

To

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Subject: L&T's response to comments on Consultation Paper on auction of spectrum in frequency bands identified for IMT/5G

We are thankful to TRAI for giving us an opportunity to share our comments and counter opinions on the spectrum allocation. The said consultation paper has raised many important topics on spectrum allocation in the forthcoming auctions. L&T has taken the opportunity to analyse these topics in depth and table our observations with TRAI. While we could not participate in the process for giving comments which ended on the 10th of Jan 22, we are submitting herewith our counter-opinions to the recommendations of other respondents. L&T would greatly appreciate TRAI's perusal of our counter-opinions.

L&T is a large Indian conglomerate with diverse presence in multiple industry verticals ranging from Construction, Defence, Heavy Engineering, IT, Smart Cities and Communications and others, with distributed campuses and factories engaged in cutting edge industrial activity. L&T's Smart World and Communication business unit is engaged in several large smart city as well as telecom projects in India. L&T Defence vertical is specialized in catering to the various requirements of Indian Defence Forces, handling a lot of sensitive information and intellectual property. We would therefore offer our counter comments from our vantage point in the industry.

Our opinion / counter-opinion on private 5G spectrum for enterprises is as follows:

L&T perceives a compelling need for private 3GPP IMT/5G networks with enterprise-held spectrum. Our rationale on such a need is stated below.

- **Empowering industries/enterprises to unlock new business value:** The 5G evolution would mean its expansion towards realizing cutting edge business solutions driven through autonomous processes, immersive experiences, deep, real-time insights across industries delivered at very high efficiencies and levels of security. Such business solutions can be realized only through bringing together a huge ecosystem of cutting-edge technologies applied to industry specific needs, underpinned by IOT that can be supported only over a 3GPP based private network. Existing campus LAN/ethernet/Wi-Fi technologies cannot scale up to the realization of these solutions. This has been the experience in several countries around the world where private 5G deployments are transforming the kind of business value being unlocked across various industries by such industry players themselves. The key reason for such success has been the ability by these industries/enterprises to apply their deep industry knowledge/know-how on their (private) network, thereby being able to bring such cutting-edge solutions to life. L&T strongly believes that without this industry specific know-how that is native only to such industry players, realization of the right value through the right solutions at the right cost is not possible. Therefore, a hybrid public/private network, as could be provided by telecom service providers to such industries, would not be the right fit solution, imposing limitations on the growth of these vast set of industries/enterprises.
- **Monetization of unsold spectrum:** In the previous two auction instances of 2016 and 2021, it is understood that 59% and 63% spectrum remained unsold. Unsold spectrum is the worst

scenario to happen since it deprives the Govt of revenue and deprives the consumer of services based on the spectrum. Such unsold spectrum could be better monetized through allocation to private enterprises with the required regulation and policies. Moreover, since the spectrum would be consumed by only 1 interested agency, which is each enterprise that gets the allocation, spectrum allocation could also be considered administratively instead of auctions to avoid loss to exchequer. We recommend portion of this unsold spectrum to be reserved for allocation to private enterprises throughout the country.

- **New business value and growth, requires new levels of security:** As cited above one of the major attributes of a private network is high levels of security which can be realized only over a completely isolated network running on the premises of an enterprise. Any kind of shared network infrastructure, however secure one would believe it to be, would always present vulnerabilities, given its openness. In the interest of national security, enterprises, especially the ones involved closely with the defence sector and government agencies, need to have their own private network with spectrum allotted exclusively to that enterprise. A dedicated spectrum available for defence sensitive information exchange with all stake holders across the country, can be better managed with data localization, specialized OTA encryption, and other safeguards to suit the security sensitivity. Such levels of isolation and security, we strongly believe, cannot be ensured by a public provider, as their networks, at large, are meant for providing global access to people. A similar view will also be held by enterprises dealing with a lot of valuable intellectual property and data, which could be potentially subject to industrial espionage.
- **Enterprises need optimal networks:** Currently the only way in which a cellular network can be set up is in collaboration with Telecom operators, whose spectrum is over utilised, not reliable & secure and will continue to be so in future as well. Moreover, the response time of the operators do not scale up to the extremely critical needs of Industry 4.0 solutions, especially where latency can have irreversible effects such as defence, healthcare, traffic management etc. In addition to this, the cost of setting up such enterprise networks through an operator would not be a viable option, due to operator overheads and spectrum costs. Private enterprise networks, with directly allotted spectrum, can ensure optimal networks at optimal cost, creating a cost-effective value chain all the way up to the end consumer, as eventually the use cases riding over such networks would have to attract consumers and businesses creating new demand patterns.

Barriers to proliferation of private networks in India through TSPs that can be overcome through private spectrum for enterprises:

Difficulty of running private networks through TSP spectrum: In India no commercial private network has been deployed despite 4G being operational for close to a decade. TSPs are not motivated to provide private networks since they are not able to realize the benefits commensurate to the improved IOT value chain and connected services. Also, TSPs have a socio-economic responsibility to balance the need for serving the public versus serving the private sector industries. Thus the revenue they make out of enterprise private networks is not in line with their perceived investments on such networks.

Pollution in unlicensed spectrum: Unlicensed band spectrum is not useful to cater to private networks requirements as the device eco-system is absent in this spectrum, that are integral to realizing the industry 4.0 business solutions. Public telecom networks have failed to use unlicensed band as well for augmenting their spectrum in either LTE-U or LAA mode. Licensed spectrum directly allotted to

private enterprises is therefore a necessity from security considerations especially for security stipulations for Defence Manufacturing and Industry 4.0 applications across the organisations.

Limitations in availability of clean spectrum and uptime: Carving out clean spectrum to be deployed in private enterprises has been expensive and very difficult for TSPs due to heavy usage. TSP networks face traffic bandwidth bottlenecks due to extreme loading of customers per unit of spectrum. TSPs tend to service private network requirements from common infrastructure locations and in India due to the poor and unreliable OFC uptime, connectivity failures for private networks served by TSPs will be very common. Telecom operator's networks are likely to be highly interfered as there is heavy reuse of the spectrum at towers in close proximity to serve more users. Carving out clean spectrum could also lead to compromising the network for public usage. Instead, allocation of spectrum directly to private enterprises is the best way out.

Concerns over security and Lawful Interception (LI): Private captive networks were earlier considered to be detrimental to national security with a fear that anti-social elements may exploit the facility to bypass interception and monitoring of messages. Certain concerns have been raised over security, but since the spectrum licences, when allotted to private enterprises, will be restricted geographically, the concern over misuse of the network can be minimized and mitigated effectively. Any LI features required over such private networks, can be built in as well, like existing TSP networks.

Limitations due to "perceived" level playing field: Certain agencies have also cited level playing field and adherence to "same service, same rule" principles, that leads to an oversight that such enterprise service is entirely different and unique to each industry/enterprise. The allocation of spectrum to private enterprises is required for an extremely small geography and may not be required throughout the LSA. While an opinion has been expressed that investors will move away from investing into TSPs in such an industry arrangement, on the contrary such level playing field between TSPs and enterprises creating their own unique value, and profitable outcomes, has led to increased investments into both these sectors, globally.

Untapped employment opportunities: Some of the agencies have pointed out that licensed mobile operators are best suited to deliver necessary support to Industry 4.0 use cases. One of the points mentioned is about long experience in running mobile networks and efficiently using spectrum. It may be pointed out that most of the Telecom operators in India have outsourced their networks to other agencies including OEMs and System Integrators. These outsourcing agencies will be able to provide the same services directly to private enterprises, thereby contributing to higher skill development and employment generation in the country.

Sub-optimal infrastructure availability and stability: There is a suggestion for offering network slices from public networks (including spectrum slice) of TSPs to cater to the demands of private networks. However, it may be noted that the infrastructure availability (especially OFC and power) is still sub-optimal, thus limiting any commercial advantage due to slicing.

Poor latency and reliability: Enterprise applications mostly reside within the enterprise or in a cloud and are not co-located with the core network of the TSPs, thereby increasing latency and causing reliability issues. With the advent of Industry 4.0 it becomes necessary for enterprises to protect private networks from issues affecting bandwidth, latency, security, QoS and overall control perspective. This is best done with spectrum allotted to private enterprises. More importantly, deployment of core network on public cloud, will only be useful for applications which can tolerate higher latency. The processing capability can improve over cloud but the distance between the enterprise and the nearest cloud location of a TSP will mean increased latency and poor reliability as

compared to having the core and the application on premise. Thus, bringing in a TSP here would not be a viable option, and therefore requires the spectrum to be allocated to the enterprise directly.

Concerns over inadequate handling of regulatory framework by private enterprises vs TSPs: It is expected that the regulation framework be simplified for the purpose of allocation of spectrum to private enterprises and therefore the point about ability of TSPs to better deal with regulation will be put to rest. It is naturally expected that the complexities of deploying an enterprise network are much lower from a regulatory standpoint and can be easily handled by the private enterprise itself if spectrum is allotted to private enterprise.

Untapped and under-tapped equipment market: TSP / Public providers tend to use global network devices and components based on business considerations. However, in the case of defence and security applications, country of origin for such devices & implementations is also a major security consideration viz a viz commercial consideration. A private spectrum, for example, if made available to L&T, would help in this respect given our vast involvement in government and defence projects in the domain of secure communication for the Armed Forces. With the Govt. of India's 'Make in India' agenda, spectrum allocated to private enterprises will in turn greatly speed up telecom equipment research and manufacturing within India, providing highly secure equipment for security sensitive applications of national interest, thereby creating a market for such equipment in India and global markets.

L&T would like to submit our contrarian point of view to some of the opinions submitted by other parties pertaining to allocation of spectrum to private enterprises, on 10th Jan 2022.

[Our response to Q.68 to Q. 74](#)

Q.68 To facilitate the TSPs to meet the demand for Private Cellular Networks, whether any change(s) in the licensing/policy framework, are required to be made. If yes, what changes are required to be made? Kindly justify your response.

Q.69...

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Q.74 What steps need to be taken to facilitate identification, development, and proliferation of India specific 5G use cases for different verticals for the benefit of the economy and citizens of the Country? Kindly provide detailed response with rationale.

L&T Smart & Safe World and Communication's response:

We believe that private cellular networks are required to be built for multiple use cases and Industry 4.0 initiatives and such networks would be complex and complicated and it would be appropriate if we follow the global practices in respect of Private 5G networks to harness the full benefits of Industry 4.0 in a time bound manner.

Steps taken to enable increased proliferation of private 5G networks in India:

1. Understanding and realizing the needs of enterprises through global examples:

- Given the advantages of private and dedicated 5G networks, many countries are opening the 5G spectrums for private enterprises which can be deployed within their captive campuses. Allocation of spectrum directly to private enterprise is the best way here since TSP's use case development cycles are extremely slow. Enterprises are far better equipped in terms of domain knowledge and IT skilled workforce which is the main requirement for use case development.
- GSMA Intelligence forecast that between 25% and 40% of small/medium enterprises and corporates could be served via private mobile networks between 2023 and 2025. It is foreseen that this massive deployment cannot be handled alone by TSPs. As can be seen from the table below less than 30% of global Private Network deployments have been done by TSPs whereas the bulk of it has been done by others.

Private Network Owner	Example	WE (Germany, Finland etc.)	NA (USA, Canada)	EMAP (China etc.)	DVAP (Japan, Australia etc.)	CEE (Russia, Hungary etc.)	LATAM (Peru, Brazil etc.)	MENA (UAE)	SSA (Gabon)	Total
Network equipment provider	Ericsson, Nokia, Motorola etc.	44	14	34	13	5	6	1		117
Operator	Telefonica, Orange, MTS, Vodafone etc.	40	4	14	4	11	8			81
Specialist network provider	Terranet, US Ignite, Viiicom etc. B32	14	25		1				1	41
Enterprise	Ameren, Bosch, Volkswagen, Fujitsu etc.	3	5	1	1					10
Systems integrator	Accenture, Etteplan, Red Rover etc.	2	4			1				7
Total Network		103	52	49	19	17	14	1	1	256

(Source: Analysis Mason)

- Examples from the global market for highly rewarding private 5G networks:
 - The German Federal Networks agency, BNetzA, has already awarded 123 spectrum licenses for private 5G campus networks with automotive manufacturers such as Audi, BMW, Daimler, Mercedes-Benz Porsche and others leading the charge.
 - In UK and Italy, Port of Southampton and Port of Livorno respectively operate private 5G networks.
 - In the United States of America, John Deere – an agricultural farm equipment manufacturer, was recently awarded a private 5G licence to build and operate a flexible factory network.
- Private Networks have become one of the telecom industry's most promising growth sectors with analysts estimating it to become a \$60 billion industry in the next five years. In order to prevent lop-sided growth, spectrum should be allotted to private enterprises as well and they should be allowed to participate in the build-up of this massive industry.
- Private networks have been developed to the point that the deployment cost (CAPEX) has become more accessible to enterprises. Some OEMs have developed their equipment and ecosystem for private cellular operation to be almost as simple as plug and play and have the advantages of deterministic operation and security right out of the box. Allocation of spectrum directly to enterprises will greatly facilitate such deployments rather than going via the TSPs.
- Enterprises can exercise more control over coverage on their property if spectrum is directly allotted to them. Finally, enterprises can have great control over the security of the private cellular network through policy controls, network design and own spectrum which is essential for the likes of **L&T Defence** and others who collaborate with the Indian Armed Forces.

2. Democratisation of spectrum:

- In most industrialised countries, TSPs no longer enjoy exclusivity over spectrum assets. Although regulators in each country approach spectrum democratisation differently, most of them are working to move at least some control of this asset into the enterprise sphere so

that it can be deployed to advance business use cases. As a result, private enterprises and companies around the world are considering cellular as a viable option when they plan their networks. Please see the table below for some data on countries following the approach.

Country	Bandwidth (approximate)	Band
Australia	400 MHz	Mid-band
Brazil	400 MHz	Mid-band
Finland	800 MHz	Mid-band
Germany	100 MHz	Sub 6 GHz
Japan	1 GHz	Mid-band and Sub 6 GHz
Korea	600 MHz	Mid-band
UK	400 MHz	Sub 6 GHz
USA	150 MHz	CBRS

Our recent experience

A recent negotiation for deployment of a private network in one of the L&T business verticals with an operator in India revealed that the costs are untenable for the use cases and the savings that the private network will bring about. This has led to delays in deployment for over a year now, not allowing the vast benefits to be realized by the enterprise, the end consumer and economic belief system. Enterprises in such situations tend to fall back and continue to use Wi-Fi networks with their inherent drawbacks, as stated above.

Summary of our recommendations

Dedicated spectrum should be allotted for Private networks with the Enterprises having control to apply and deploy a private network in order to fulfil all the above evaluation criteria.

L&T recommends for consideration of allocation of suitable frequencies including specifically **Sub-6 GHz & mm Wave** band for Enterprises directly.

- Sub-6 GHz -3300 MHz to 3800 MHz: This band is the best choice for private networks due to the virtue of confined geographic operation; and same spectrum can be used by multiple private enterprises removing the possibility of any scarcity of spectrum.
- mm Wave -24.25 GHz to 29.25 GHz:
These bands can meet capacity requirements of country like India. Around 400 Mhz to 800 MHz can be easily carved out for the private networks without compromising the capacity of other requirements of Space (Satellite) Communications, and mobile operators for deployment in public networks. The major advantage is clean frequency in both of these bands.

Yours sincerely,

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