NASSCOM®

10 January 2022

To,
Shri Syed Tausif Abbas,
Advisor (Networks, Spectrum and Licensing)
Telecom Regulatory Authority of India,
Mahanagar Doorsanchar Bhawan,
Jawaharlal Nehru Marg,
New Delhi, Delhi 110002

Subject: **NASSCOM Response to Consultation Paper on Auction of Spectrum in frequency bands identified for IMT/5G**

Dear Shri Abbas,

At the outset, we would like to congratulate the Telecom Regulatory Authority of India (**TRAI**) for releasing the extensively researched, and implementation-oriented Consultation Paper on Auction of Spectrum in Frequency Bands identified for IMT/5G (**CP**). In particular, we appreciate the inclusion of private 5th Generation (**5G**) networks within the scope of consultation.

As rightly acknowledged by the TRAI, benefits including security, mobility, outdoor stability, network efficiency and reliability of coverage, are all factors that have made 5G/Long-Term Evolution (**LTE**) Non-Public Networks (**NPNs**) a compelling proposition amongst the industry worldwide.[1] In fact, as on date, at least 330 large, small and medium enterprises across the world are investing in 5G/LTE NPNs, in the form of trials, pilot deployments, and commercial network launches. By 2024, an estimated US$ 5.7 billion worldwide revenue is expected to be attributable to the sales of 5G/LTE NPN infrastructure components, and this valuation is expected to surpass US$ 17.7 billion by 2030. The Private 5G networks infrastructure is estimated to grow by a Compound Annual Growth Rate (**CAGR**) of 43.4% with US, China, Germany, Japan & South Korea expected to be leaders in this market. As the world progresses towards Industry 4.0, the Asia-Pacific market is expected to have the fastest private 5G growth rate by 2027.[2]

Therefore, the reference from the Department of Telecommunications (**DoT**) and TRAI's CP, are both timely, and in line with the National Digital Communications Policy - 2018 (**NDCP**) which *inter alia* aims to: *"harness the power of emerging digital technologies, including 5G, AI, IoT, Cloud and Big Data to enable provision of future ready products and services; and to catalyse the fourth industrial revolution (Industry 4.0) by promoting Investments, Innovation and IPR"*.

The remainder of our response pertains only to aspects dealing with the deployment of 5G/LTE NPNs, and are generally responsive to Questions 68 to 74 of the CP.

Background

Private 5G/LTE networks, also referred to as NPNs are enterprise-dedicated networks that are built using 3rd Generation Partnership Project (**3GPP**) standardised technology (i.e., mobile carrier and cellular technology such as LTE, LTE Advanced, 5G NR and 5G Advanced) rather

[1] See CP at pp. 96-97
[2] Please see: https://www.idc.com/getdoc.jsp?containerId=prUS47318621

than using Institute of Electrical and Electronics Engineers (**IEEE**) standardised technology (LAN, Ethernet, Wi-Fi, etc.) to establish a private network in a specific building or site.

The potential benefits of NPNs have come to fore with the advent of Industry 4.0, wherein an increasing number of use-cases continue to underscore the benefits of NPNs to industries. While networking as a service, obtained from licensed Telecommunications Service Providers (**TSPs**) would continue to be in the mainstay, worldwide industries with niche and specific requirements – automotive manufacturing, logistics service providers, ports and airports, healthcare institutions, etc. are increasingly adopting NPNs and, this trend is likely to gain momentum going forward. For these industries, the key benefits of NPNs over other IEEE-based technology standards include:

(a) ***Security***: One of the main advantages of 5G/LTE NPNs is security, since they allow industries implementing such networks an incrementally secure network for critical enterprise communications.[3] Enterprises deploying NPNs have greater control over network usage, and are free to frame security policies, prioritise traffic and regulate the transfer of personal and business sensitive data in line with industry-specific standards.[4]

(b) ***Customisability***: Unlike public networks, 5G NPNs can be configured to a location's specific needs, and configurations can vary by site, depending on the type of work undertaken in each venue. For instance, for factories or assembly units, 5G NPNs can be connected to IoT devices for better monitoring, automation and security. Similarly, in hospitals, dedicated network layers can be used for patient health monitoring.

(c) ***Efficiency and Innovation***: 5G NPNs can be tailored to be highly compatible and integrable to very specific enterprise level equipment and software through the deployment of network slicing, wherein each "network slice" is an isolated end-to-end network tailored to fulfil diverse requirements requested by a particular application. This is typically done through Software Defined Networks (**SDNs**), Network Function Virtualisation (**NFV**) and multi-access edge computing. Resultantly, 5G NPNs promise to reduce latency, transmission delays and error rates, resultantly increasing efficiency for industrial applications.[5]

Licensing and Deployment Models Considered by the TRAI

In the CP, the TRAI has srecognised two high-level approaches for enabling the deployment of 5G/LTE NPNs viz.,

(a) ***Meeting the Demand for 5G/LTE NPNs through Licensed TSPs***: Under this model the TRAI envisages: (i) the provision of NPN 'as a service' by existing TSPs, (ii) TSPs deploying NPN infrastructure to utilise portions of their existing spectrum holdings, or (iii) TSPs sub-leasing their spectrum holdings for the creation of NPNs.[6]

(b) ***Utilising Unlicensed Spectrum or Earmarking of Licensed Spectrum for NPNs***: Under this model the TRAI envisages the utilisation of unlicensed spectrum by

---

3 Please see https://www.gsma.com/iot/wp-content/uploads/2020/10/2020-10-GSMA-5G-IoT-Private-and-Dedicated-Networks-for-Industry-4.0.pdf

4 Please see https://www.researchgate.net/publication/342210096_Challenges_Associated_with_Implementing_5G_in_Manufacturing

5 Please see: https://www.pure.ed.ac.uk/ws/files/32883461/network_slicing_5g_final_version_1.pdf

6 See CP at pp. 99-100

enterprises for the deployment of NPNs,[7] or the earmarking of bandwidths in licensed spectrum bands, specifically for the deployment of NPNs.[8]

NASSCOM Submissions on Approaches to Deploying NPNs

NPN as a Service provided by TSPs

We recognise that at the moment, investments in NPN infrastructure and spectrum are likely to be a viable strategy for select industries. Therefore, the first approach of enabling TSPs to serve the existing demand for NPNs, by providing NPN as a service, is likely to serve wider sections of the industry, who may not have the resources or know-how to deploy and manage NPNs.

Currently, there is nothing in the extant regulatory and licensing framework that prevent TSPs from designing and offering services that they believe will address enterprise requirements. Therefore, the extant licensing framework is adequate for enabling TSPs to utilise spectrum licensed to them to offer managed NPN services through techniques such as "network slicing." However, it would be unrealistic to expect that this approach alone, can serve the entire demand for enterprise NPNs for enabling Industry 4.0 use-cases in India.

Accordingly, the TRAI should consider a combination of all the approaches considered in the CP, with a special emphasis on direct licensing of earmarked spectrum to enterprises, for reasons elaborated below.

Sub-Leasing of Spectrum

Another option considered under the CP is sub-leasing of spectrum to enterprises by TSPs. While this option has indeed been operationalised in several jurisdictions, in practice, this approach is fraught with certain practical difficulties. TSPs are likely to limit instances of sub-leasing to only such bands which are underutilised/ unutilised. Given the simultaneous demand for consumer 5G applications, the pool of spectrum bands available for sub-leasing to enterprises for NPN deployments is likely to be limited. Moreover, given that sub-leasing is likely to be limited to Licensed Service Areas (**LSAs**) where the TSP holds spectrum utilisation rights, enterprises that are national in scale may need to lease spectrum from multiple TSPs. Even if reasonable leases could be negotiated enterprises may be left working with a patchwork of spectrum band with multiple TSPs, thereby adding additional complexities in the process of enterprise level network integration. All these factors add to the complexity of leveraging spectrum leasing towards accelerating NPN deployments.

Nonetheless, the TRAI should consider enabling spectrum leasing as one of the many options for enterprises looking to deploy NPNs, since the possibility of suitable sub-leasing arrangements tailored to enterprise-specific needs cannot be ruled out. Given the diversity of use-cases and enterprise requirements, a one-size fits all approach to regulating spectrum leasing is unlikely to succeed. Therefore, the TRAI should consider adopting a light-touch approach enabling TSPs to negotiate sub-leasing arrangements with enterprises and as such, there should not be any prior approval requirements. Moreover, TRAI should consider the following:

(a) Matters such as geographic scope of the sub-lease, payment terms, duration of sub-lease, etc. should be left to be decided by negotiations between TSPs and enterprises.

[7] See CP at pp. 101-102
[8] See CP at pp. 104-109

(b) TSPs and enterprises should be subject to a requirement of prior intimation to the Government. Parties to a sub-leasing agreement may be required to intimate the Government within 30 - 60 days of executing the sub-leasing arrangement and/or at the time of commencement of NPN operations.

In general, the TRAI should avoid any attempts at prescribing granular requirements to govern negotiations of sub-leasing arrangements between TSPs and enterprises, as that is likely to reduce the scope for negotiations and make the option of sub-leasing unviable for most enterprises.

Earmarking of Spectrum for NPNs

Greater control over network design and spectrum management are crucial enablers for the success of NPNs across a diverse and constantly evolving set of end-use requirements. Therefore, direct licensing of earmarked spectrum, is likely to enable greater number of use-cases for NPNs, while also providing certainty to enterprises on the availability spectrum access for the duration of the licenses.

By enabling enterprises to directly obtain licenses for spectrum use, spectrum usage can be tailored to enterprise-specific needs over a delimited geographic footprint that corresponds to their business premises. Further, and as rightly acknowledged by the TRAI, this approach is also likely to enhance spectrum utilisation by promoting shared usage amongst enterprises. Therefore, and given the limitations of the other two approaches, and the competing requirements for consumer applications over public networks, and enterprise applications over NPNs, the earmarking for dedicated frequencies in the mmWave and mid-Band spectrum is likely to be the best suited strategy for accelerating the deployment of NPNs.

Regulatory Considerations

Amongst licensed spectrum bands, the Government could consider limited bands (e.g., of 100 MHz each) can be earmarked for localised NPNs and licensed directly to enterprises under a light-touch regulatory framework. As such conditions such as roll-out obligations and reporting of spectrum utilisation should be avoided. Instead, the TRAI could consider including appropriately framed conditions to ensure that:

(a) The enterprise has requisite technical know-how to operate and maintain an NPN or has requisite arrangements with third parties having know-how to operate and maintain an NPN;
(b) The enterprise has technical documents detailing their NPN use-case;
(c) The allocated spectrum is not utilised for the provision of access services/ other commercial services, and is utilised solely for captive usage to meet enterprise requirements;
(d) NPNs are required to synchronise as necessary, if they are adjacent geographically or spectrally, in order to ensure non-interference with other applications;
(e) Equipment deployed for the NPNs meet all other technical requirements such as those relating to Effective Isotropic Radiated Power (**EIRP**) boundaries;
(f) Appropriate policies such as annual "check-ins" to ensure optimal and continual utilisation of all earmarked spectrum.

Similar to existing online processes developed by the Government, the licensing process should be entirely online, and be accompanied by time bound approvals for allocation of spectrum for NPN deployments.

Candidate Bands for Earmarking

Globally, the bands of n77 (3.7 GHz/ C-Band), n78 (3.5 GHz/ C-Band) and n79 (4.7 GHz/ C-Band) in the Sub 6 and n257 (28 GHz/ LMDS), n258 (26 GHz/ K-Band) are the preferred bands dedicated for 5G NPNs. TRAI should consider adopting a similar and harmonised earmarking strategy to ensure easy access to eco-system partners and reduce integration costs. A channel bandwidth of 100MHz in mid-Band spectrum may be considered for initial assignment with an ability to review the same in subsequent phases. Such spectrum can be contained within limited areas by limiting the maximum permissible transmit power and hence harmoniously co-exist with spectrum re-use for other enterprise networks.

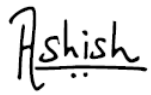
Millimetre wave bands, such as n257 (28 GHz) and n258 (26 GHz), despite their tendency of propagation losses, should also be considered for applications such as network backhaul. A channel bandwidth of 400MHz may be considered initially, which should be reviewed periodically by TRAI in line with evolving requirements of the industry.

Additionally, the Government should also consider utilising shared and unlicensed spectrum bands for the deployment of NPNs.

We hope for a favourable consideration of our submissions and look forward to the TRAI's recommendations in this regard. We remain available to address any queries that you may have with regard to the present submission.

Thank you.

Yours sincerely,



Ashish Aggarwal
Vice President, Head of Public Policy
NASSCOM