LT GEN DR S P KOCHHAR

ENABLING THE 5G REVOLUTION AND BEYOND IN INDIA

The fifth generation of telecom networks will lay the foundation of a successful 6G that can meet the needs of a hyper-connected future

5G technology is expected to be a game-changer with its unprecedented data speed and capacity, and the ability to enable massive machine-to-machine (M2M) connectivity, thus creating a more seamless digital experience for users across the enterprise and retail segments. However, its widespread adoption requires significant investments in infrastructure, spectrum allocation, and affordable network equipment, among others.

While we have embarked on the 5G journey in India, the efforts for making it accessible as well as affordable, will be an ongoing process, and involve a lot of learnings with trials and errors. The world is still hunting for the 'killer app' and until such decisive use cases be established to reassure profitability and sustenance for the sector, it is equally important to ensure that the financial health and viability of the sector are safeguarded to enable continuity to that phase.

FACILITATING FINANCIAL VIABILITY

To make 5G more accessible as well as affordable, the most fundamental step would be to provide some relief to this heavily debt-ridden sector, on priority. The first quarter of FY22 witnessed a gross income of Rs 64,801

> The 5G experience will help us set up more readily for 6G, which is essentially an incremental advancement to 5G.

The 6 GHz band provides a balance of coverage and capacity with less power consumption than other bands, which would help optimise the use of 5G.

crore (USD 8.74 billion) in the telecom sector in India, while at the same time, the total debt of the industry stood at approximately Rs 4.73 lakh crore, as of 31 March 2022. This amply depicts the sector's dire financial straits, which is hampering its growth potential.

As has been requested by the industry for some time now, the reduction in levies like license fees and USOF contribution, etc. would be crucial for re-invigorating the sector and will leave more funds with TSPs for expansion, increasing liquidity and facilitating the investments required to complete the Digital India vision and 5G roll-outs. Further, subsidies to reduce the cost of 5G infrastructure and devices can help make 5G more accessible to the general population.

ADDRESSING SPECTRUM REQUIREMENTS

Spectrum, being the most essential component for any telecom technology, would be crucial for the successful functioning of 5G as well. Given that 5G will enable massive M2M connectivity with a widespread sensor-based network, besides retail use cases, additional spectrum is imperative to augment the 5G performance and experience. More spectrum, made available at reasonable prices, will help free up additional capital for the TSPs, which can be allocated for subsequent investments in network deployments.

India's significantly higher population density of 464 persons per square km, compared to 36 in the USA and 25 in Brazil necessitates that spectrum loading happens to the tune of ~96%, as compared to 40-50% in the two countries. The average population served by each antenna in India is roughly 8x that of these countries, putting a requirement of almost 4-5 MHz of spectrum per person. Licensed 6 GHz is ideal for commercial success and deployment of 5G NR, 5.5 G, and 6G in the future. Therefore, a more affordable spectrum, especially in the 6 GHz band is needed to satisfy IMT-2020 user-experienced data rates.

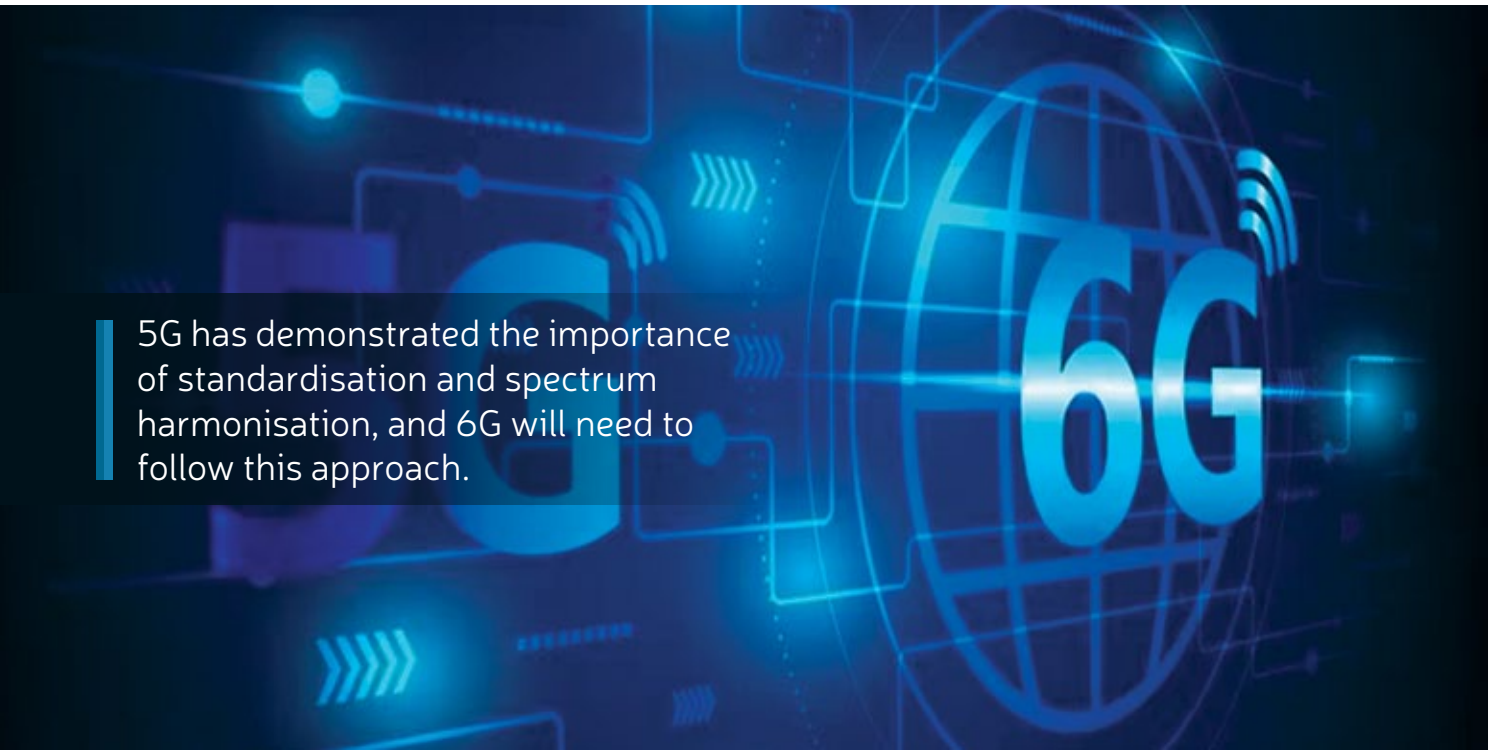
The 6 GHz band provides a balance of coverage and capacity with less power consumption than other bands, which would help optimise the use of 5G. By reducing congestion and interference in other bands, the 6 GHz frequency can lower 5G network cost per bit and spectral efficiency. In fact, according to a GSMA survey, India can save over USD 10 billion annually on network expenditures by utilising the mid-band spectrum for 5G services, such as the 6 GHz band.

On the other hand, a shortage of 6 GHz spectrum would compel TSPs to densify networks to meet the IMT-2020 5G performance requirements, leading to 60% higher annual costs. Without densification, 5G download speeds may be reduced to 50% if less spectrum is allocated in the 6 GHz band. So, licensed 6 GHz is ideal for commercial success and deployment of 5G NR, 5.5 G, and even 6G in the future.

There are some arguments favouring delicensing of the 6 GHz band though, chiefly to support Wi-Fi services. However, Wi-Fi services in India already have sufficient spectrum in the 2.4 GHz and 5 GHz bands (totalling 688 MHz) to meet the demand for Wi-Fi access in the 2025-2030 period. The TRAI, in its Recommendations on Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed (31 August 2021), had clearly stated that "... in India, the existing spectrum bands for Wi-Fi, i.e., 2.4 GHz and 5 GHz have still not been fully utilised". Moreover, Wi-Fi services have negligible data offload from IMT mobile to Wi-Fi because India is a mobile-first nation with more than 95% of Internet users accessing mobile broadband data.

ENSURING DEVICE AND SERVICE AFFORDABILITY

5G adoption rates are also affected by equipment affordability, multi-band compatibility and awareness. 5G's adoption pace can expedite technological cost reduction. The affordability of 5G equipment can expedite and expand the adoption of 5G services. It can also stimulate the domestic manufacturing sector and generate new jobs and skills for India's vast labour population.



5G has demonstrated the importance of standardisation and spectrum harmonisation, and 6G will need to follow this approach.

In consumer devices, affordability will be key to propel uptake in the price-sensitive Indian market. The cost of 5G devices, such as smartphones and routers, is still relatively high. Currently, about 30-35% of the ~150-170 million smartphones shipped in India annually are 5G enabled, according to CRISIL. The low initial value proposition and high price compared to 4G phones will restrict overall 5G adoption to ~300 million users by fiscal 2025.

The need for multi-band compatibility in 5G adds to the cost of handsets. Therefore, one solution could be to adopt software filters to develop handsets working only in low bands for rural areas, and mid bands for urban areas. The advancement of networks in 5G and beyond, with growing provision for the edge-computing and storage, and leveraging facilities like Cloud, Fog and Mist are also expected to help lessen the need for local storage and computation requirements in smartphones, thus helping reduce costs.

Sharing the cost of building and maintaining infrastructure among multiple service providers can further result in lower costs for everyone. Educating the public about the benefits of 5G and how to use it can help increase adoption rates and usage. More people using 5G can help drive down the cost of the technology over time.

ADDRESSING CRITICAL HURDLES

The challenges to deploying efficient 5G services in India include the fibreisation of towers, which is currently at 35% and needs to at least double to achieve desired results. The government has introduced amended Right of Way (RoW) rules to help facilitate faster deployments of telecom infrastructure, but implementation at the ground level continues to face difficulties.

States and local authorities must adopt the central RoW rules quickly. They also impose exorbitant charges for deploying telecom infrastructure on street furniture, which can be reduced by adopting the latest amendment in RoW rules. State electricity regulatory commissions must provide electricity connections to telecom sites at industrial/utility rates, and small cells should be exempt from any minimum connected load requirements under the Open Access policy to make use of renewable power sources. These measures can help create a robust 5G infrastructure in India expeditiously.

ENABLING A CONNECTED FUTURE

5G is not simply a faster version of 4G, but a fundamentally different network architecture. The widely heterogeneous requirements of 5G users need to be catered to dynamically, with a deeper understanding of each scenario. This requires a new way of planning and

> One of the significant shifts that 5G has brought is bringing part of the network to the device, and 6G aims to bring the entire network to devices.

deploying, with a 'business-first' approach that identifies specific use cases and customer segments that can benefit from 5G's capabilities, instead of the 'technology-first' approach taken for the earlier 4G, where every device got the same service.

This approach entails designing customised solutions that meet their needs and expectations, and optimising network resources and performance accordingly. This would also enable more energy efficiency and sustainability for both carriers and devices, as well as more innovation and value creation for various industries and sectors.

To fully realise the potential of 5G, technical advancements are necessary, including creating new radio access technologies that can function in higher frequency bands (such as mmWave) and support massive MIMO, beamforming and full duplex approaches. It also requires developing flexible and scalable network designs to accommodate service-based interactions, Network Function Virtualisation, Software-defined Networking, and Edge computing. It also requires adopting network slicing methods that can dynamically assign network resources and functionalities to various types of services and customers based on their Quality-of-Service needs and improving the linkage of Internet Exchange Points (IXPs) and adopting prudent traffic management practices.

These advancements will facilitate peering between ISP customers, improve data exchange and encourage connectivity to IXPs. Businesses need to prepare for the future by embracing the changes required for 5G and investing in the necessary technical advancements.

LEVERAGING 5G FOR 6G ADOPTION

The 5G experience will help us set up more readily for the next generation of communication technology – 6G, which is essentially an incremental advancement to 5G. The lessons we learn from the deployment of 5G can provide a roadmap for the early adoption and more successful implementation of 6G. One of the most significant shifts that 5G has brought is bringing part of the network to the device, and 6G aims to bring the entire network to our devices.

This change will require a shift in the role of computation and storage, moving them from devices to the network, with Edge computing, Cloud, Mist, and Fog technologies playing an enhanced role. To achieve global interoperability and compatibility of networks and devices, 5G has demonstrated the importance of standardisation and spectrum harmonisation. 6G will need to follow this approach and leverage existing 5G standards and spectrum bands while exploring new ones such as terahertz and visible light.

Another essential lesson from 5G is the ability to cater to the different needs of humans and machines with enhanced features like eMBB, uRLLC and mMTC. 6G is expected to build on these traits and provide more advanced capabilities such as holographic communications, tactile Internet and quantum communications. While 5G has leveraged the power of Artificial Intelligence (AI) to optimise network performance, enhance user experience and enable new services such as network slicing, 6G will need to integrate AI more deeply into the network architecture and operations, and explore new AI applications such as holographic telepresence, brain-computer interfaces and cognitive networks.

Despite its potential, 5G faces several challenges in deployment, including high costs, complex network installation, and security risks, among others. To overcome these challenges, 6G will need to adopt more cost-effective, flexible, secure and sustainable solutions such as network slicing, open RAN, Edge computing, AI, Blockchain, and green technologies. With these lessons, we can lay the foundation for 6G and ensure its successful deployment to meet the needs of a hyper-connected future.

Lt Gen Dr Kochhar is the Director General of COAI.

feedbackvnd@cybermedia.co.in