". The importance of adopting a system where approvals are provided at a national level using generic

declarations and standardized classes in order to evolve towards a system of simplified, standardized, and repeatable set of processes was covered in the CP. The Authority had taken up the subject in detail and studied the best practices being followed by various countries.

2.116 Comments relating to the need for standard documentation and adoption of international standards for permit exemption, were solicited from the stakeholders through the following questions. A question related to the need for standardization of small cell equipment or installation practices was also posed alongside.

viii) Should there be permission exemption for deploying certain categories of small cells at all places or all categories of small cells at certain places (Like apartments etc.)? What legal framework will support such exemptions?

ix) What should be the criterion/ conditions (like power, height etc.) and administrative procedure for implementing such exemptions? Please provide exact text with detailed justifications.

x) For Small Cells that do not fall under the exemption category, should there be a simplified administrative approval process (like bulk approvals etc.) for deployment? If yes, what should be the suggested process? If not, what should be the alternative approach?

xi) Is there a need for standardizing the equipment or installation practices for next generation small cell deployment on street furniture? If yes, what are the suggested standards and what should be the institutional mechanisms for defining, and complying to them?

Comments on permit exemption and criteria for exemption for installation of small cells

2.117 Broadly, most of the stakeholders opined on adopting the concept of permission exemption for small cells. But their views diverge on the location and type of small cells that can be exempted. Stakeholders have

suggested a) exemption from paying user charges, b) exemption from building permits, and c) exemption from frequency exposure certification for small cells. Regarding the questions on the two types of exemption posed in the CP, few of them have suggested that all categories of small cells can be exempted at certain places. Few of the others suggested that only certain categories of small cells need to be exempted at all places or certain places. The suggested areas for exemption include common areas in apartment complexes/buildings, privately owned commercial places like shopping malls/complexes and Government or PSU buildings. Small cell infrastructure to be installed within such existing buildings can be exempted from specific notification or other permission requirements.

2.118 A few stakeholders have suggested that wall mount outdoor small cells and those small cells with an EIRP less than 10W can be exempted from permissions. Along with small cells, it was also suggested that Micro-Communication equipment, supporting telecom infra like in-building fiber laying, installing termination boxes, putting OLTs, laying ODN should also be exempted from formal permissions. One service provider has stated that there should be no restriction on the type of small cells installed as long as it meets the EMF radiation norms of DoT. Another suggestion was that safety and structural capacity of the infrastructure should be the only consideration for deciding small cell installations and no other permissions should be required.

2.119 One of the stakeholders had suggested that for small cells working at the same EIRP, the exemption process should be decided separately for rural and urban areas, and indoor vs outdoor installations. Another stakeholder suggested that different slabs of technical specifications based on the size, shape, area of coverage can be defined and within those slabs, certain categories could be exempted from the permissions. The building code should also be modified to provide for identified space for these exemption category small cells in the building.

2.120 Majority of the stakeholders have proposed that criteria based on power emitted and deployment heights needs to be adopted and a general declaration and certification of the equipment at a national/regional/local level can be made. It was also suggested by a stakeholder that either the DoT in consultation with the operators or TEC in conjunction with TRAI, should have a detailed discussion with TSPs and Original Equipment Manufacturers (OEMs) to decide on the permit exemption mechanism and criteria. A suggestion to consider additional factors such as maximum radiated power, minimum loss between transmitter and passing people, and network performance was also put forward by one of the associations for prescribing necessary exemptions. It was put forward by one of the Smart cities that TRAI should develop standards and guidelines similar to Europe's EECC for public and privately owned buildings by incorporating permissible criteria on the power, antenna position, etc. A few of the stakeholders opined that India should adopt installation classes IEC 62232 and ITU-T K10032 similar to those adopted by the EU as discussed in detail in the CP. Some other ranges of factors have been suggested for consideration including area, volume and radio characteristics. An association has cited the example of the USA that has adopted rules exempting small cells from environmental assessments that meet certain limitations on size and visibility. The following table summarizes some of the submissions of stakeholders on exemption criteria for small cells.

Table 2.2: Suggestions of small cell and site wise permit exemption criteria

	Stakeholder 1	Stakeholder 2	Stakeholder 3	Stakeholder 4
Output power	4*5W	1.2- 1.5 KW	38dBm	<10W
Duplexing	4*4 MIMO			
Permissible deployment height	>3m	6 m	>=10m	> 9m
EMF Applicable	>1000W			

Power	3KW			
Power backup	4hrs			
Weight of equipment		100 to 150 KG (3 Small Cells + power back up + FDB with fiber)		

2.121 A couple of the stakeholders have stated that the RF-EMF compliance boundaries typically evaluated based on peak transmit powers create overly conservative RF-EMF limits that constrain the density of small cell deployments. For facilitating network densification, they suggest that the EMF exposure levels should be reviewed, and the recent guidelines issued by ICNIRP in 2020 be adopted in India also.

Comments on Simplified administrative approval process for Small Cells installation that do not fall under the exemption category

2.122 For those small cells that do not fall under the exemption criteria, most stakeholders have unanimously proposed for the implementation of a one-time bulk approval/intimation route through simple online process/digital tools. Another suggestion put forward by the majority was around reducing the approval timelines to 15-30 days with automatic deemed approval after 30 days through online portals. In contrast to the suggestion of bulk approval, one of the stakeholders has stated that administrative approval may be necessary and should be decided case to case, instead of bulk approval.

2.123 It was proposed by a service provider that the small cells not falling under the exemption category should be kept under a much-simplified administrative self-certification based deemed approval process. Since the output power of small cells is much less compared to macro cells, small cells can be installed at lower height as it emits lower power, hence a generic declaration conforming to the maximum allowable power under the small cells category should be sufficient without any additional document process. The documentation requirement can be

simplified through this self-certification mechanism with a minimum one-time fee covering all types of costs for such small cells.

Comments on Standardization of small cell equipment or Installation practices

Standardization of small cell equipment

2.124 Since standardization of small cell equipment might have both pros and cons on the deployment of small cells, a few stakeholders are in favor while a few are against standardization. A stakeholder has suggested that the standards of equipment and installation practices may be fixed so that new street furniture may conform to it, and existing street furniture may adapt. Another stakeholder has added that manufacturers of small cell equipment must ensure that they conform to relevant technical standards and to any essential requirements in terms of health and safety. A suggestion provided is that TEC in consultation with TSPs can come up with broad guidelines for design specifications through a separate activity and that no other local agency/body/authority should prescribe any requirements. It has also been suggested that standardization should be market driven.

2.125 Two stakeholders have commented that the size of small cell equipment (cabinet, holding box, device dimensions, etc.) should be standard, be modular in nature for installation and deinstallation needs and that there should not be any additional requirement for wiring. As per another stakeholder, similar to BIS, IEC, ARAI etc. standard creating bodies, the Government shall entrust public bodies to verify and provide approvals based on relevant parameters of the equipment and installation process. Another suggestion was that the equipment should comply with TEC standard TEC 13019:2021, as may be amended from time to time. One stakeholder suggested that configurations such as RF frequencies, backhaul connectivity (OFC, microwave etc.), wind speed/load, noise (not greater than 65 dBA measured at 25 feet), and structural integrity can be considered for equipment standardization. An

association has suggested exploring and standardizing convergence of fiber and power connectivity and giving emphasis on new OFC technologies such as Ribbon technologies. Further it was suggested that telecom infrastructure deployed under the National Building Code (NBC) /within any premises must comply with fire safety requirements like the CPR rating in European countries. In contrast to the above, a few of the stakeholders believe that an immediate need for this standardization may not be prudent and may even be counterproductive at this stage. Therefore, they proposed that standardization needs to be done only for structures, poles and other street furniture that will be developed in the future.

Standardization of installation practices

2.126 A few stakeholders state that the deployment templates will emerge under the market-based evolution, therefore standardization of installation practices is not prudent currently. Contrarily, one of the service providers opines that depending on the street furniture category, deployment and installation guidelines can be specified to minimize visual impact and ensure positive opinion from the public. Another stakeholder adds that TEC can issue guidelines in respect of the structural safety of the SF for installation of small cells. A stakeholder has suggested detailed characteristics of installation for outdoor small cells which is as follows: The power of the small cell should be between 1.2 to 1.5 KW and the antenna should be placed at a height of six meters. Given that the pole can usually sustain up to 100 to 150 kg, it can accommodate three small cells, power backup and FDB with fiber. Clamps should be made available in the SF for mounting small cell and the SF shall be able to withstand a predefined applicable wind velocity in that area under maximum permissible loading

Analysis of the issues and views of the Authority

2.127 The Authority recognizes that the issuance of individual permissions for small cells at the state, regional or local level can make it difficult for

operators to keep track of the variety of rules and processes that will be followed by each authority. To deal with the humongous volume of small cell installation permissions continuing with the existing process may become difficult not only for telcos but also for permission processing authorities. Process complexity and also resource bottlenecks will result in delays as the number of applications increases. The Authority feels that introducing a permit-exempt regime can aid in minimizing such delays and will help in quick modernization and upgradation of the networks. A permit-exempt regime will help in ease of doing business for service providers thus resulting in quicker rollout of the next generation network. At the same time, there is need to keep in mind that public health is protected, and visual landscape remains coherent. Therefore, the most important factor for creating an exemption regime is the selection and specification of characteristics that serve balanced interests of various stakeholders, generate public acceptance as well as improve network rollout significantly.

2.128 As far as the radio frequency related monitoring is concerned, in India, the Department of Telecommunications (DoT) gives guidance on the EMF exposure assessment, providing various categories based on the reference from several ITU recommendations and international standards. The TEC report on "Test Procedure for Measurement of Electromagnetic Fields from Base Station Antenna, No: Tec 13019: 202" has released a test procedure to ensure that the EMF exposure from cellular base station installations conform to the exposure limits prescribed by DoT.

2.129 TEC has also provided for the audit requirement of base stations in line with the introduction of Low Power Base Transceiver Station (LPBTS) (having EIRP limited to 100 W) in the Indian telecom market. Simplified Assessment Procedure criteria based on mounting height, main lobe direction and distance to other ambient sources as EMF evaluation techniques has been adopted as per the ITU-T Recommendation K.100. Out of the three classes of base stations defined by the TEC, the

Inherently compliant category includes base stations with EIRP <=2W where no assessment procedure is required, only self-certification is needed. The normally compliant class includes those base stations with EIRP > 2 and ≤ 100 Watts. For this class, a report is to be filed proving that compliance as per Simplified Assessment Criteria (SAC) (as per Table 2.3) is exhibited. The Provisionally compliant class that includes base stations with EIRP >100 Watts EIRP shall be subjected to LSA Units audit by measurement of EMF exposure levels using Broadband / Frequency selective measurement procedures.

Table 2.3: Simplified assessment criteria as per No: Tec 13019: 202

Restriction on minimum height of lowest radiating part of antenna and minimum distance to areas accessible to general public in the main lobe direction for Low Power Base Station (EIRP <100 W)

Table 1: For base stations with Frequency of operation between 400 MHz to 2000 MHz

Sr. No.	EIRP (in Watts)	Minimum Height(in metres) as per different antenna tilts in degrees				Minimum distance (in metres) for publically accessible area in the main lobe direction	Minimum distance (in metres) for other emitters (≥ 10 W) in the main lobe direction
		0°	5°	10°	15°		
1	≤ 2	No specific criteria. According to [ITU-T K.52] emitters with a maximum EIRP of 2 W or less are inherently compliant					
2	≤ 10	2.5	2.7	2.8	3.0	1.9	9
3	≤ 20	2.8	3.0	3.2	3.4	2.6	13
4	≤ 30	2.9	3.2	3.5	3.7	3.2	16
5	≤ 40	3.1	3.4	3.7	4.0	3.7	19
6	≤ 50	3.2	3.5	3.9	4.2	4.2	21
7	≤ 60	3.3	3.7	4.1	4.4	4.6	23
8	≤ 70	3.4	3.8	4.2	4.6	4.9	25
9	≤ 80	3.5	4.0	4.4	4.8	5.3	26
10	≤ 90	3.6	4.1	4.5	4.9	5.6	28
11	≤ 100	3.7	4.2	4.7	5.1	5.9	29

Table 2: For base stations with Frequency of operation between 2000 MHz to 40000 MHz

Sr. No.	EIRP (in Watts)	Minimum Height(in metres) as per different antenna tilts in degrees				Minimum distance (in metres) for publically accessible area in the main lobe direction	Minimum distance (in metres) for other emitters (≥ 10 W) in the main lobe direction
		0°	5°	10°	15°		
1	≤ 2	No specific criteria. According to [ITU-T K.52] emitters with a maximum EIRP of 2 W or less are inherently compliant					
2	≤ 10	2.5	2.6	2.8	2.9	1.8	9
3	≤ 20	2.7	2.9	3.1	3.3	2.5	13
4	≤ 30	2.9	3.1	3.4	3.6	3.1	16
5	≤ 40	3.0	3.3	3.6	3.8	3.6	18
6	≤ 50	3.1	3.5	3.8	4.1	4.0	20
7	≤ 60	3.2	3.6	4.0	4.3	4.4	22
8	≤ 70	3.3	3.7	4.1	4.5	4.7	24
9	≤ 80	3.4	3.9	4.3	4.7	5.0	25
10	≤ 90	3.5	4.0	4.4	4.8	5.4	27
11	≤ 100	3.6	4.1	4.5	5.0	5.6	28

2.130 The guidelines developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) are widely adopted by national authorities around the world. In terms of providing protection for 5G technologies, the latest ICNIRP guidelines in 2020 for limiting exposure to Electromagnetic fields (100 kHz to 300 GHz) has made several changes to ensure that new technologies such as 5G will not be able to cause harm, regardless of our current expectations. Reference levels have been derived to provide an equivalent degree of protection to the basic restrictions, and thus an exposure is taken to be compliant with the guidelines if it is shown to be below either the relevant basic restrictions or relevant reference levels. Table 2.4 presents the latest reference levels for local exposure averaged over six minutes.

Table 2.4: ICNIRP Reference levels for local exposure, averaged over six min, to electromagnetic fields from 100 kHz to 300 GHz (unperturbed rms values)

Exposure scenario	Frequency range	Incident E-field strength; E_{inc} (V m^{-1})	Incident H-field strength; H_{inc} (A m^{-1})	Incident power density; S_{inc} (W m^{-2})
Occupational	0.1 – 30 MHz	$1504/f_M^{0.7}$	$10.8/f_M$	NA
	>30 – 400 MHz	139	0.36	50
	>400 – 2000 MHz	$10.58f_M^{0.43}$	$0.0274f_M^{0.43}$	$0.29f_M^{0.86}$
	>2 – 6 GHz	NA	NA	200
	>6 – <300 GHz	NA	NA	$275/f_G^{0.177}$
	300 GHz	NA	NA	100
General public	0.1 – 30 MHz	$671/f_M^{0.7}$	$4.9/f_M$	NA
	>30 – 400 MHz	62	0.163	10
	>400 – 2000 MHz	$4.72f_M^{0.43}$	$0.0123f_M^{0.43}$	$0.058f_M^{0.86}$
	>2 – 6 GHz	NA	NA	40
	>6 – 300 GHz	NA	NA	$55/f_G^{0.177}$
	300 GHz	NA	NA	20

[a] Note:
1. "NA" signifies "not applicable" and does not need to be taken into account when determining compliance.
2. f_M is frequency in MHz; f_G is frequency in GHz.

(Source: ICNIRP EMF guidelines 2020)

2.131 Several stakeholders through their comments had shared that the EMF exposure levels should be reviewed, and the recent guidelines issued by ICNIRP in 2020 be adopted in India for facilitating the network densification, they suggest. The Malaysian Government is an example of a country that has affected revision of EMF standards in view of the

change in ICNIRP guidelines brought in 2020 and the EU through its Staff Commission working document had also shared that the ICNIRP guidelines 2020 confirm the health safety margin of existing EMF exposure limits at the EU level set out in Recommendation 1999/519/EC. In the revised MS-EMF, the Malaysian Commission decided to follow Table 5 of ICNIRP guidelines for assessment for EMF exposure over the whole body from radio communications infrastructures (RCI).

2.132 Recent actions taken by DoT/TEC to create special EMF compliance dispensation for Small Cells:

a. Vide letter dated 27.08.21, DoT issued revised "TEST PROCEDURE FOR MEASUREMENT OF ELECTROMAGNETIC FIELDS FROM BASE STATION ANTENNA No: TEC 13019: 2021". Vide Para 4.1 of Part A of this document TEC has stated … "*Normally compliant: Normally compliant installations contain sources that produce EMF that can exceed relevant exposure limits. All base stations with EIRP between > 2 and ≤ 100 Watts are considered as normally compliant and >100 Watts EIRP are considered as provisionally compliant. As a result of normal installation practices and the typical use of these sources for communication purposes, the exceedance zone of these sources is not accessible to people under ordinary conditions. Examples include small cells with low transmit power (with EIRP ≤ 100 Watts) and antennas mounted on sufficiently tall towers. Precaution may need to be exercised by maintenance personnel who come into the close vicinity of emitters in certain normally compliant installations.*" So, a Small Cell was defined as equipment radiating EIRP<=100 W. The same Para stated that the LSA Units may conduct only physical audit of base stations covered under Simplified Assessment Criteria for checking compliance to the requirement based on the EIRP declared by the TSP and no measurements need be conducted.

b. DOT vide letter 09.05.22 issued instructions for "Simplification of SACFA siting clearance guidelines- procedure for clearance of Low Power BTS/ small cells i.e., Micro, Pico and Femto cells on existing street furniture/infrastructure and the cases of additional antenna". These instructions inter alia stated *"...it has been further decided that the following guidelines shall be applicable for the SACFA siting clearance for Low Power BTSs (EIRP <=100W) ... The requirement for a formal application for SACFA processing is done away with for such Low Power BTSs..."*

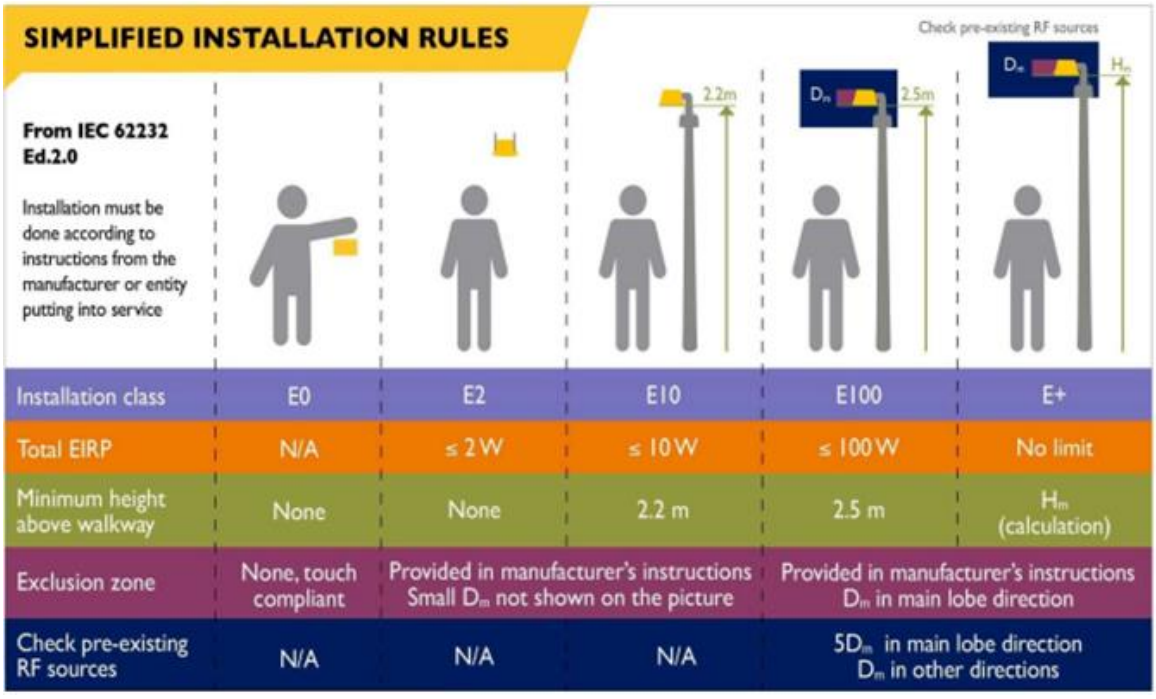
2.133 TRAI conducted four pilots at International Airport (New Delhi), Kandla Port (Gujarat), Bengaluru Namma Metro (Karnataka) and Bhopal Smart City (MP) to understand challenges for using Street Furniture at these places for mounting Small Cells. During these Pilots TSPs used the 5G small Cells of EIRP <= 600W to demonstrate how small cells of these capacities mounted on street furniture can be used to meet coverage and capacity requirements of these places.

2.134 As validated from the responses received, installation procedures for small cells are usually developed and established based on internationally accepted equipment classes and such international reference accepted by the national authorities to enable generic permits for installation and operation. As was elaborated in the CP, a common approach for base station classification is through the basis of installation classes derived from parameters, including transmit power, effective isotropic radiated power (EIRP), antenna installation height and installation location (outdoor or indoor). A number of standards have been specified by various standard developing organizations (SDOs), to reduce inconsistencies in the selection of classification parameters in different regulatory regimes. The current consensus seems to be building around the IEC 62232 Ed.2.0 guidelines as the preferred classification method which uses criteria of EIRP and antenna

installation height but also provides more detailed elaboration on technical rationale and evaluation approaches.

2.135 Several countries across the world have a regime for small cells focused on ensuring aesthetical visual appearance and sufficiently low emission power for building public acceptance and ensuring safety of the public. The current global landscape witness's diversity in parameters and the limits used to qualify sites for exemptions. As discussed in the CP, the EU uses the IEC 62232 guidelines to specify that an overall emission power limit not exceeding 10 W of equivalent isotropic radiated power (EIRP) (applicable to E10) as well as class-dependent requirements as one of the criterions to provide exemption from building permits. Figure 2.2 shows a pictorial representation of the IEC 62232 and ITU K100 simplified installation rules.

Figure 2.2: Pictorial representation of IEC Simplified Installation Rules



2.136 A few other countries have used location as the criteria to give exemption. In Cyprus, if the base station is "outside the boundary of urban development" then site permits are not needed when the antenna mast is less than 25 meters tall. Transmitters inside buildings in

Lithuania and transmitters in privately owned buildings of Spain are granted exemption from permits. Based on the power parameter, some countries have provided exemptions. In Belgium, no environmental permit is needed for transmitters with ERP of 2 W or less. In Estonia, no permits or Health Board approval are needed for base stations with ERP ≤100W. For France, no declaration or ANFR (French Regulatory agency for spectrum management) authorization is needed for stations radiating less than 1 W EIRP. Any station operating on an assigned frequency at 1-5 W EIRP, which is their de facto definition of small cells, must notify ANFR and the local governing authority about the station's technical characteristics. In Germany, radio stations with EIRP of 100 mW or less do not need site certificates. BNetzA (Federal Network Agency) must be notified two weeks in advance about the commissioning of new or substantially modified stations whose EIRP is greater than 100 mW, but less than 10 W and civic authorities must be informed at the same time. In certain parts of Italy, for base stations <10 W and surface area <0.5 m^2 the local planning authority requires notification but does not have to decide on a permit.

2.137 In Denmark, local permits are not needed for panel antennas for mobile communication with associated radio modules and transmission links in neutral colors, set on existing masts used for public mobile communications when the height of the building is not increased. In Sweden, antennas (and thereby small cells) are exempted from building permits if they do not materially change the appearance of the building. Some municipalities in Amsterdam and Barcelona have been supporting low visual impact installations by conducting public campaigns for encouraging aesthetical designs of SAWAPs. Finland is another country that has initiated the same through a nationwide design competition in Helsinki on "standard model designs" which can smoothly fit a variety of environments and are easily scalable for mass production.

2.138 From the aforesaid, it can be seen that there are diverse practices adopted by countries for exempting different types of permits based on

the location and power parameters used. Some other parameters such as mounting, total size of equipment, mast height, appearance, etc. have also been adopted. Considering that one of the primary factors for exemption adopted commonly by most countries is the EIRP of the small cell equipment, the Authority feels that exempting certain categories of small cells at all places through use of EIRP as an exemption criterion is an approach that can be adopted in the context of India also.

2.139 In the four Pilots that were carried out by TRAI on deployment of small cells and aerial fiber on street furniture, most of the small cells used by TSPs had maximum EIRP between 52 dBm to 57.5 dBm (say up to 600 watts). The Authority has noted that TEC has currently defined Low power Base Station Transmitters (LPBTS) as having EIRP limited to 100 Watts in its TEC Test Procedure No: TEC/TP/EMF/001/02.OCT.2012 on Simplified Assessment Procedure for EMF compliance of Low Power BTS dated 16.11.2015. TEC document acknowledges the fact that such BTSs are small in size and radiate lower power vis-a-vis micro BTS and therefore, they require different treatment from the point of view of audit of EMF radiation limits already laid down by the DoT. The audit requirement for these types of BTS has been accordingly called Simplified Assessment Criteria (SAC). This TEC document details the self-certification requirement from the TSP and audit by TERM Cells under SAC. There are certain concessions given to such LPBTS sites. For example, there is no requirement of signage for the BTS falling under SAC. TERM Cells may conduct physical audit of BTS covered under SAC for checking compliance to the requirement based on the EIRP declared by the TSP and no measurements need be conducted. Any violation of this requirement will be dealt with as per the procedure prescribed by DoT/Licensor. However, while conducting measurement for EMF compliance for BTSs not covered under SAC, the EMF contribution from micro BTS to the total radiation will also be taken into consideration. In such cases, micro BTS radiation must meet the prescribed EMF limit. The format for self-certification of such LPBTS has been provided as follows in Figure 2.3:

Figure 2.3: Format for self-certification of low power BTS

FORMAT FOR SELF CERTIFICATION OF LOW POWER BTS

SITE DATA & TECHNICAL PARAMETERS

Name of TSP:

Name of the BTS :

Sr. No.	Item	Units	Site Data
1	Site ID		
2	Date of Commissioning		
3	Address		
4	Lat / Long (minimum 5 decimal places)	deg	
5	Pole/wall Height	(m)	
6	Height of lowest part of radiating antenna(s) from public accessible area	(m)	
7	Make and model of Antenna/BTS		
8	System Technology (GSM/CDMA/W-CDMA/ OFDM)		
9	Base Channel Frequencies (BCCH/CPICH/PBCH)	(MHz)	
10	No. of Carriers / Sub-Carriers		
11	Antenna Gain	dBi	
12	Tx Power	(dBm)	
13	EIRP	(dBm)	
14	Any radiating element within 14 meters in the main lobe direction & 2.7 meters in any other direction.	Yes/No	

It is to certify that above BTS comply with the installation criteria/ technical requirements mentioned in Table-1 of Addendum No. 4 to TEC Test Procedure No: TEC/TP/EMF/001/02.OCT. 2012 , Dated : 16-11-2015

Signature of authorised representative of TSP

2.140 As has been discussed above, TEC has also provided for the audit requirement of base stations in line with the introduction of LPBTS (having EIRP limited to 100 W) in the Indian telecom market. Simplified Assessment Procedure criteria based on mounting height, main lobe direction and distance to other ambient sources as EMF evaluation techniques has been for normally compliant class that includes those base stations with EIRP > 2 and ≤ 100 Watts. Since most of the small cells that are being deployed are having EIRP upto 600 watts, the Authority feels that it would be prudent to revise the EIRP limits for

LPBTS definition upto 600 watts. The normally compliant class should include those base stations with EIRP > 2 and ≤ 600 Watts and TEC should accordingly modify the tables (As provided in Table 2.3) for this class.

2.141 In the matter of conducting EMF audit and providing self-certificates by the licensees, DoT through a notification[15] dated 4th February 2021 has reviewed the biennial submission of self-certificates confirming compliance to the EMF norms as prescribed by the ICNIRP from time to time. The cycle of submission has now been changed from two years (biennial) to three years (triennial). Further, the triennial submission of self-certificate shall not be done if following self-certificates have been submitted by the TSPs during the three-year cycle: -

a) Self-certificates for New BTS

b) Self-certificate for Upgradation of BTS.

c) Self certificate due to upgrade/ addition of BTSs of other/ sharing TSP.

DoTs instructions on the matter have been attached as **Annexure IV**.

2.142 **The Authority, therefore, recommends that Low Power Base Transceiver Stations (LPBTS) should be defined as those BTS that radiate EIRP<=600 W. Such equipment/small cells should be exempted from seeking any kind of permission from any Authority except from the Street Furniture/building owning Agency at all places.**

2.143 **DoT's simplified EMF compliance framework should redefine normally compliant class to include those LPBTS**

[15] https://dot.gov.in/sites/default/files/04-02-2021.pdf?download=1

with EIRP > 2 and ≤ 600 Watts and TEC should accordingly modify the tables (As provided in Table 2.3) for this class.

2.144 **Recent actions have been taken by DoT for simplifying the process for SACFA compliance, for low power equipment/small cell radiating EIRP<=100 W. DoT should increase this limit to 600W to cover most of the Small Cells/LPBTSs that are being deployed.**

2.145 **Presently TERM Cell is required to audit 10% of sites for which TSPs have submitted self-certification to their offices. TERM cells for undertaking this exercise depend upon TSPs like providing Testers etc. However, considering the sheer volume of Small Cells, which otherwise may put severe strain on TERM cell and TSPs resources, this audit criteria for Small Cell may be relaxed. DoT should consult the Ministry of Statistics and Programme Implementation (MOSPI) to come up with a scientific sample size for auditing BTS/small cell sites.**

2.146 **Presently TSPs are required to provide self-certification for EMF radiation compliance every three years. However, considering the sheer volume of Small Cells, which otherwise may put severe strain on TSPs resources, self-certification criteria for LPBTS should be relaxed to five years.**

2.147 In addition to the exemptions for those cells that will require permissions for installations, the Authority is of the view that putting in place a

simplified administrative process can reduce time and costs. This will be beneficial for both the Government and the Industry.

2.148 The concept of batched applications for small cells has been provisioned by the FCC in USA. As per the FCC, shot clocks are defined as the time frame within which the authority generally must act on a given wireless application. The code has presented its discussions on whether the batched applications should be subject to either longer or shorter shot clocks than would apply if each component of the batch were submitted separately[16]. Each small cell application will fall within either of the two categories –

i. Review of an application to collocate a Small Wireless Facility using an existing structure: 60 days, or
ii. Review of an application to deploy a Small Wireless Facility using a new structure: 90 days.

2.149 As per the code, if a single application under either of the above categories seeks authorization for multiple deployments, then the reasonable period of time for the application as a whole is equal to that for a single deployment within that category. If a single application seeks authorization for multiple deployments wherein the components are a mix of deployments of the two categories, then the reasonable period for the application as a whole is 90 days.

2.150 At state level, the Punjab Government has come out with a draft policy where they have tried to simplify the administrative process for approval of small cells. It is provided in the draft policy that the telecom service providers/infrastructure providers shall take one time permission from the competent authority through an online application on the Punjab Invest Business First Portal (pbindustries.gov.in). The permission shall be given by the concerned department/corporation/agency within a maximum of 60 days of making the application. To speed up the approval process, for site locations where electricity authorities or any

[16] https://docs.fcc.gov/public/attachments/FCC-18-133A1.pdf

other appropriate authority have permitted the installation of small cells and/or aerial optical fiber, further permission from municipal corporations or local bodies may not be required.

2.151 As far as duration of permission is concerned, the deemed approval for permissions for usage of street furniture for small cell and aerial fiber deployment is 60 days as per sub-rule 3 of 10A in the Amendment rule 2022. Some stakeholders have suggested reducing it to 30 days. As has been discussed above, even FCC process defines 60-day and 90-day timelines for processing the permissions. The Authority feels that a sixty-day deemed approval clause in the rules should serve the purpose for the time being. It is more important to monitor delays and rejections and ensure that flimsy excuses are not given to seek further clarifications as the time period approaches. The Sub-rule (2) of Rule 4 of the RoW rules 2016, as amended, already provides for appointment of Nodal officers. The Authority is of the opinion that a close monitoring at the portal admin level and coordination with Nodal officers will ensure timely processing of application and reduce unwanted rejections.

2.152 In order to manage the large number of small cell applications, a batch processing or bulk processing provision is important for facilitating speedy deployment of small cells. The Authority as per para 2.34 and 2.35 has already recommended the same. Once the bulk approval provision is in place in the RoW rules, the Authority is of the opinion that the concept of bulk approval for small cells can also be incorporated in the National RoW GatiShakti Sanchar Portal.

2.153 Considering the above, **the Authority recommends that DoT should put in place a mechanism for close monitoring of all RoW applications by portal administrators and also coordination with Nodal officers of Appropriate Authorities to ensure timely processing of application and reduce unwanted rejections.**

2.154 **The Authority also recommends that DoT should make necessary provisions in the GatiShakti Sanchar Portal to incorporate bulk application filing and processing for all categories of Small Cells.**

Standardization of small cell equipment and installation practices

2.155 The Authority notes that few stakeholders are in favor of standardization of small cell equipment, but they have failed to provide sound justification in favor of their arguments. Most stakeholders have not felt an immediate need for standardization of the equipment as it may be counterproductive at this stage when the 5G ecosystem is still developing. The Authority feels that there is a lot of variation/customization in designs of street furniture itself and every installation may be required to be tailored to meet specific conditions such as quality and design of SF, power related issues etc. The type of small cells expected to deploy varies as per the requirements of service providers and use cases. Not giving vendors the liberty to choose from a wide variety of options would strangle innovation and ingenuity in finding site specific solutions. Also, standard designs for mounting equipment may not be able to accommodate different types of equipment available. Considering the fact that the design of 5G outdoor small cells by service providers are currently under development and the finalization of exact specifications may take time as the current specifications may change (in dimensions and power specs) based on future developments. As time progresses, deployment templates will emerge that can be replicated by TSPs on their own across all similar types of locations. Therefore, the Authority is of the opinion that adoption of standard equipment or installation practices may not help network rollouts at this stage.

E. Power related issues and solutions

2.156 The Authority through the CP had discussed the importance of continuous and affordable power supply for the efficient functioning of small cells. Though small cells consume much lower power compared to macro base stations given the lower coverage area and the lesser requirement for site support infrastructure (e.g., cooling systems), a continuous power source is nevertheless required at the street furniture for deploying small cells. Discussing various power related challenges for deployment of small cells on street furniture's, following questions were raised in the CP to gather more detailed inputs from the stakeholders:

xii) What power related problems are envisaged in deploying small cells on street furniture? Please provide full details.

xiii) What viable solutions are suggested to address these problems? Please provide full details.

Comments on power related issues

2.157 Getting adequate uninterrupted power to all the telecom infrastructure is an issue pointed out by majority stakeholders. Another issue raised is related to the cumbersome process of getting permission for the electricity meter at every street pole and managing billing of a large number of sites. Some of the DISCOMs are not giving a separate connection for installing electricity meters on SF. Two stakeholders have shared that there is the need for appropriately designing power back up. High commercial tariffs, frequent annual revision in electricity rates and supply at only locations where a connection already exists are some of the other issues shared by stakeholders. One stakeholder has stated that the electrical bill comprises fixed demand charge (on sanctioned load) irrespective of running load drawn, which results in paying huge monthly payments on unutilized sanctioned load. A few stakeholders have also expressed concerns regarding the different rates for commercial, industrial, utility, etc. connections by different SERCs.

Comments on solutions to power related problems

2.158 As a solution to the cumbersome process of metering and billing at every pole, most stakeholders have proposed that a system of providing power connections on several poles through the process of single application based bulk approvals should be considered. To resolve the problem of proper physical address at SF locations where power supply is to be provisioned, stakeholders have suggested that DISCOMs should provide power supply on temporary addresses or else give address codes to SF locations. Enabling open access to support the telecom infrastructure by suitable modification and doing away with restrictions of minimum connected load per site is another solution given by a few stakeholders.

2.159 Many stakeholders have stated that back-up battery requirements are a limiting factor in deploying small-cell power systems on street furniture. As per one of the associations, in addition to the conventional AC/DC power supply system, the small cell site should have a fallback mechanism to work on battery backup (preferably Li-Ion)/suitable solar based power solution in the absence of conventional AC supply. Since both Radio and Baseband require DC-48V supply Power-plant will be required to convert from AC supply. A suggestion given is that TSPs/IPs should be allowed to have their own backup suited to the type of small cells. Making available a centralized power source inclusive of back-up (for a cluster of street furniture with a power cut-off mechanism localized at the location) and distribution mechanism have been put forward by a couple of stakeholders.

2.160 One of the associations has proposed the usage of two types of power systems. The first one is miniaturized DC-power systems which are modular designs that offer flexible power-distribution options and can support larger batteries for longer back-up power periods. The second type of unit is the "pole/wall mount" category of all-in-one power systems; however, they usually have less configuration flexibility and more limited back-up battery options. Power conversion efficiency must also be a factor in the design of small-cell power systems. Ensuring

reliable and stable AC/DC power and exploring cost-effective ways such as DC supply through battery banks or through solar panels by way of subsidization by states have been suggested by some stakeholders.

2.161 The adoption of a *'One DISCOM-One Bill-One Payment policy'* by the DISCOMs has been proposed by the majority. A service provider has suggested deployment of meters on 5%-10% of installed small cells base, and the metering for all installations can be done based on this sample. Charging of such sampled meters can be averaged and extrapolated to arrive at the bill. Another service provider has suggested that slab rates can be defined and established based on the power rating of the equipment and that bulk billing as per the cumulative equipment installed can be done at the respective division level by DISCOMs.

2.162 The suggestion that has been proposed by the majority of stakeholders is with regard to lowering the electricity tariff, more specifically based on industrial tariff or utility tariff. Further, provision for priority electricity connection within 15 days at these rates was given by the majority. Imposing minimum requirements, discounted prices, and charges while raising demand notice at the time of EB installation was put forward by one of the associations.

2.163 Granting permissions for digging earth pits or sharing the same among different operators and subletting of electricity from the private entity are some other submissions made by stakeholders. It was also submitted that DISCOMs should not process disconnection in haste on minor complaints of residents and corporations.

Analysis of the issues and views of the Authority

2.164 As India walks towards the deployment of next generation technologies, not only is there a paradigm shift in the physical infrastructure requirements, but there is also a vast difference in the powering requirements for 4G and 5G. While 4G powering is mainly characterized by the presence of huge power cabinet to each tower along with renewable energy sources used for backup, 5G requires providing

separate connection from the grid to each of the densely placed small cells although the power required for each of the individual small cell is less than that of macro BTS.

2.165 Power being the lifeline on which telecom network runs, the Authority has already taken an initiative for cross-sectoral collaboration between the Telecom and Power sectors. At the behest of TRAI, Forum of India Regulators (FOIR) had constituted a working group on Cross Sector Collaborative Regulation between the Telecom Regulators and Electricity Regulators. The working group had representation from TRAI, Central Electricity Regulatory Commission (CERC), State Electricity Regulatory Commissions (SERCs), DISCOMs, Infrastructure Providers and has a provision to co-opt experts from other organizations as well. It had identified certain issues and made its recommendations to FOIR (attached as **Annexure V**). Subsequently on some of these issues, TRAI had made a presentation to FOIR in its 49th Meeting of the Governing Body. In the presentation, the Governing Body was briefed on the recommendations of the working group on the following subjects:

- Development of a centralized portal & GIS Mapping of Assets
- Monetizing assets of power utility companies
- Placement of telecom antennas and associated equipment on the transmission towers
- Utilizing transmission assets such as electric substation lands & buildings
- Deployment of small cells and aerial fiber on electric poles

2.166 Based on this meeting, it was noted that the recommendations of the working group should be disseminated among all the DISCOMs, as it would be infrastructure of the DISCOMs which would be used to install the 5G cells and related equipment. It was also decided that the recommendations of the working group will be presented before the Forum of Regulators to sensitize the State Electricity Regulators on the importance and need for sharing infrastructure to enable the implementation of the 5G technology. FOIR vide its letter

dated 27.04.2022 intimated Secretary SERCs/JERCs, of the deliberations during the 49th GB meeting of FOIR and requested them to share the recommendations of the Working Group and the minutes of 49th GB meeting to the DISCOMs under his jurisdiction. Also, basis the decision taken in the FOIR Governing Body meeting; TRAI made a presentation to Chairman of all SERCs/ JERCs in the 79th meeting of the Forum of Regulators (FOR) which was held on 22.04.2022.

2.167 As there will be thousands of small cells deployed on the available street furniture while rolling out 5G in an area, the issue of availability of continuous power supply to the installed equipment in a cost-effective manner needs to be addressed. Usually, distribution licensees only allow one grid connection point for each consumer address. On most street furniture like billboards, bus shelters, traffic lights etc. electric connection is already present. Some DISCOMs do not treat street furniture as a commercial address while some others refuse to provide another connection on the same SF address. Therefore, to enable multiple connections on the same street furniture asset, the Authority is of the view that the distribution licensees should consider small cells as 'consumers' (i.e., end user) of electricity and be entitled to get a separate electricity connection regardless of whether they are using the premises/apparatus of an existing consumer. The best approach can be to share the already available connection on these SFs by putting a sub-meter. Subletting of an existing power connection from one consumer to another by installing sub meters is not allowed under the existing regulatory framework of some DISCOMS. Sharing of power connection is in the domain of electricity regulations and the States where there is an embargo on tapping connection (by putting a sub-meter) from already available connection, the SERCs may have to re-look at the policy.

2.168 The traditional model of powering a cell site — in which the site is powered by the AC power grid, with a backup power source available as a fallback— cannot be applied to small cells, as these sites either do not currently come with power backup or will have very limited backup, and

therefore, would go down during a power outage. The way to fix that would be to have a system that has some level of backup that maintains 24*7 uninterrupted power available in the traditional telecom network. A power hub cabinet that has battery backup distributes that power from a centralized location can be a solution. In Korea, service providers have experimented with small cells that have only radiating antennas at the cell site while the processing and power units are centralized for small area that may have few small cell sites in vicinity. The Authority is of the opinion that such solutions will keep evolving with time and it should be left to market forces to experiment with new emerging solutions.

2.169 Another important concern is that electrical bill comprises of fix demand charge (on Sanctioned load) irrespective of running load drawing, which results into a telecom operator paying huge monthly payments on unutilized sanctioned load as well, leading to huge financial burden. Considering the deployment of huge number of small cells, it is imperative that DISCOMs should consider issuing electricity bill on the basis the running load and not on the sanctioned load. Therefore, the Authority is of the opinion that charging of power should be based on running load, there should not be any charges on the basis of fixed load in order to incentivize the operators.

2.170 Smart meter technologies as being installed under various schemes of Government of India as well as by the State Utilities themselves are designed to accommodate the evolution of communication services over time. Smart meters will provide accurate, not estimated bills and allow suppliers to better predict demand, thus helping to shape energy infrastructure to become more reliable and efficient. According to the National Infrastructure Commission of UK, a complete smart energy grid could save the nation 8 billion pound each year[17]. The Government of India is providing funding to the States for implementation of smart metering under National Smart Grid Mission (NSGM) and Integrated

[17] https://www.yesenergysolutions.co.uk/advice/benefits-of-smart-meters

Power Development Scheme (IPDS)[18]. Further, Revamped Distribution Sector Scheme (RDSS) was launched on 20th July 2021 under which deployment of ~25 crore smart prepaid meters for all domestic consumers have been envisaged till March 2025. The Government has been providing financial assistance under these various schemes (viz. IPDS, NSGM etc.). A sum of Rs. 22,500 crore has been earmarked as Central Government grant for the installation of those 25-crore smart prepaid meters across the country under the RDSS scheme for power distribution entities (DISCOMs) recently approved by the Cabinet[19]. RDSS envisages smart metering on the OPEX mode and provides financial support to DISCOMs opting for prepaid smart metering. Under the scheme, the States which can install smart prepaid meters before December 2023 will also be eligible for an additional incentive of Rs 450 per meter. As small cells will be in thousands, processing and paying individual bills will be tedious for service providers. Pre-paid smart meters can help in releasing funds locked in security deposit for the TSPs/IP-Is. It will also enhance revenue realization for DISCOMS who will benefit by getting all usage paid upfront. Given the benefits of smart metering, the Authority is of the opinion that smart pre-paid electricity meters should be installed in all existing telecom installations on priority and in a time bound manner. Also on all new installations, including those for small cells, DISCOMs should only install smart prepaid electric meters.

2.171 SERCs prescribe different rates for commercial, industrial, utility, billboard etc. connections. The rate for public utilities is Rs 6.25/unit whereas the same for advertisement & hoardings is Rs 8.50/unit, these variations in the tariffs for different street furniture assets can affect the viability of a cell site. As per the Electricity Act 2003, respective SERCs in each state determine the electricity tariff applicable on consumption of electricity by different classes of consumers (such as domestic,

[18] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1797348

[19] https://www.financialexpress.com/govt-earmarks-rs-22500-crore-for-smart-pre-paid-meters--new-discom-scheme/

commercial, industrial etc.). Providing telecommunications is part of service industry. The vital role of telecommunication and broadband service in the economic growth of connected areas justifies that telecom sites should be provided electricity connection at industrial/utility tariffs.

2.172 Given the importance of connectivity in Government service delivery, commerce, education, health and other sectors, the State Government should consider providing electricity to Telecom sites on priority (within 15 days of connections request). Currently the charges raised for providing electricity to telecom sites are very high and dissuade installation of new sites. The State Governments should also consider waiving off last mile installation charges for extending electric connection to telecom sites.

2.173 In the case of mass deployment of small cell equipment across a geography, processing separate applications for each individual electrical connection will be cumbersome. To facilitate faster rollouts, the requirement of taking power connection on several poles or street furniture can be facilitated through the process of bulk approvals. Considering the large number of power supply applications that would follow as part of small cell densification, a provision for bulk processing of applications is also necessary to enhance ease of doing business.

2.174 Thousands of small cells will together consume megawatts of energy. For making sector footprints greener, it is essential to enable green energy access for powering small cells. The Open Access (OA) policy can be very helpful for telecom operators to support the telecom infrastructure and achieve green energy targets. One of the stakeholders has submitted that a major bottleneck in the OA policies is that the buyer must have a minimum 'Connected Load' of typically 1MW, which is being followed by most states. Authority has observed that Ministry of Power has notified Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022 on 06.06.2022 with the objective of ensuring access to affordable, reliable, sustainable and green energy for all. These rules

address several issues like reduction of Open Access Transaction limit from 1 MW to 100 kW and have made appropriate provisions for cross-subsidy surcharge, additional surcharge, standby charge. This will incentivize the common consumers to get Green Power at reasonable rates. However, from a TSP/IP-I perspective, these rules may still not be very helpful since individual small cell, or any other telecom site will consume significantly less electricity than 100 KW. This will restrict TSPs from making use of OA policy for renewable sources. However, if the aggregated demand of all sites of a service provider under a DISCOM is considered, it will go in megawatts. Therefore, Authority feels that the OA policy for using solar/renewable energy sources needs to be modified to incorporate provision to aggregate demand from all sites of a TSP/IP-I that are served by a DISCOM.

2.175 **The Authority therefore recommends that DOT should take up the case with Ministry of Power, State governments and SERCs for implementation of following:**

i. **DISCOMs should make provisions to provide connections for telecom sites to TSPs/IP-Is on priority basis. The timelines for providing the connection should be fixed (preferably 15 days) and monitored through portal.**
ii. **Given the importance of DCI for socio-economic development of States, DISCOMs should not charge the TSPs/IP-Is for installation/upgradation of transformer or for pulling the last mile of the electrical connection. If required, states should make necessary provisions for compensating DISCOMs for such waiver of charges.**
iii. **As the power requirements for small cells remain almost flat throughout the day, DISCOMs should charge TSPs/IP-Is on the basis the running load and not on the sanctioned load.**
iv. **All DISCOMs should treat Street Furniture Address as Commercial Address for the purpose of providing a power**

connection and allow multiple power connections at the same SF commercial address to different commercial entities.

v. **DISCOMs should allow sub-letting of connections at street furniture locations.**

vi. **Smart pre-paid electricity meters should be installed in all existing telecom installations on priority and in a time bound manner. Also on all new installations, including that for small cells, DISCOMs should only install smart prepaid electric meters.**

vii. **Provision for one application for bulk processing of connection requests for multiple sites should be made available through portals for promoting ease of doing business.**

viii. **Telecom sites should be provided electricity connection under Utility/Industrial tariff.**

ix. **DISCOMs should adopt One DISCOM-One Bill-One Payment policy for all Telecom sector service/infra providers users that use electricity connections at multiple locations.**

x. **OA policy for using solar/renewable energy sources needs to be modified to incorporate provision to aggregate demand from all sites of a TSP/IP-I that are served by a DISCOM.**

xi. **DISCOMs should share their maintenance schedules with TSPs/IPs (site owners) in advance so that site owners can be prepared in the event of power cuts. The actual duration of all power outages should also be made available area wise on their website.**

2.176 The role of power sector in supporting telecom networks is well-known. Similarly, the roll that telecom sector plays in modernizing smart transmission and distribution networks of power sector need not be emphasized. 5G when deployed on DISCOM's infrastructure creates a win-win situation where the distribution companies can benefit from 5G

use cases of smart metering, smart grid monitoring, disaster management, automation, fiber-ready network for power grids, energy management etc. Thus, there are new revenue and cost-saving opportunities for transmission companies and DISCOMs when their infrastructure is utilized for telecom installations. A cross sectoral collaboration between telecom and power sector, in sync with GatiShakti initiative, needs to be further improved. However, there are certain challenges in the same that will need to be addressed.

2.177 The aforementioned FOIR Working Group that was formulated to submit its recommendations on "Cross Sector Collaborative Regulation between Telecom Regulators and Electricity Regulators" has, in its report mentioned:

> "*Delhi Electricity Regulatory Commission (DERC) has allowed for utilization of distribution assets for Telecom services on revenue sharing basis and same can be adopted by other State Regulators also. However, Municipal Corporation are imposing tax liability in cases where transmission assets i.e., Substation lands & buildings, are shared for cross function use on revenue sharing model. The Working Group recommends that this issue needs to be taken up at appropriate level so that whenever land is provided on favorable terms to utility companies and those utility companies are sharing the same for utilization with other utility company, then terms of use of land should not change.*"

2.178 **In the collaborative spirit of GatiShakti and to promote sharing of infrastructure above, the Authority recommends that DoT should take up the issue with the states that whenever land is provided on favorable terms to utility company and those utility company shares the same for utilization with other utility company, then terms of use of land should not change.**

F. Institutional mechanism for enabling Collaboration between Controlling Administrative Authorities and TSPs/IP-Is

2.179 To ensure that 5G deployment take place in a coordinated environment and the challenges due to interdependencies on different agencies are addressed, strong collaboration between stakeholders is needed[20]. This will aid the infrastructure creation at a cost efficient and time bound manner and improve the operator's confidence in providing services. Recommendations relating to cross sectoral collaboration for infrastructure creation for provision of shared duct infrastructure in municipalities, rural areas and national highways was provided by the Authority in the prior broadband recommendations dated 31st August 2021. In order to gather further insights on cross sectoral collaboration specific to the use of street furniture, the following questions were raised in the CP:

xiv) Is there a need for a specific mechanism for collaboration among local bodies / agencies for deployment of small cells and aerial fiber using street furniture? If yes, what mechanisms should be put in place for collaboration among various local bodies/agencies involved in the process of permissions with TSPs/IP-Is and to deal with other aspects of Small Cell deployment?

xv) Kindly suggest an enabling Framework that shall include suggestions about the role of various authorities, rules of coordination among them, compliance rules and responsibilities, approval process, levies of fees/penalties, access rules etc.

xvi) What should be the commercial arrangements between the TSPs/Infrastructure Providers and street furniture owners for the same?

xvii) Whether there should be any specific regulatory and legal framework to enable Small Cell and Aerial Cable deployment on

[20] https://www3.weforum.org/docs/WEF_The_Impact_of_5G_Report.pdf

Bus Shelters

Billboards

Electric/ Smart Poles

Traffic lights

Any other street furniture

Comments on Mechanism for collaboration and Role of various Authorities

2.180 Various suggestions given by stakeholders for collaborative mechanisms to coordinate and oversee the 5G deployment process are as follows:

a) Coordination Committees: One of the stakeholders has proposed the formation of a three-layer committee with representatives from DoT, Industry experts, and other central PSUs in the field of telecommunication. These committees at the state/district/ local body level would help facilitate the process of approvals.

I. National level committee to suggest overall guidelines for RoW permission, charges and other governing rules.
II. State level committee to coordinate with different state agencies and ensure the implementation at state level. The State Broadband Committee and its Sub Committee (Operational Committee) will be able to bring about necessary coordination wherever there is any problem.
III. Local body at Secondary Switching Service Area (SSA) level, headed by district collector, to take care of single point of contact for roll-out issues.

The requirement of establishing a nodal agency that can be equipped with all the powers under RoW regulations, coordination with all bodies and simplifying the application process was put forward by a few stakeholders. The contact details of nodal officers of local bodies, and the TSPs/IPs should be mandatorily available on the Portals. The appointment of Nodal Officers by every concerned department at State level can add to better coordination. State level/district level

nodal officers may be appointed with delegated power to decide on grant of permission and for resolutions in case of any disputes and responsibility matrix to be published online along with the escalation and grievance redressal process.

b) Use of existing Broadband Committees: Many stakeholders had put forward suggestions on the constitution and role of committees under National Broadband Mission (NBM) and its requirement to be sensitive to the needs of 5G deployment on street furniture. The committees under NBM should function as both knowledge gathering and sharing hubs. It was suggested by a service provider that on lines of State Broadband Committees (SBCs), a Joint committee with Central agencies/departments can be created with sole purpose of expediting RoW permissions. The SBCs can also have districts/towns specific representatives like DMs, Mayors to discuss and facilitate small cells/aerial fiber deployment issues. It should be mandatory for NBM to hold monthly meetings and in that, if possible, members of SERC, DISCOMs and agencies like airport, port trust, metro/railways could be co-opted as members. Besides this it is utmost important to have representations of TSPs and IP-Is also in those committees.

c) National RoW Portal: The Online Central National RoW Portal (GatiShakti Sanchar Portal) should also provide for communication including notices between the concerned stakeholders like TSP/IP-Is and appropriate/administrative/ local authorities. Besides, the role of different stakeholders, rules of compliance, assessments, approvals, etc. can be very well addressed through the portal.

d) Dedicated specialized authority: A special team should be formed which will have the End-to-End responsibility of street furniture deployment and process the applications in a time bound manner. This team should also have the right to publish amendments as required by the specific city to meet its requirement along with the authority to collect fees and levy fines/ penalties.

e) Many of the stakeholders have commented on the role that the PM GatiShakti initiative can play in enhancing collaboration.

f) Setting up a nationwide Small Cell Information Exchange (SCIX), a digital platform that would hold real time information about availability, backhaul connectivity, monthly rent and permit status for infrastructure capable of hosting small cells has been suggested similar to that of the UK.

2.181 The responsibilities of the Central, State, and local authorities have been put forward by the stakeholders. The Central Government can play a role in setting the overall strategy for connectivity, and framing appropriate legal structure, policy, and regulation. Local planning authorities can play a vital role in facilitating network development and in helping to identify the SF suitable for small cells deployment.

Comments on Commercial Arrangements between CAAs and TSPs/IPs

2.182 Regarding TSPs/IPs entering into arrangements with CAAs, most of the stakeholders are of the opinion that consistent with the light touch regulatory regime, it should be left to a voluntary arrangement. To this, one of the associations has added that only the time taken to grant permissions and cap on charges to be paid by the IP-Is, should be specified. Few stakeholders have submitted that TSPs/IPs should work out with street furniture owners and submit it to DoT to frame a uniform policy/ standardized agreement format across the country.

2.183 Various commercial arrangements and viable business models suggested for sharing SF are -

a. Revenue sharing models like Public Private Partnership (PPP), Build–operate–transfer (BOT) models.
b. The commercial arrangement should be on a no-profit no-loss basis, through a national rate card for all types of street

furniture. The rate card should be designed on the lines of a classification of circles, i.e., A/B/C circles.

c. Provision of complimentary services by the service providers at designated infra to the local bodies viz., Passenger Feedback Solutions at Railway Station, Bus Stations, Smart Street Light solutions, i.e., a win-win situation is an effective arrangement. Providing free 5G services for smart solutions i.e., IoT/M2M by converting bus shelters to smart bus shelters is an example. The same can be applied for multiple street furniture so that the fixed cost may be avoided.

Comments on Enabling a framework for specific street furniture structures like Bus Shelters, Billboards, Traffic lights etc.

2.184 A few stakeholders are in support of bringing a specific regulatory and legal framework for specific SF as it will ensure uniformity in the equipment and installation process. With regard to permissions, it has been proposed by a service provider that SEBs/DISCOMs should be instructed to permit usage of electricity poles; municipal agencies/authorities to permit use of smart poles, streetlights and billboards; and State Road transport authorities/agencies should be instructed to allow the use of Bus Shelters for small cells deployment. A few others are of the opinion that a specific legal framework for each street furniture is not required at this stage.

Analysis of the issues and views of the Authority

a) <u>Mechanism for collaboration</u>

2.185 The Authority is of the view that systematic collaboration between the industry stakeholders and governance stakeholders along with coordinated decision making is necessary to aid the infrastructure creation required to achieve large scale deployment. It is understood that the involvement of multiple government bodies or utility service providers i.e., telegraph, electricity, water, gas etc., for the approval of

small cells, necessitates that the process should be considerably simplified and streamlined to avoid unnecessary delays.

2.186 The constitution of the National Broadband Mission (NBM) was envisaged by the National Digital Communication Policy (NDCP) in 2018. NBM aims to operationalize the 'Broadband for All' objective by facilitating the creation of digital communications infrastructure and provisioning of services thereon. Under the NBM, one of the objectives is to enhance cooperation among concerned stakeholders by developing innovative implementation models for RoW. Another objective is to work with States/UTs for having consistent policies pertaining to expansion of DCI including for RoW approvals required for laying of OFC. Thus, streamlining the RoW permission framework is already a part of the responsibility of various setups proposed in NBM such as Governing Council for broadband, Broadband Steering Committee, and the State Broadband Committee. At the Central level the work is carried out by the Broadband Steering Committee, while at the State level the work is carried by the State Broadband Committee. For monitoring at the District/Municipal level, the States/UTs are required to set up a District level Committee. These elaborate institutional arrangements for streamlining RoW permissions were recommended in the Broadband recommendations by the Authority.

Figure 2.4: Representation of Broadband steering committee under NBM

Secretary, Department of Telecom	Chairperson
Administrator, USOF	Member
Representatives from (Not below the level of Joint Secretary)	
Niti Aayog	Member
Department of Economic Affairs	Member
MeitY	Member
MoRTH	Member
Petroleum & Natural Gas	Member
Environment & Forest	Member
Power	Member
Housing & Urban Affairs	Member
Department of Space	Member
Railway Board	Member
Joint Secretary and Mission Director, Department of Telecom	Member Convenor

2.187 The Authority through its recommendations on "Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed" had appreciated the role of NBM committees as one of the key collaborative strategies to streamline RoW permissions. Few of the relevant extracts are presented as follows:

7.13 Following institutional arrangements for streamlining RoW permissions framework should be put in place:

i. Under the National Broadband Mission (NBM), the Central Government has put-in-place the institutional mechanism, in form of the Governing Council for Broadband, the Broadband Steering Committee, and the State Broadband Committee, for inter-ministerial coordination at Center and State level. The objective of the Council and the Committees should be broadened to streamline RoW permissions framework for all utilities by inclusion of additional members nominated from other utility departments/ service providers.

ii. *In the State Broadband Committees, Secretaries in charge of panchayat and local self-governments, and industry departments should also be included. Further, the Chairman of the State Broadband Committees may coopt the state level representative of the central agency(ies) on need basis in the meeting to resolve the RoW issues in time.*

iii. *Additionally, District Level Committees, with District Magistrate as Chairman, a representative from LSA unit of DoT, and Superintendent Engineer (SE) / Executive Engineer (Ex. Eng.) of the Public Works Department (PWD), be set up to streamline the RoW permissions framework at the district level. The District Level Committees could necessarily include representatives from:*

   a. *Irrigation Department,*
   b. *Forest Department,*
   c. *Rural Development Department,*
   d. *Local Bodies like Municipal Corporation, Municipality, etc. and*
   e. *Utility service providers like telegraph, electricity, water, gas etc.*

2.188 Since the SF structures are owned by both State and Central bodies, the Authority deduces that the involvement of both Broadband Steering Committee and State Broadband Committees as institutionalized in the NBM can play a key role in taking care of the needs of 5G deployment. The Authority is of the opinion that the institutional framework has already been put in place in writing under the NBM, so a separate provision is not required at this stage. Further, the Authority has already recommended the expansion of the objective of these entities to include streamlining of RoW permission framework for all utilities. Implementing this on priority will suffice to take care of the needs of both macro cells and small cells.

2.189 Figure 2.4 displays the representations of the various Ministries/ Departments involved in the National Broadband committee. To develop consensus among the stakeholders and ensure ease in collaboration

among sectors, it is important to bring together all those CAAs associated with the deployment of small cells into a common platform. The NBM report states that the Broadband Steering Committee may incorporate representation from other Ministries / Departments and experts as per requirement. With respect to the above statement, the Authority opines that the current representation of the committee shall be expanded to include other relevant departments also. Since some bodies like the Airports, ports etc. can play an important role in the commercial rollout of 5G, the inclusion of these bodies in the State committees shall also be vital to streamline RoW permissions.

2.190 Regarding the above discussion, the Authority recommends the following:

2.191 **In order to evaluate and assess the progress of small cell rollout, the role of Broadband steering committee, State broadband committee and District/ Municipal Monitoring Committee, should be expanded to include continuous monitoring of the issues of small cells at Central, State and District/Municipal levels, respectively.**

2.192 **The representation of the Broadband Steering Committee should be expanded to co-opt other Ministries or Departments like Civil Aviation, Defense, Ports, Shipping and Waterways, Power etc. as per requirement.**

2.193 **For the State broadband committee members from major ports, airports, metro rail and other relevant commercial bodies that are present in the states, should be co-opted.**

2.194 **In cities where street furniture is controlled by multiple agencies, the concerned State/Local government should**

nominate one of the assets owning agencies as lead/nodal Authority to monitor the permissions related to small cells.

2.195 **The details of the nodal ministry and nodal officers from each of the states along with the TSPs/IPs and IPs should be included in the Monitoring Dashboard as envisaged in the NBM to track the progress of the small cell deployment across each State and District of the country.**

2.196 **The Authority reiterates that its earlier recommendations on 'Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed' dated 31.08.2021 (Para 7.14.ii) in the context of defining clear roles for the Central, State, and Local Body authorities in the RoW portal, should be implemented by the Government on priority. The Authority further recommends that these roles should be widened to administer the use of street furniture for small cell and aerial fiber deployment.**

2.197 In response to the suggestion of a few stakeholders on setting up a nationwide Small Cell Information Exchange (SCIX), the Authority agrees that information sharing shall be one of the ways to strengthen collaborations between industry and the Government. The UK government has said that it would invest in piloting the latest innovations in digital asset management platforms, to help local councils share data more easily with network operators. This would help to deal with the difficulties of network operators on getting the required information to verify a structure is suitable, like its location or physical dimensions, proximity to the street, or access to a power source.

2.198 As has been discussed previously, DPIIT has requested the states to map additional data layers namely electric poles, traffic light poles, bus terminal / bus shelters and Government buildings (State Govt/Central Govt, PSU) which are thought to be used for mounting 5G small cells. As part of these recommendations, the Authority in previous sections has already recommended that a catalogue of GIS mapped Street furniture assets in the National RoW portal should be created with the certain specifications. It has also been recommended that dedicated spaces on rooftops should be identified for deploying small/macro cells. All such spaces should be GIS mapped and mad available on GatiShakti Sanchar portal for charge free use by TSPs/IP-Is on non-discriminatory basis.

2.199 The Authority in its recommendation (numbered 7.31) on "Roadmap to Promote Broadband Connectivity and Enhanced Broadband speed" dated 31st August 2021, had recommended the establishment of an e-market place to facilitate leasing and trading of passive infrastructures using a common GIS platform. The relevant extracts of the recommendation have been mentioned under Section A (refer to para 2.36). But the mentioned recommendation was limited to the sharing of information of only passive infrastructure. With the evolution of 5G, an interactive marketplace and online mapping application for small cells built on reliable and trustworthy data is important. This will aggregate and visualize various dimensions for demand-supply management of small cells to enhance the 5G network connectivity. Therefore, the Authority is of the opinion that the e-marketplace enabled through GIS mapping should be expanded for small cells along with the passive infrastructure.

2.200 With regard to the above discussion, **the Authority recommends that the scope of e-marketplace which was recommended by the Authority in para 7.31.iv of its recommendations dated 31.08.2021 on "Roadmap to Promote Broadband Connectivity and Enhanced Broadband speed" to facilitate leasing and trading of passive infrastructures using a common GIS platform should be expanded to include small cells along with the passive infrastructure.**

b) Regulatory framework for specific street furniture

2.201 The Pilot study conducted by TRAI had given insights on how certain street furniture assets are owned and/or controlled by multiple agencies. It was also observed that the feasibility for housing small cell equipment varied across street furniture structures. As the rollout of 5G is at a nascent stage, the designs of infrastructure associated with it are also evolving. Specifying a regulatory framework for each type of street furniture structures can restrain free development of designs and installation practices. In order to arrive at cost effective strategies and practices of small cell deployment in the near future, it is necessary that the market should be left to evolve without major restrictions. Therefore, the Authority is of the opinion that there is no need for defining a specific regulatory framework for different street furniture structure. All assets including streetlights, traffic poles, kiosks, bus shelters etc. that are potentially capable to host small cells, should be made available for use by TSPs for small cell deployment.

c) Commercial arrangements

2.202 The operators/infrastructure providers generally enter arrangements with street furniture owners in the interest of greater accessibility, time and cost savings. But in most cases, it is of concern that the deployment of small cells on the public structures are seen solely as a source of revenue by various local Authorities and Government bodies, instead of understanding the long-term benefits for the economy. Through the RoW

amendment rules (2022), DoT has already specified the compensation for the establishment and usage of poles and street furniture for the deployment of small cells and overground telegraph line. The Authority is of the opinion that the recent amendment to ROW rules has already addressed the issue of charges levied by the appropriate authorities from the applicants (service providers) for deployment of small cells and aerial fiber on street furniture and no further intervention is required at present.

CHAPTER 3

SUMMARY OF THE RECOMMENDATIONS

A. Right of Way (RoW) Issues and adequacy of current provisions in ROW rules 2016

3.1 The Authority recommends that the DoT clarification dated 26.10.2022 on Indian Telegraph RoW rules 2016 regarding the term "street furniture", should be made part of the Indian Telegraph RoW rules through a suitable amendment in a relevant Gazette Notification.

[Para 2.24]

3.2 The Authority reiterates its earlier recommendations issued in the context of Broadband Recommendations dated 31.08.2022 vide Para 7.14.iii that the scope of the proposed national portal should be expanded to grant RoW permissions from utility providers like water, electricity, gas etc. also. More specifically, since most of the SF assets are under the control of the power sector, the portal shall also include a facility to process RoW falling under the jurisdiction of power sector including DISCOMs.

[Para 2.32]

3.3 The Authority recommends the following amendments to the Indian Telegraph Right of Way (Amendment) Rules, 2022:

Sub-rule (1) of Rule 10A of the Indian Telegraph Right of Way (Amendment) Rules, 2022 should be amended as:

A licensee shall for the purpose of installation of small cell and telegraph line submit an application, along with details of street furniture and a copy of certification by a structural engineer authorized by appropriate authority, attesting to the structural safety of the street furniture where installation of small cells and

telegraph line is proposed to be deployed, to the appropriate authority for permission to use street furniture for installation of small cells and telegraph lines.

Provided that licensee may have option to submit single application for multiple sites and appropriate authority shall make due provisions for accepting such applications and issuing single permission for multiple sites accordingly for establishment of small Cells.

[Para 2.34]

3.4 The Authority recommends that DoT should make provision in the GatiShakti Sanchar Portal for accepting single applications for bulk processing of sites for granting various permissions, including RoW and power connection.

[Para 2.35]

3.5 The Authority recommends that a Catalogue of GIS mapped Street furniture assets in the National RoW portal should be created with the following specifications:

a) Height, load bearing, and wind load capability of structure.

b) Wattage, type of power (AC/DC), voltage etc. if power is available.

c) Picture of SF.

d) Non-discriminatory terms and conditions offered for hiring.

e) Contact details (Mobile number, landline number and email ID) of the nodal person for the particular Street Furniture.

[Para 2.41]

3.6 The Authority recommends that use of Drone based mapping in the GIS system should be considered for quick assessment of the location of small cell infrastructure and for the creation of the street furniture catalogue.

[Para 2.42]

3.7 The Authority recommends that till the Draft Telecommunications Bill 2022 is passed as a law, the Government should specifically monitor action taken by the state police, for security of Telecommunications Asset, through a DoT and MHA joint committee.

[Para 2.45]

B. Infrastructure sharing by the Controlling Administrative Authorities (CAA) with TSPs and IP-Is

3.8 The Authority recommends that:

i DoT should issue advisory guidelines to States for mandating CAAs that own/control traffic lights to share these assets with TSPs/IP-Is for deployment of small cells subject to structural stability.

ii All Central Government entities should earmark dedicated spaces in their existing and planned buildings/structures for installing DCI including small and macro cells. Dedicated spaces on rooftops should be identified for deploying small/macro cells. All such spaces should be GIS mapped and made available on GatiShakti Sanchar portal for charge free use by TSPs/IP-Is on non-discriminatory basis.

iii Advisory guidelines should also be issued to State Governments for similar action by their entities and local bodies. DoT should also follow up with State Governments for implementing the guidelines.

[Para 2.85]

3.9 The Authority recommends that enabling provisions or suitable terms and conditions shall be introduced in all telecom licenses and IP-I registration agreement prohibiting the TSPs/IP-I providers from entering into any exclusive contract or right of ways with infrastructure owners/CAAs or any other authority.

[Para 2.90]

3.10 The Authority recommends that DoT should include the following in their advisory guidelines to States:

i **All CAAs or asset controlling authorities should prohibit entering into exclusive rights/exclusive tie-up with any licensee/registration holder. SF infrastructure should be offered in a non-exclusive and non-discriminatory manner.**

ii **In future, tenders for setting up new SF structures by the appropriate authorities, the possibility of sharing of SF on non-exclusive basis, for hosting DCI like small cells and aerial fiber, should be kept in mind. The terms and conditions for offering all assets that are catalogued and uploaded on GIS portal, should have a mention that the SF is being offered on non-exclusive basis and will be shared with other eligible entities.**

iii **In line with GatiShakti initiative, in all future projects of utility providers that are partially or fully funded by government to put-up new assets (such as gas pipelines, HT power lines, streetlights) or expand existing assets, provisions to host/support DCI such as small cells, towers, and aerial fiber should be in-built.**

[Para 2.91]

3.11 The Authority also recommends that DoT should immediately act on TRAI's letter dated 1st February 2022 (attached as Annexure III) and 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.

[Para 2.92]

3.12 The Authority reiterates that its earlier recommendations on 'Roadmap to Promote Broadband Connectivity and Enhanced

Broadband Speed' dated 31.08.2021 (para 7.23) may be implemented at the earliest. National Fiber Authority (NFA) should be formed in priority to undertake the planning and development of common duct and posts infrastructure. The scope of the agency should be expanded beyond common ducts and telegraph posts, to undertake responsibilities related to above-ground contrivances, appliances, and apparatus. Further, NFA should also be given responsibility of ensuring, in consultation with State Governments that CAAs share street furniture assets on non-discriminatory, transparent, and non-exclusive basis.

[Para 2.97]

3.13 The Authority recommends that in case more than one TSP makes requests to use the same SF and there is insufficient space available to meet the demands of all the requesting TSPs, they should coordinate among themselves to work out a technically feasible solution for shared use of the structure for the installation of equipment. In case the TSPs fail to reach an agreement, they should accept the decision of the CAA which may use a fair and reasonable method to select the TSP(s) who will use the SF.

The above provision should be made part of the Indian Telegraph Right of Way Rules, 2016 through a suitable amendment by issuing a Gazette notification.

[Para 2.98]

3.14 The Authority reiterates its earlier recommendation on 'Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed' dated 31.08.2021 (para 7.11) for formation of a National RoW Council. All the RoW matters related to street furniture should also be placed before this council.

[Para 2.99]

C. Street furniture and small cell sharing among TSPs and IP-Is

3.15 The Authority recommends that charges paid by lessee TSP to lessor TSP for use of shared infrastructure should be reduced from the Gross Revenues of the lessor TSP to arrive at Applicable Gross Revenue (ApGR) of such Lessor TSP. To implement this, a new item named as "Revenue earned from other licensed TSPs from sharing/leasing of infrastructure" should be inserted under existing license condition named as "List of other items to be excluded from GR to arrive at ApGR". This modification may be carried out in UL, UL(VNO) and ISP licenses. Also, the information collected in "Format of Statement of Revenue and License Fee" that is attached with each authorization chapter in UL, UL(VNO) and with ISP licenses needs to be modified to capture information from such revenues under a separate head.

[Para 2.113]

3.16 The Authority recommends that the guidelines and registration agreement of IP-I providers should be modified to exclusively mention the term 'poles' in their scope of work.

[Para 2.114]

D. Process Simplification, Permission Exemption, Standardization of small cells and Installation practices

3.17 The Authority recommends that Low Power Base Transceiver Stations (LPBTS) should be defined as those BTS that radiate EIRP<=600 W. Such equipment/small cells should be exempted from seeking any kind of permission from any Authority except from the Street Furniture/building owning Agency at all places.

[Para 2.142]

3.18 DoT's simplified EMF compliance framework should redefine normally compliant class to include those LPBTS with EIRP > 2 and ≤ 600 Watt and TEC should accordingly modify the tables (As provided in Table 2.3) for this class.

[Para 2.143]

3.19 Recent actions have been taken by DoT for simplifying the process for SACFA compliance, for low power equipment/small cell radiating EIRP<=100 W. DoT should increase this limit to 600 W to cover most of the Small Cells/LPBTSs that are being deployed.

[Para 2.144]

3.20 Presently TERM Cell is required to audit 10% of sites for which TSPs have submitted self-certification to their offices. However, considering the sheer volume of Small Cells, which otherwise may put severe strain on TERM cell and TSPs resources, this audit criteria for Small Cell may be relaxed. DoT should consult Ministry of Statistics and Programme Implementation (MOSPI) to come up with a scientific sample size for auditing BTS/small cell sites.

[Para 2.145]

3.21 Presently TSPs are required to provide self-certification for EMF radiation compliance every three years. However, considering the sheer volume of Small Cells, which otherwise may put severe strain on TSPs resources, self-certification criteria for LPBTS should be relaxed to five years.

[Para 2.146]

3.22 The Authority recommends that DoT should put in place a mechanism for close monitoring of all RoW applications by portal administrators and also coordination with Nodal officers of

Appropriate Authorities to ensure timely processing of application and reduce unwanted rejections.

[Para 2.153]

3.23 The Authority recommends that DoT should make necessary provisions in the GatiShakti Sanchar Portal to incorporate bulk application filing and processing for all categories of Small Cells.

[Para 2.154]

E. Power related issues and solutions

3.24 The Authority recommends that DOT should take up the case with Ministry of Power, State governments and SERCs for implementation of following:

i. DISCOMs should make provisions to provide connections for telecom sites to TSPs/IP-Is on priority basis. The timelines for providing the connection should be fixed (preferably 15 days) and monitored through portal.

ii. Given the importance of DCI for socio-economic development of States, DISCOMs should not charge the TSPs/IP-Is for installation/upgradation of transformer or for pulling the last mile of the electrical connection. If required, states should make necessary provisions for compensating DISCOMs for such waiver of charges.

iii. As the power requirements for small cells remain almost flat throughout the day, DISCOMs should charge TSPs/IP-Is on the basis the running load and not on the sanctioned load.

iv. All DISCOMs should treat Street Furniture Address as Commercial Address for the purpose of providing a power connection and allow multiple power connections at the same SF commercial address to different commercial entities.

v. **DISCOMs should allow sub-letting of connections at street furniture locations.**

vi. **Smart pre-paid electricity meters should be installed in all existing telecom installations on priority and in a time bound manner. Also on all new installations, including that for small cells, DISCOMs should only install smart prepaid electric meters.**

vii. **Provision for one application for bulk processing of connection requests for multiple sites should be made available through portals for promoting ease of doing business.**

viii. **Telecom sites should be provided electricity connection under Utility/Industrial tariff.**

ix. **DISCOMs should adopt One DISCOM-One Bill-One Payment policy for all Telecom sector service/infra providers users that use electricity connections at multiple locations.**

x. **Open Access policy for using solar/renewable energy sources needs to be modified to incorporate provision to aggregate demand from all sites of a TSP/IP-I that are served by a DISCOM.**

xi. **DISCOMs should share their maintenance schedules with TSPs/IPs (site owners) in advance so that site owners can be prepared in the event of power cuts. The actual duration of all power outages should also be made available area wise on their website.**

[Para 2.175]

3.25 In the collaborative spirit of GatiShakti and to promote sharing of infrastructure above, the Authority recommends that DoT should take up the issue with the states that whenever land is

provided on favorable terms to utility company and those utility company shares the same for utilization with other utility company, then terms of use of land should not change.

[Para 2.178]

F. Institutional mechanism for enabling Collaboration between Controlling Administrative Authorities and TSPs/IP-Is

3.26 In order to evaluate and assess the progress of small cell rollout, the role of Broadband steering committee, State broadband committee and District/Municipal Monitoring Committee, should be expanded to include continuous monitoring of the issues of small cells at Central, State and District/Municipal levels, respectively.

[Para 2.191]

3.27 The representation of the Broadband Steering Committee should be expanded to co-opt other Ministries or Departments like Civil Aviation, Defense, Ports, Shipping and Waterways, Power etc. as per requirement.

[Para 2.192]

3.28 For the State broadband committee members from major ports, airports, metro rail and other relevant commercial bodies that are present in the states, should be co-opted.

[Para 2.193]

3.29 In cities where street furniture is controlled by multiple agencies, the concerned State/Local government should nominate one of the assets owning agencies as lead/nodal Authority to monitor the permissions related to small cells.

[Para 2.194]

3.30 The details of the nodal ministry and nodal officers from each of the states along with the TSPs/IPs and IPs should be included in the Monitoring Dashboard as envisaged in the NBM to track the

progress of the small cell deployment across each State and District of the country.

[Para 2.195]

3.31 The Authority reiterates that its earlier recommendations on 'Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed' dated 31.08.2021 (Para 7.14.ii) in the context of defining clear roles for the Central, State, and Local Body authorities in the RoW portal, should be implemented by the Government on priority. The Authority further recommends that these roles should be widened to administer the use of street furniture for small cell and aerial fiber deployment.

[Para 2.196]

3.32 The Authority recommends that the scope of e-marketplace which was recommended by the Authority in para 7.31.iv of its recommendations dated 31.08.2021 on "Roadmap to Promote Broadband Connectivity and Enhanced Broadband speed" to facilitate leasing and trading of passive infrastructures using a common GIS platform should be expanded to include small cells along with the passive infrastructure.

[Para 2.200]

ANNEXURE I

DoT clarification (dated 26.10.2022) on Indian Telegraph RoW rules, 2016

No.2-10/2022-Policy
Government of India
Ministry of Communications
Department of Telecommunication
*****

Sanchar Bhawan, 20, Ashoka Road
New Delhi, the 26th October, 2022.

OFFICE MEMORANDUM

Subject: - Indian Telegraph Right of Way Rules, 2016 (as amended from time to time) – Clarifications - regarding.

The undersigned is directed to refer to the provisions related to application fee to be paid by the applicants for seeking permission for Right of Way for establishment of telegraph infrastructure and rejection of application [Rule 6(2)(b) and 10(3)(b)] under the Indian Telegraph Right of Way Rules, 2016. In this regard, it is clarified that application fee shall not be deducted (fully or partly) by agencies processing the application, in case of rejection of application on account of deficiency in the documents submitted by the applicants and the application fee paid shall be adjusted on re-submission of application after rectification for the same site.

2. Further, it is also clarified that the term "Street furniture" mentioned in the Indian Telegraph Right of Way (Amendment) Rules, 2022 includes "post/pole used for electricity, street light, traffic light, traffic sign, bus stop, tram stop, taxi stand, public lavatory, memorial, public sculpture, utility pole or any other structure or contrivance of such nature established over the property of an appropriate authority".

3. All concerned Central Ministries/Departments and State Governments/UT Administrations are requested to convey the above clarification to all the agencies who are involved in granting Right of Way permissions for establishment of telegraph infrastructure.

[Rahul Dwivedi]
Under Secretary to the Government of India
Tel. No. 011-23713715

To

1. **Secretaries of all concerned Ministries/Departments** (as per list enclosed).
2. **The Chief Secretaries/Administrators of all States/UTs** (as per list enclosed)

For information to:

1. **The Director General,** Cellular Operators Association of India(COAI), New Delhi.
2. **The Director General, Digital Infrastructure Providers Association(DIPA),** New Delhi.
3. **The President, Internet Service Providers Association of India,** Nehru Place, New Delhi.

ANNEXURE II

DPIIT letter (dated 24th June 2022) instructing to include additional data layers in the State Master plan

No. National Master Plan/Logistics/2021
Government of India
Ministry of Commerce & Industry
Department for Promotion of Industry and Internal Trade
(Logistics Division)
*****

Udhyog Bhawan, New delhi
Dated 24th June 2022

OFFICE MEMORANDUM

Subject: PM Gatishakti State Master Plan - Development of State Master Plan
Ref: OM no. National Master Plan/Logistics/2021 dated 3rd March 2022

The undersigned is directed to refer to above mentioned OM wherein States have been requested to update 24 data layers on PM Gatishakti State Master Plan. In this regard a request has been received from Department of Telecommunication(DoT) (Copy enclosed) regarding additional data layers which can be used for deployment of 5G Cell as DoT is planning to roll out 5G mobile network in the country. Therefore, following additional layers are required to be mapped on the State Master Plan.

i. Electric poles
ii. Traffic light poles
iii. Bus terminal and Bus shelters
iv. Government buildings (State Govt/ Central Govt/ PSU)

2. All States are requested to integrate these layers, as far as possible, in their State Master Plan in coordination with BISAG-N.

(Pramod Kumar Verma)
Under Secretary to Govt of India

Encl: As above

To,

i. Chief Secretaries of all States and UTs
ii. PM Gatishakti nodal officers of all States and UTs

Copy for kind information to:

1. Secretary, DPIIT
2. Shri T.P. Singh, Director General, BISAG-N
3. Shri Vinay Thakur, Additional Director General, BISAG-N
4. Shri Neeraj Kumar, DDG(NBM), DoT and Member NPG

No. 1-1/2021-DGT/NMPPMGatiShakti
Government of India
Ministry of Communications
Department of Telecommunications
O/o DG Telecom HQ
(Broadband Mission)

Dated: 21.06.2022

To
Special Secretary (Logistics)
Department for Promotion of Industry and Internal Trade
Udyog Bhawan, New Delhi – 110011

Subject: PM GatiShakti State Master Plan - inclusion of electric poles for 5G rollout

Reference:

1. DPIIT OM No. National Master Plan /Logistics/2021 dated 3rd March,2022 from Under Secretary to Chief Secretaries of all States & UTs.
2. DO.No. 39-1/2020-DGTHQ/3 dated 11th Feb 2022 from Secretary, (Telecom) to all Chief Secretaries (copy attached)

Please refer to DPIIT OM dated 03.03.2022 mentioned above, wherein DPIIT has requested Chief Secretaries of all States & UTs for integration of data layers (in Annex-A of the letter) into the State Master Plan through the assistance of BISAG-N. Out of the 24 layers suggested for mapping by States one of the layers is for mapping of 'Power transmission and distribution'.

2. In this regard it is suggested that DPIIT may specifically ask States to map the location of the electric Poles as part of mapping of 'Power transmission and distribution'. This is necessary, for imminent 5G rollout, as the Telecom Service Providers may need to install 5G cells at very short distances and the electric poles may be one of the most important choices.

3. It may also be conveyed to the States that it will be good if the States can also identify other potential Street furniture viz. traffic light poles, bus shelters, potential sites of Govt. buildings, bus terminals etc. which may be used for deployment of 5G cells, as DoT is targeting 5G rollout in 15 identified cities of the country, which will be followed by full-fledged rollout in the future.

4. In view of the important role of States in supporting the 5G rollout, it is requested to issue another memorandum to Chief Secretaries of all States & UTs with above points.

(Neeraj Kumar)
DDG & Mission Director
National Broadband Mission

ANNEXURE III

TRAI letter to DoT (dated 1.02.2022) on Streamlining the guidelines of passive and active infrastructure sharing

भारतीय दूरसंचार विनियामक प्राधिकरण
TELECOM REGULATORY AUTHORITY OF INDIA
भारत सरकार /Government of India
TRAI

File No. M-7/1/6(4)/2022-BBPA

Date :1st February, 2022

To

Shri K. Rajaraman,
Secretary,
Department of Telecommunications,
Ministry of Communications
Sanchar Bhawan,
20, Ashoka Road, New Delhi - 110001

Subject: Streamlining the guidelines of Passive and Active Infra Sharing as per Authority's Recommendations-Regarding

This is regarding issue of Active and Passive sharing as authorized under various Access and Internet Service provision Licenses and Authorization. The provisions allowing active and passive infrastructure sharing in the different licenses/authorizations that were issued at different points in time vary, thus dissuading infrastructure sharing and creating issues of level playing field.

2. About Sharing of passive and Active Infrastructure, Authority in its recent recommendations of August 2021 titled "Recommendations on Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed" vide Para 3.47 said that similar to the Access Service authorization, passive as well as active infrastructure sharing should be allowed under the Internet Service License, and Internet Service authorization under the Unified License (UL) and UL(VNO) licenses." A similar recommendation was made in the context of "Proliferation of Broadband through public Wi-Fi networks" dated 9th March 2017.

3. It may be noted that UL and UL-VNO License agreement, each has two parts. Part-I has seven chapters and specify conditions that are applicable to all Licensees irrespective of the Authorizations. Part-II has different chapters dedicated to each of the Authorizations like Access Service, ISP, NLD, ILD etc and have specific clauses that are applicable to that particular Authorization over and above the general conditions

Contd/-

महानगर दूरसंचार भवन, जवाहर लाल नेहरू मार्ग, Mahanagar Doorsanchar Bhawan, Jawahar Lal Nehru Marg
(पुराना मिन्टो रोड), नई दिल्ली / (Old Minto Road), New Delhi-110002
फैक्स/Fax : +91-11-23213294, ईपीबीएक्स नं0/EPBX No. : +91-11-23664145

mentioned in Part-I. Presently different clauses for Active/Passive Infra Sharing under Common Conditions (PART-I) and Specific Service Conditions (PART-II) in different authorizations/Licenses are mentioned (compiled as **Annexure-I).** Plain reading of these conditions can be confusing on following grounds :

a) The Conditions mentioned in Part-I are in conflict with conditions mentioned in Part-II. For example, Clause 33.1 of UL License mentions *"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."* However, under ISP Authorization chapter there is no mention of any Active Infrastructure sharing.

b) The conditions mentioned for Access and ISP authorization are not similar.

4. In addition, in the Case of ISP licenses issued under 2002 and 2007 guidelines, there is no clarity about passive Infra sharing or sharing of active infrastructure like antenna, feeder cable, and transmission systems.

5. Authority thus feels that terms of Active/Passive Infrastructure Sharing should be similar in all Licenses/authorizations, to the extent possible. The scope of provisions in common conditions (Part-I of UL and UL-VNO) and specific service conditions (Part-II of UL and UL-VNO) should be clearly mentioned as to whether the clauses in part-II are "additional clauses" or "having overriding effect". DoT may accordingly issue clarification/amendment to license conditions so that sharing of active/passive Infra can be further facilitated.

Encl: As above

RAGHUNANDAN
VARTHAKAVI

(V. Raghunandan)
Secretary, TRAI

	Unified License			Unified License (VNO)			ISP 2002	ISP 2007
	Provision under common conditions	**Provision under Access service authorization under UL**	**Provision under ISP Service authorization under UL**	**Provision under common conditions**	**Provision under Access authorization under UL**	**Provision under ISP authorization under UL**		
Passive Sharing		4.2(i) Sharing of "passive" infrastructure viz., building, tower, dark fiber, duct space, Right of Way etc. with other Licensees.	2.1(xi)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 Licensees.	32.1 The terms and conditions of sharing of infrastructure between the NSO(s) and VNO shall be left to the market i.e. on the basis of mutually accepted terms and conditions between the NSO(s) and the VNO.	4.2(i) Sharing of "passive" infrastructure viz., building, tower, dark fiber, duct space, Right of Way etc. with other Licensees.	2.1 (vii) 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.		
Active Sharing	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.	4.2 The sharing of infrastructure, owned, established and operated by the Licensee under the scope of this Authorization, is permitted as below: (ii) Provision of point to point bandwidth from their own infrastructure within their Service Area to other licensed telecom service providers for their own use. However, the Licensee hiring the bandwidth shall not resell such bandwidth.		32.1 The terms and conditions of sharing of infrastructure between the NSO(s) and VNO shall be left to the market i.e. on the basis of mutually accepted terms and conditions between the NSO(s) and the VNO.	4.2 The sharing of infrastructure, owned, established and operated by the Licensee under the scope of this Authorization, is permitted as below: (ii) Provision of point to point bandwidth from their own infrastructure within their Service Area to other licensed telecom service providers for their own use. However, the Licensee hiring the bandwidth shall not resell such bandwidth.		Sharing of Active infrastructure amongst Service Providers based on mutual agreements entered amongst them is permitted. Active infrastructure sharing will be limited to WiFi equipment such as Wi-Fi router, Access Point etc. (Inserted in Guideline on 31.03.2021)	Sharing of Active infrastructure amongst Service Providers based on mutual agreements entered amongst them is permitted. Active infrastructure sharing will be limited to WiFi equipment such as Wi-Fi router, Access Point etc. (Inserted in Guideline on 31.03.2021)
	3.2 Sharing of Active infrastructure amongst Service Providers based on the mutual agreements entered amongst them is permitted. Active infrastructure sharing will	4.3 Further, the Licensee may share its own active and passive infrastructure		32.2 Sharing of Active infrastructure amongst Service Providers based on the mutual agreements entered amongst them is permitted. Active	4.3 Further, the Licensee may share its own active and passive infrastructure for providing other services authorized to it under the license.			

	be limited to antenna, feeder cable, Node B, Radio Access Network (RAN) and transmission system only. (Amended vide DoT's letter no. 20-443/2014 AS-I Pt. dated 11.02.2016)	for providing other services authorized to it under the license.		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. (Amended vide DoT's letter no. 20-271/2010 AS-I (Vol.-III) dated 06.04.2021)	4.4 Moreover, sharing of active infrastructure with other licensees shall be governed by the license conditions/amendments issued by the Licensor from time to time.		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. (Amended vide letter no. 20-271/2010 AS-I (Vol.-III) dated 23.09.2021 & 27.09.2021)	4.4 Moreover, sharing of active infrastructure with other licensees shall be governed by the license conditions/amendments issued by the Licensor from time to time.			
	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. (Amended vide letter no. 20-271/2010 AS-I (Vol.-III) dated 23.09.2021 & 27.09.2021)	2.1(x) Spectrum sharing and trading would be permitted as per guidelines issued by the Government from time to time. (Amended vide DoT letter no 20-271/2010 AS-I dated 03.12.2015)		33.4 An authorized Gateway hub operated by the satellite provider itself is permitted to be shared with the satellite bandwidth seeker. (Amended vide letter no. 20-271/2010 AS-I (Vol.-III) dated 23.09.2021 & 27.09.2021)				
	33.4 An authorized Gateway hub operated by the satellite provider itself is permitted to be shared with the satellite bandwidth seeker. (Amended vide letter no. 20- 271/2010 AS-I (Vol.-III) dated 23.09.2021 & 27.09.2021)							

ANNEXURE IV

DOT's Instructions (dated 04.02.2021) on the Review of EMF Audit Biennial Self-certification

Government of India
Ministry of Communications
Department of Telecommunications
(Access Services Wing)
Sanchar Bhawan, 20, Ashoka Road, New Delhi

File No.:800-15/2010-VAS (Pt.) **Date: 04.02.2021**

To,

All CMTS/UASL/UL (having Access Service Authorization) Licensees

Subject: Review of Biennial Self-Certificate submitted by the TSPs.

This is in reference to Clause 6.1 of letter no. 800-15/2010-VAS dated 20.11.2013 which states that *"In case of all BTSs, except new BTSs commissioned during the cycle, the TSPs are required to submit the self-certificate within the window of 2 years, which is presently from 01.04.2013 to 31.03.2015, subject to a time gap of at least one year in submission of self-certificate in 2 consecutive cycles. In case of upgraded sites, these certificates are to be submitted in addition to revised certificates submitted at the time of site upgradation."*

2. The matter has been further examined and the process of submission of Biennial certificates has been modified as below:-

i. The cycle of submission of self-certificates shall be changed from two years (Biennial) to three years (Triennial). The current cycle commences w.e.f 01.04.2019 and ends on 31.03.2022.

ii. The Triennial submission of self-certificates shall not be done in respect of those BTSs for which following self-certificates have been submitted by the TSPs during the three year cycle:-
   a) Self-certificates for New BTS.
   b) Self-certificate for Upgradation of BTS.
   c) Self certificate due to upgrade/addition of BTSs of other/sharing TSP.

3. All existing instructions in general and particularly those issued vide letter no. 800-15/2010-VAS dated 20.11.2013 shall remain same.

This is issued with the approval of competent authority.

(Suresh Kumar)
ADG(AS-II)

Copy to:
1. DG (T), DoT HQ, New Delhi.
2. All Advisor(s)/Sr. DDGs of LSA Units of DoT.
3. COAI.

ANNEXURE V

Recommendations of the Working Group to FOIR

Recommendations of the Working Group to the FOIR on "Cross Sector Collaborative Regulation between Telecom Regulators and Electricity Regulators"

Background

Based on discussions in the 21st Annual General Body Meeting of FOIR, held on 30.09.2020, a Working Group was constituted (**Annexure-I**) to submit its recommendations on "Cross Sector Collaborative Regulation between Telecom Regulators and Electricity Regulators". The working group was to submit its recommendations within 3 months from the date of its constitution. However, due to the ongoing pandemic and vastness of the subject which necessitated formation of some sub-groups, the recommendations of the Working Group were delayed.

Meetings of the Working Group

Meetings of the Working Group took place on **23.11.2020, 27.01.2021, 21.10.2021, 08.11.2021**, and **16.11.2021**. Deliberations/Presentations were made on how telecom sector can utilize available infrastructure in the electricity sector, international case studies, and information and communication technologies (ICTs) requirements of electricity utilities. Bhaskaracharya National Institute for Space Applications and Geo-informatics{BISAG} , an Autonomous Scientific Society registered under the Societies Registration Act, 1860 under the MeitY, Government of India to undertake technology development & management, research & development, facilitate National & International cooperation, capacity building and support technology transfer & entrepreneurship development in area of geo-spatial technology was requested to make a presentation before the Working Group as they have data of various sectors in realtime form, which can be super imposed to know actual availability of Telecom & Discoms Electrical Poles, OFC etc. The presentation was made by DG of BISAG-N on **8.11.2021**

regarding the work they are doing for development of various portals for the Government.

Constitution of Sub-groups

As the subject was extensive and various aspects were to be studied and analysed in detail, the Working Group decided to further constitute following four sub-groups :

S.N.	Group & Mandate	Members	TOR
1	**Group 1 - Mapping ofavailable infrastructure/assets**	- Shri H.S Kaushal; CTU (POWERGRID) - Shri H C Sharma, TPDDL - Shri M K Singh, Indus Towers	Guidelines to evolve a country wide National Fibre Grid map based on the fibre optic networks of various utilities which can be further utilized for 5G infrastructure.
2	**Group 2 - Installation practices for small cells**	Shri H C Sharma; TPDDL Shri M K Singh; Indus Towers Er. J. Prabhakaran; TNERC	
3	**Group 3 - Installation practices for aerial fibre**	Shri H C Sharma; TPDDL Er. J. Prabhakaran; TNERC	
4	**Group 4 – Legal, regulatory and licensing issues to enable cross sector collaboration**	Shri Manoj Kumar Singh; Indus Towers Shri H.S Kaushal; CTU (POWERGRID) Mr. H C Sharma; TPDDL Shri Sanjay Sharma , Joint Director - DERC Ms Shilpa Agarwal, Joint - Chief (Engg), CERC	To look into the appropriate provisions of the relevant Acts, Regulations etc. in order to have a seamless participation of Power & Telecom sectors for the development of 5G infrastructure in India. appropriate relevant Acts.

These Sub-Groups held various meetings and submitted their reports. Based on deliberations held in various meetings and the reports of the sub-groups, the recommendations of the Working Group has been framed as follows :

Recommendations of Working Group

(i) Government has already announced the GatiShakti programme that marks a paradigm shift in decision making to break the silos of departmentalism. The Working Group strongly feels that FOIR platform can be leveraged to make this program a success. A well thought through and effective cross-sector partnership between Telecom and Power sector can benefit both sectors through increased scales, leveraging shared resources, improve reach and amplify overall developmental impact. Figures below depicts some of the possible areas for cross sectoral collaboration that can bring in new revenue opportunities and cost savings for the service/infra providers of both Telecom & Power sector.

While the possibilities for cross-sectoral collaborations are limitless, the Working Group has identified few areas as low hanging fruits that can be picked up easily to start with. The suggested areas of collaborations are:

a. **Cross-sector collaboration for Aerial/underground fiber deployment**

Overhead or Aerial fiber deployment is deployment of optical fiber cables (OFC) using pole or tower infrastructure and in process avoids the need to dig roads to lay cables or to create new ducts/pipelines. Many developed countries like Japan and Europe have rolled out aerial fibers as part of their broadband plans due to their relatively quick and easy installation

characteristics. South Korea, which has one of the highest Fiber-to-the Home (FTTH) penetration, has relied heavily on aerial fiber deployments in initial years. International experience in the telecom sector has proved that collaborative regulations are helping in the speedy deployment of the 5G Networks. For instance, Georgia Power of the US is utilizing its assets to deploy 5G infrastructure by offering 5 lakh outdoor streetlights poles and 90,000 transmission structures to telecom service providers.

With most of the population residing in Tier 2/Tier 3/Rural areas in India, the overhead fibers can be a good option for rolling out the last mile fiber connections for increasing broadband penetration in hard-to-reach areas. Either existing electricity poles or dedicated poles erected overground for this purpose could be used for laying aerial OFC. Access to the utility poles as well as commercial or residential buildings is also required for installing aerial OFC, small cells, and In-building solutions. This can boost the cross-sector infrastructure development and sharing with other utility sectors can provide added cost advantages.

Power transmission companies like PGCIL have laid down and owns around 1 lac kilometers of optical fiber network Pan India and already provided transmission towers for use by the telecom/ internet service providers. Service providers of Telecom and power sectors together own majority of the utility poles/tower infrastructure and cross-sector collaboration between these two sectors can promote aerial OFC proliferation. Service providers thus can have a mix of underground deployment and overhead deployment along transmission or distribution lines, eliminating infrastructure hurdles of digging and Right of Way (RoW) permissions. This can ensure fast and wide-spread OFC deployment across the country on one hand and can also generate additional revenues from existing assets.

b. Cross-sector collaboration for 5G Small Cells deployment

Small cells are low-powered radio access nodes or base stations operating in the licensed or unlicensed spectrum that have a coverage range from a few meters upto several hundred meters. They can be deployed to facilitate connectivity, increase the network capacity and coverage in localized areas whether inside buildings or in outdoor spaces. Small cells will be much closer to mobile users and hence can offer better voice quality and data performance. In the 5G technology, the deployment of small cells will increase tremendously. To promote mobile connectivity, street furniture can be a highly effective tool in expanding the coverage of existing 4G as well as upcoming 5G networks. Moreover, there is a close relationship between street furniture access and aerial fiber deployments.

Granting access to public places like Government buildings/railway stations/metro rail stations/airports/ stadiums etc. and street furniture, such as bus stop shelters, utility poles, lamp posts, or traffic lights, owned by municipalities, at reasonable cost could remove a significant hurdle in 5G small cell deployment in the country.

In India, the power sector contributes to accessible street furniture like electric poles/lines/ supply pillars/cabinets/posts. Most of the infrastructure owned by the power sector distribution utilities in cities can be utilized by the telecom operators for the deployment of 5G Small cells. Alliances can be made with power DISCOMs, cable operators, and municipal authorities for using their utility poles and fibers for small cell deployments and for

providing OFC backhaul to these small cells, LT electric poles can be utilised subject to compliance of safety requirements.

c. **Cross-sector collaboration for smart metering, smart grid monitoring etc.**

5G when deployed on DISCOM's infrastructure creates a Win-Win situation where the distribution companies can be benefited from 5G use cases of smart metering, smart grid monitoring, disaster management, automation, fiber-ready network for power grids, energy management etc. Thus, there are new revenue and cost-saving opportunities for transmission companies and DISCOMs when their infrastructure is utilized for telecom installations.

(i) DISCOMs may rapidly facilitate to overlay the 5G infrastructure over Discom infrastructure which will provide seamless and ubiquitous digital connectivity, enabling adoption of emerging technologies e.g. AI, M2M, IoT, VR etc. for modernization/upgradation of DISCOMs infrastructure on mutual terms and conditions.

(ii) Though the above identified collaboration opportunities are win-win for utility service providers of both sectors, the Working Group felt that there are certain bottlenecks that prevent cross sectoral use of assets. The first major bottleneck is the information asymmetry whereby the utility company of one sector does not know which assets of the utility of other sector are available for sharing/use. The Working Group therefore recommends that a portal should be developed where utilities can give details of existing assets and fibers. A format for collection of Fibre Optics/Tower details from various utilities is being recommended (**Annexure-II**). This information will also help in creation of National Fibre Grid map by Department of Telecommunications (DoT) . The Working Group recommends that a

national portal may be created to publish this information on digital maps. The portal should also have provision whereby a utility company can indicate which of its assets are available for sharing and all other stakeholders can convey their response, if interested. Such a portal will thus be able to match demand and supply for sharing of the assets of utility companies of Power and Telecom sector.

(iii) The Working Group has parallelly requested BISAG-N to develop a prototype portal marking assets of Power and Telecom service providers such as for a 2 km x 2 km area in Delhi which will cover data of telecom towers, electric poles and overhead & underground Fibre networks of State Transmission & DISCOMs. However, this may take some time and the utility companies may not respond to the Working Group's request for data. Therefore, without waiting for the outcome of this initiative, the Working Group recommends that FOIR may ask DoT to get the portal developed.

(iv) The Working Group has observed that many utility companies have either laid optical fiber or own OPGW/ADSS, but are not monetizing these assets by renting them out. Utility companies can register as Infrastructure Providers with DoT to lease out dark fiber. Tata Power have in place their guidelines in this regard. The same can be shared with all power sector utility companies to help them in monetizing their dark fiber assets.

(v) Central Electricity Regulatory Commission (CERC) Regulation (Sharing of Revenue Derived from Utilization of Transmission Assets for Other Businesses), 2020 describes the manner of revenue sharing if any transmission licensee engages in telecommunication business (The amount of the sharing is 10% of gross revenue from Telecom business in a financial year). The Working Group recommends that CERC may request FOIR to either issue guidelines to SERCs or frame model regulations for SERCs on similar lines. The same may be suitably modified and adopted by SERCs.

(vi) It was brought to the notice of the Working Group that POWERGRID has developed an innovative solution for utilizing earth wire & transmission tower obviating the need of land acquisition and equipment power supply for Telecom equipment. Full-fledged demo set up was established by POWERGRID at Jhatikara substation on 400kV Jhatikara-Mundka line for tapping the auxiliary power from the earth wire to feed the tower mounted BTS equipment. Approx six kms Earthwire is isolated using arching horns to take care of intended lightening protection. Auxiliary power in the range of 4.1kW was obtained using induced current of the isolated E/W. This auxiliary power is fed to the BTS equipment by using a suitable DCPS convertor. The telecom antennas and the BTS with associated panel, batteries, charger etc were placed on a platform mounted on the transmission tower. A typical installation has been depicted in **Annexure-III**. The set-up has been working satisfactorily since 18.06.2017. The Working Group therefore recommends utilization of the 400kV & 765kV transmission line Towers (and any other suitable ones) located near urban/rural population for placement of Telecom antennas and associated equipment on the towers itself (wherever feasible) to cater to the requirement of telecom towers.

(vii) In the matter of utilisation of Transmission Tower for placement of Telecom equipment and auxiliary power from earth wire, CERC has issued an Order i.r.o POWERGRID petition and has decided for revenue sharing with beneficiaries in ratio of 50:50 for one year and same shall be reviewed after one year. The Working Group recommends that CERC may request FOIR to either issues guidelines to SERCs or frame model regulations for SERCs on revenue sharing model similar to CERC's order w.r.t. POWERGRID petition.

(viii) The Working Group also recommends utilization of transmission assets such as electric substations lands & buildings as location for

placing Telecom sector equipment (wherever feasible) as they are operational on 24x7 power supply.

(ix) Delhi Electricity Regulatory Commission (DERC) has allowed for utilization of distribution assets for Telecom services on revenue sharing basis and same can be adopted by other State Regulators also. However, Municipal Corporation are imposing tax liability in cases where transmission assets i.e. Substation lands & buildings, are shared for cross function use on revenue sharing model. The Working Group recommends that this issue needs to be taken up at appropriate level so that whenever land is provided on favourable terms to utility companies and those utility companies are sharing the same for utilization with other utility company, then terms of use of land should not change.

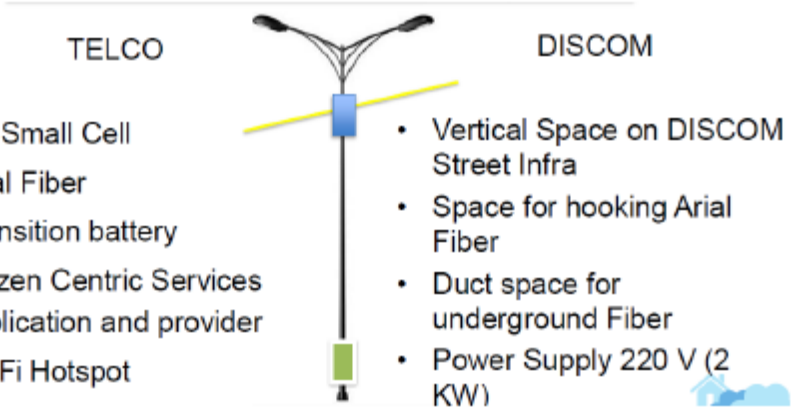
(x) As far as deployment of small cells on electric poles is concerned, the Working Group is of the opinion that Utility Poles would need following retrofit for small Cell Deployment :

a. Mounts for deployment of Small cell / Wi-Fi
b. Electricity Connection : 2KW
c. Outdoor enclosure for hoisting Power / Fiber / Telecom Equipment

As per the information provided to the Working Group, typical requirements of cabinets on utility poles for small cell deployment will be as follows:

Item	Details
Small Cell &Power Enclosure	1. Cabinet with Power Backup= 300(W)*450(L)*575(H) in MM. Weight= 32Kg ± 2Kg 2. Cabinet without Power Backup= 200(W)*275(L)*375(H) in MM. Weight= 22 Kg ± 2Kg 3. Only one Cabinet will be installed at one Pole as per requirement. 4. Small Cell= 300*300*50 Weight= 14 Kg for 1 unit, 2 Units atone pole. 5. Pole Mount Assembly= Weight= 6 kg

(xi) However, to have full understanding of all the requirements, the Working Group recommends that FOIR can initiate a pilot project to practically show how assets of Telecom and Power sector can be shared as shown below:



For the same, FOIR can identify 2 DISCOMs with 50-100 nos. of locations of street light poles. One or two Infrastructure providers can deploy 5G & Fiber Infra over DISCOM Infra (Indus Tower has already shown interest to work on this pilot). Citizen Centric Service and App provider can be looped in by these players to identify 2-3 use case for DISCOM i.e. Smart Metering, Uptime Management & QoS at user end. The Pilot Project may run for 3 months and detailed report to be submitted.

Additional recommendations for consideration of FOIR

The Working Group was also apprised of some issues that if addressed, can help in rapid infrastructure creation and faster rollout of 5G services. The same have been listed below for consideration of FOIR.

(i) A sum of Rs 22,500 crore has been earmarked as Central Government grant for installation of 25 crore smart prepaid meters across the country under the Rs 3-lakh-crore scheme for power distribution entities (DISCOMs) recently approved by the Cabinet. SERCs may direct the DISCOMs to Install Prepaid smart meters at telecom sites on priority.

(ii) As per CBDT Circular dtd. 30th June, 2021, Companies are paying 0.1% TDS over DISCOM bill payments, whereas DISCOMs are yet to upgrade their payment portals to accept bill nett of TDS. Due to this , the industry is burdened with 0.1% of additional out flow (Paying 0.1% TDS & not deducting from the bills). As there is no adverse impact on the DISCOMs , there is reluctance to upgrade their system to accept payments net off TDS. It is recommended that either DISCOMs seek exclusion from CBDT for TDS applicability upon electricity payments or seek some moratorium period to upgrade their system, to stop double payment problem currently faced by Service providers/Infrastructure providers of telecom sector.

(iii) Telecom sites should be provided electricity connection under Utility/Industrial tariff. SERCs may be requested to incorporate the same in their tariff orders.

(iv) Discoms should adopt One Discom-One Bill-One Payment policy for all Business users that use electricity connections at multiple locations including Telecom sector service/infra providers. SERCs may be requested to incorporate the same in their tariff orders.

(v) Electricity consumption at each telecom site may be allowed to be aggregated and offset with green power (solar, wind, hydro etc) generated at distant locations. SERCs may be requested to incorporate same in their regulations.

******

Annexure - I

Members of the Working Group

1. Shri Sanjeev Kumar Sharma, Advisor, TRAI – Chairman of the Working Group
2. Shri J.K. Vaid, Director (Tariff), PSERC- Member
3. Ms. Sujata Das Chakrabarti, Secretary, TERC - Member
4. Shri Sanjay Kumar Sharma, Joint Director (PS & Engg.), DERC - Member
5. Ms Shilpa Agarwal, Joint Chief (Engg.), CERC - Member
6. Shri S.T.Anada, Joint Director, GERC – Member
7. Er. J.Prabhakaran, Dy.Director/ Engg. (II), TNERC - Member
8. Shri Shouvik Banerjee, SE (E), CPD, WBSETCL – Member
9. Shri Manoj Kumar Singh, Chief of Technology, Indus Towers Limited - Member
10. Shri H.S Kaushal, Senior General Manager, CTU (POWERGRID) – Member & Convenor
11. Ms. Rashmi Somasekharan Nair, Dy. Chief (RA), CERC, FOIR Secretariat

Special Invitee

Mr. H C Sharma, GM, TPDDL

13

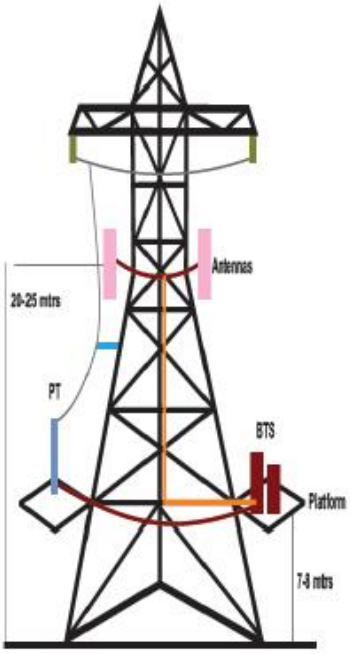
Annexure-II

Format for Assets Database										
Utility Name (TELCO/POWERTEL/GAIL/RAILTEL/BSNL/MTNL/SEB/Other) -										
Sr. No.	Name of link				No. of Fibre (24/48/96)	Possible Fibre Sharing		Whether Space is available in Node-A for BTS/MTS equipment/ Monitoring Center (Y/N)	Whether Space is available in Node-B for BTS/MTS equipment/ Monitoring Center (Y/N)	Remarks (if any)
	From Node-A		To Node-B			Whether Dark fibres Available (Y/N)	Whether Bandwidth Available (Y/N)			
	Node Name	Co-ordinate	Node Name	Co-ordinate						
1										
2										
3										

Power Distribution Utility (DISCOM) Name-								
Sl No.	Tower/Pole Details							
	Name of city	Details of Towers/Poles for mounting of 5G equipment (Mico Cells) – Height/Weight carrying capacity	Area/ Location of Pole	Latitude	Longitude	Clearance from ground available for mounting equipment	Whether electric connection available	Whether Tower Pole is available for sharing
1								
2								

14

Annexure-III



15

List of Acronyms

S. No.	Acronym	Description
1	3D	Three Dimensional
2	3G	Third generation
3	4G	Fourth generation
4	5G	Fifth generation
5	AC	Alternating current
6	AGR	Adjusted Gross Revenue
7	AI	Artificial Intelligence
8	ANFR	French Regulatory agency for spectrum management
9	ApGR	Applicable Gross Revenue
10	API	Application programming interface
11	ARAI	Automotive Research Association of India
12	BG	Bank Guarantee
13	BIS	Bureau of Indian Standards
14	BISAG-N	Bhaskaracharya National Institute for Space Applications and Geo-informatics
15	BMRCL	Bengaluru Metro Rail Corporation
16	BOT	Build–operate–transfer
17	BSNL	Bharat Sanchar Nigam Limited
18	CAAs	Controlling administrative authorities
19	CAPEX	Capital Expenditure
20	CDPDA	Common Ducts and Posts Development Agency
21	CERC	Central Electricity Regulatory Commission
22	CP	Consultation Paper
23	CPR	Construction Products Regulation
24	CPSE	Central Public Sector Enterprises
25	CTI	Common Telecom Infrastructure
26	DAS	Distributed antenna systems
27	dBm	decibel milliwatts
28	DC	Direct current
29	DCI	Digital Connectivity Infrastructure
30	DERC	Delhi Electricity Regulatory Commission
31	DISCOMs	Distribution Company
32	DoT	Department of Telecommunications
33	DPIIT	Department for Promotion of Industry and Internal Trade.
34	EB	Electricity Board

35	EECC	European Electronics Communication Code
36	EIRP	Effective Isotropic Radiation Power
37	EMF	Electromagnetic fields
38	EU	European Union
39	FCC	Federal Code of Communication
40	FDB	Fibre Splitter Distribution box
41	FOIR	Forum of India Regulators
42	FOR	Forum of Regulators
43	G.S.R	General Statutory Rules
44	GB	General Body
45	GIS	Geographic Information System
46	HT	High tension
47	IBS	In-building systems
48	ICNIRP	International Commission on Non-Ionizing Radiation Protection
49	ICT	Information and Communication Technology
50	IEC	International Electrotechnical Commission
51	IoT	Internet of Things
52	IP	Infrastructure Provider
53	IPDS	Integrated Power Development Scheme
54	IP-I	Infrastructure Provider Category -I
55	ISP	Internet Service Provider
56	ISRO	Indian Space Research Organisation
57	ITU	International Telecommunication Union
58	JERC	Joint Electricity Regulatory Commission
59	km	kilometre
60	LF	License fee
61	LPBTS	Low power Base Station Transmitters
62	LSA	Licensed Service Area
63	M2M	Machine to Machine communications
64	MIMO	Multiple-Input Multiple-Output
65	MNO	Mobile Network Operator
66	MoHUA	Ministry of Housing and Urban Affairs
67	MO-RAN	Multi-operator Radio Access Network
68	MOSPI	Ministry of Statistics and Programme Implementation
69	NBC	National Building Code
70	NBM	National Broadband Mission
71	NDCP	National Digital Communications Policy
72	NFA	National Fiber Authority
73	NOC	No objection Certificate

74	NSGM	National Smart Grid Mission
75	OA	Open Access
76	ODN	Optical Distribution Network
77	OEMs	Original equipment manufacturer
78	OFC	Optical fibre cables
79	OG	Overground
80	OHD	Open House Discussion
81	OLT	Optical line termination
82	OPEX	Operational Expenditure
83	PBO	Plan Build Operate
84	PM	Prime Minister
85	PPP	Public Private Partnership
86	PSU	Public Sector Undertaking
87	PWD	Public Works Department
88	RBS	Radio base station
89	RCI	radio communications infrastructures
90	RDSS	Revamped Distribution Sector Scheme
91	RF	Radio frequency
92	RoW	Right of Way
93	SAC	Simplified Assessment Criteria
94	SBC	State Broadband Committees
95	SCF	Small cell forum
96	SCIX	Small Cell Information Exchange
97	SDO	standard developing organizations
98	SE	Superintend Engineer
99	SEB	State Electricity Board
100	SERC	State Electricity Regulatory Commission
101	SF	Street Furniture
102	SLAs	Service-level agreements
103	SMPS	Switched Mode Power Supply
104	SSA	Secondary Switching Service Area
105	SUC	Spectrum usage charges
106	TEC	Telecom Engineering Centre
107	TP	Test Procedure
108	TRAI	Telecom Regulatory Authority of India
109	TSPs	Telecom Service Providers
110	UK	United Kingdom
111	UL	Unified license
112	UL-VNO	Unified license -Virtual Network Operators
113	US	United States
114	USA	United States of America
115	UT	Union Territory

116	VR	Virtual Reality
117	W	Watts
118	Wi-Fi	Wireless Fidelity