Legislative and Regulatory Issues and Prospects in Indian Telecom Sector

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ABSTRACT

The telecom services signify the social and economical development of a nation. Telecommunication sector is one of the prime sectors required for transformation and development of the nation. Indian telecommunication sector has undergone a major process of evolution and progression. National telecom policy was declared in 1994 and was subsequently reformed and carried forward under National Telecom Policy 1999. Indian telecom sector is the spectator of a complete revolutionary transformation due to reformation of various policies in the last decade. It has achieved a phenomenal escalation during the last few years and is poised to take a big leap in the future also. The growth has resulted into some adverse effects like accumulation of green house gases (GHG), issues in spectrum management and paucity of energy. Increasing public demand for corporate social responsibility and an authentic desire to effect positive change in the environment are leading telecommunications service providers and their suppliers to diminish their carbon footprint. There are many emerging issues in the management of spectrum like reform of previous regulatory framework, streamlining SAFCA (Standing advisory committee on frequency allocation) clearances, delicensing spectrum bands for broadband services, spectrum trading and lack of unique global unified standard. Many industries and institutions are carrying out the research for efficient telecommunication infrastructure. This paper focuses on the issues related to energy, environment, spectrum as well as remedies to overcome the challenges. Use of renewable energy resources, effective and transparent spectrum management and one unified standard with convergence of different technologies can be the future prospects for the betterment of service providers as well as subscribers.

KEY WORDS: Spectrum, Green telecommunication, 5G, Carbon Footprint, GHG, 3D Cells, IBS, DAS

I.INTRODUCTION

The growth in telecom sector depicts the socio economic growth of a country. India has witnessed a magnificent transformation in telecom sector. India has expected to reach 1 billion subscribers by the year 2014 [1].Building pertinent telecom infrastructure has the major impact on growth of economy as infrastructure investments add to capital stock. India has around 3, 10,000 telecom towers [1].Active role of state as well as central government is required for the deployment of telecom infrastructure. This glorious growth in telecom sector has created many adverse effects on environment like emission of Green house gases and Carbon dioxide into atmosphere. Use of enormous amount of fuel has resulted into paucity of energy resources. Management of spectrum is also a crucial and critical challenge. The telecom network can be categorized as below.

- Mobile and wireless Network
- Fixed access Network
- IP Network
- Long Distance Communication Network
- Broadband Network

The principal regulatory organization for telecommunication is Telecom Regulatory Authority of India (TRAI).This agency is legally constituted under the TRAI act (1997) and responsible for regulating all forms of telecom services.

Currently, infrastructure prerequisite is being made by infrastructure providers who are currently being registered by the Department of Telecommunications. The telecom service providers who are licensees under Section 4 of the Indian Telegraph Act, 1885 are divesting themselves of the assignment of infrastructure provision. Therefore, benefit of the notification under Section 19B is much less today than before. In the TRAI Recommendations on "Spectrum Management and Licensing Framework" issued in May, 2010, this Authority had recommended that Infrastructure Providers should be brought under Unified Licensee.

II. LEGISLATIVE, REGULATORY, ECOLOGICAL STRATEGY AND ENERGY ASSOCIATED ISSUES IN INDIAN TELECOM SECTOR

- As mentioned earlier , around 1 lac supplementary towers will be required to provide to 1 billion mobile telephones by the year 2014.It will ask for an investment of Rs.25 lacs per tower and this will require an investment of Rs.25,000 crore [2]. Given the significant capital investment required, it is vital to seek private sector participation in this area. The Government provides tax benefits under section 80 IA of the Income Tax Act, 1961 to infrastructure companies in sectors like energy, power, ports, natural gas etc. Since telecommunication is an indispensable infrastructure, companies constructing the telecom infrastructure should also be brought under such a provision under Income Tax Act, 1961. Such a provision can also encourage investments in the pastoral areas and inspire private sector participation in telecom infrastructure projects.

- The most boisterous revolution and progression in technology has been the phenomenal evolution in wireless and mobile communication. Growth of telecommunication infrastructure requires more amount of energy to power different telecom equipments. This electricity is provided from grid and burning of fossil fuel like diesel. These sources contribute to emission of green house gases (GHG) into atmosphere. The reason for increased GHG, mainly Carbon Dioxide (CO2), is because of the increased energy consumption which results into formation of pollutants. Emission of GHG causes adverse effects and results into global warming. Climate change and global warming are the most irrefutable universal challenges in present scenario. Natural calamities like typhoons, floods and changes in the sea levels are attributed to the greenhouse effect. It is predictable that during the last 30 years the CO2 emissions have gone up by 73%. India is ranked 5th amongst the countries in the list of worldwide GHG emission, with USA and China contributing about 4 times emission than that of India [1]. Thus India along with other countries is facing the challenge to overcome the global warming.

- Currently, there are 12-14 telecom service providers in each service area serving to around 791 million wireless subscribers. Moreover, the operators who were successful bidders in the auction of spectrum for 3G and Broadband wireless access services are also in the process of deployment of their networks [2]. As telecom towers are an essential part of the wireless telecom infrastructure, number of towers will also increase along with network extension. Presently, there are approximately 400,000 telecom towers and it is estimated that approximately 100,000 more towers will be required to serve around 1 billion mobile subscribers by 2014 and to support deployment of 3G and Broadband wireless access services [2].

- With the advancement in technology and enormous growth in number of subscribers, many applications like Mobile banking, data transfer, accessing social networking sites, gaming and mobile TV etc have developed. According to CISCO [3], global mobile data traffic has reached 237 petabytes per month in 2010 with 2.6 fold growth over the last year. Overall, mobile data traffic is estimated to grow to 6.3 exabytes per month by 2015, a 26-fold raise over 2010. India is also poised to see rapid expansion in data services on account of 3G and Broadband wireless access service launches. This has resulted in an increased demand on the already inadequate spectrum and an enhanced requirement of provision of seamless services anytime & anywhere. The service providers are required to expand their network coverage inside the buildings to provide low latency, high speed network services. An enormous growth in telecom infrastructure has raised important issues about radiation hazards and health concerns especially in metro and urban areas. The use of power generators to deal with lack of un-interrupted power supply (UPS) also adds to pollution. As a result, severe conditions have been imposed by

various civic authorities for erection of towers. These include many requirements such as advance consent from Resident Welfare Associations in case of residential areas, structural safety certificate and permission from pollution control authorities and fire authorities. At times there are enormous delays in conceding the permission. Additionally, there has been multi fold enhancement in charges for grant of approval. This delay is affecting the growth of telecom sector as well as quality of services to customers.

With the rapid expansion in the mobile subscriber base, service providers are required to create adequate base transceiver stations for expanding the network. As there are no compulsory design specifications for towers, every service provider and infrastructure provider has adopted tower designs that suit their necessity. Due to unavailability of any uniform tower design specifications and lack of a nominated approving body, cities and towns are cluttered with towers of various designs which are causing adverse effects on health of human beings. More number of towers consumes more energy. The power of such towers also becomes vital in view of the towers erected in residential and busy commercial areas. A study proves that radiation causes adverse effects on human body and increases the risk of cancer and neurological defects. 10 Housewives in Sher-e-Punjab Colony - Andheri (East), Mumbai have been diagnosed with various forms of cancer [4].Photograph -1 and 2 shows the cell towers installed in commercial and residential in Mumbai. A Public interest litigation (PIL) was filed before the supreme court of India by Karma jyot sewa trust of Gujarat after the survey of cell towers installed in residential areas and on the roofs of monuments. Local authorities share the concerns of the customers about various aspects of the towers in particular about the protection and radiation aspects consequent to deployment of tower. Standardization and certification has become crucial to reassure the local authorities and customers about the safety and other related issues. There is no provision for certification of Specific absorption rate (SAR) limits in Indian telegraph act. Therefore, the amendments in the Indian telegraph act are indispensable.

Photograph-1: Cell towers in Mumbai in Haji Ali area [4]

Photograph-2: Cell towers in Mumbai in residential area [4]

- There are troubles such as levy of high charges, lack of uniformity in decision making processes, unavailability of single window system for Right Of Way clearance, long time in granting approval etc. are impeding an expansion of telecom infrastructure in the nation. There is a need to assure unvarying procedures for Right Of Way permissions across the country for apt and quicker deployment of telecom infrastructure [2].

- Nowadays Mobile phone provides multiple applications. So, there is a duplication of resources due to lack of single core infrastructure. Internet and Broadband access are accepted as catalysts for economic and social progress of a nation. Availability of broadband services at reasonable price can contribute to higher GDP for growth rates, offer a larger & more competent labor force and increased working competence. As per the report of World Bank [5], a 10 percentage increase in broadband penetration accounted for 1.38 percentage increase in per capita GDP growth in developing economies. It is of immense apprehension that the broadband penetration per 100 inhabitants in nation is lagging behind compared to other countries. The net broadband addition per month is

just 0.1 to 0.2 million in contrast to 18 million mobile connections per month. The broadband penetration is just 0.94% when compared with teledensity of 67.67%.

- Under National broad band plan, deployment of fiber optic network is required from tower to nearest block headquarter to facilitate broad band network in rural areas. There is an unavailability of high bandwidth fiber optic broadband network especially in rural areas due to lack of backhaul network, deployment issues, lack of support infrastructure and high cost of customer premises equipment [2].

- In mobile communication, an entire coverage area is divided into small geographical areas which are called cells. With the rapid increase in the usage for both voice and data services, it is difficult to provide seamless and good quality of service inside the building. Additionally, there is a failure of signal inside the buildings. To resolve this problem, more power is to be radiated from outside the buildings. These results in smaller cell size and inter cell interference (ICI).

- Service providers are also facing the problem of energy expense due to increased demand of telecom infrastructure. The analysis of energy expense of Indian operators is shown in Table-1 [6].

SR No.	Quantities	Network Opex Values For Indian Operator
1	Power & Fuel	28.06%
2	PSTN & Line Rentals	7.07%
3	Repairing and Maintenance	28.06%
4	Rent	14.05%
5	Others	18.60%

TABLE-1: THE ANALYSIS OF ENERGY EXPENSE OF INDIAN OPERATORS

The energy expense of the Indian operator is 30% of the total OPEX. Service providers should concentrate on energy saving as well as living environment for human being for the rapid economical growth and non hazardous technologies.

- The radio spectrum ranges from 3 kHz to 300 GHz. This spectrum is used for many applications like mobile telephony, satellite communication, television transmission, FM and AM radio transmissions, military and fixed wireless communication. The demand for services is increasing. As spectrum is a very limited resource, there is a challenge to support enormous subscribers with limited spectrum.

- One of the key challenges for the future of the Internet is its ability to connect billions of people and devices. Each device must have a unique IP address in order to communicate. However, Internet Protocol version 4 addresses are getting exhausted. Internet Assigned Numbers Authority (IANA) has reported that IPv4 addresses have finally exhausted on 3rd February 2011[7] [8].The last five blocks of 16 million Internet Protocol version 4 (IPv4) addresses were officially handed over to the five Regional Internet Registries projections indicate that even available blocks of Internet Protocol version 4 addresses would be exhausted by August-September 2011. The voyage to Internet Protocol version 6 (IPv6) addresses will become imminent, once IPv4 addresses are exhausted. Internet Protocol version 6 is defined by Internet Engineering Task Force (IETF) in year 2000. The new protocol could theoretically support 3.4×10^{15} unique IP addresses. For this reason, the timely deployment of IPv6 by network operators and service providers is essential.

III.PROSPECTS IN INDIAN TELECOM SECTOR

I.GREEN TELECOMMUNICATION

The term Green Telecommunication can be defined as the technology which uses convergence of energy efficient methodologies at different stages to minimize the adverse effects of technology on environment. Reduction of the green house gases produced or caused by the telecommunication sector is referred to as greening of telecommunication. Green telecommunication system has many facets. It can be classified broadly in terms of greening of telecommunication networks, green telecommunication equipment manufacture, and atmosphere friendly design of telecommunication buildings and secured telecommunication waste disposal. As network equipments have become more IP-based, the energy consumption required has progressively increased. Green wireless communication can be achieved with the use of Green Handover, Green codes, Green Electronics, Green power amplification systems, Green antennas and Green Base Transceiver Stations using renewable energy sources. Growing telecommunication infrastructure requires increasing amount of electricity to power it. India currently has more than 3, 10,000 cell phone towers, which consume about 2 billion liters of diesel per year [1]. The move from diesel to solar and other alternate energy sources will result in a reduction of 5 million tons of CO2 emissions as well as a savings of $1.4 billion in operating expenses for telecommunication tower companies. Ericsson has deployed more than 200 photovoltaic 'Sunsites' (solar powered base stations) in Morocco, Mexico and Ethiopia, among many other countries [1]. BSNL has taken up pilot projects for 10KW solar plants at 14 sites and Wind power project at 6 sites in Rajasthan, Gujarat, Tamil Nadu, Karnataka and Maharashtra [1].

II.3D CELL

3D Cellular technology is the technology used for cellular coverage inside the high rise building. It converts existing 2D cells into 3D cells [7]. The 3D cells have three dimensional space coverage which covers ground, lower and upper space above ground in its cells. Its coverage has columnar shape and is much higher in altitude than conventional two dimensional macro cell's coverage. This technology can be used for In Building Solutions. Figure-1 shows the comparison between existing cellular system and 3D cellular system [9]. 3D cellular network shares existing cellular frequencies. This system does not cause frequency interferences to existing cellular network. 3D cellular network solution can be used in all current cellular technologies and in any cellular frequency band. 3D cellular system solves the coverage problem of high-rise buildings. With 3D cells, cellular signal inside upper floors of high-rise buildings improves 10 to 100 times (10 to 20dB gain) than existing two dimensional systems. 3D cellular network is an inventive remedy of the infrastructure deficiency of cellular network in space coverage. This concept has been granted patent in Canada, Europe, China, Hong Kong, India, Singapore and South Africa [9].

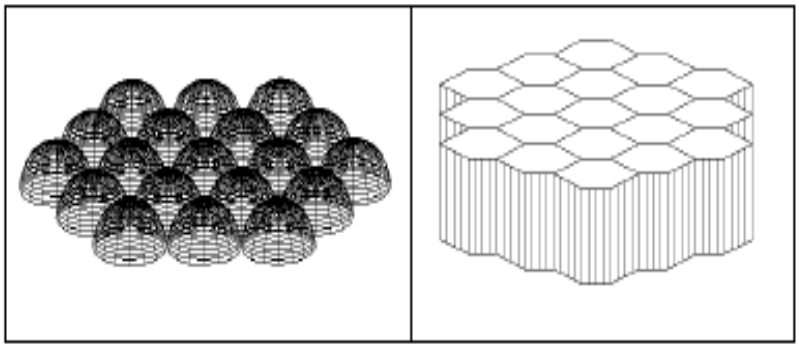

FIGURE-1:3D VIEW OF CURRENT CELLULAR SYSTEM & 3D CELLULAR SYSTEM

III.5G TECHNOLOGY

The next generation network can be developed with integration of different technologies as shown in figure-2.It can be conceptualized with common core network with energy efficient technologies to overcome the present challenges in cellular network. The 5G technology is going to be a combination of Personal Area Network (PAN), Wireless local area network (WLAN), Cellular and Satellite Network supported by Artificial Intelligence. 5G can provide data rates up to 1Gbps.To achieve above requirements; an effective government regulatory framework is required.

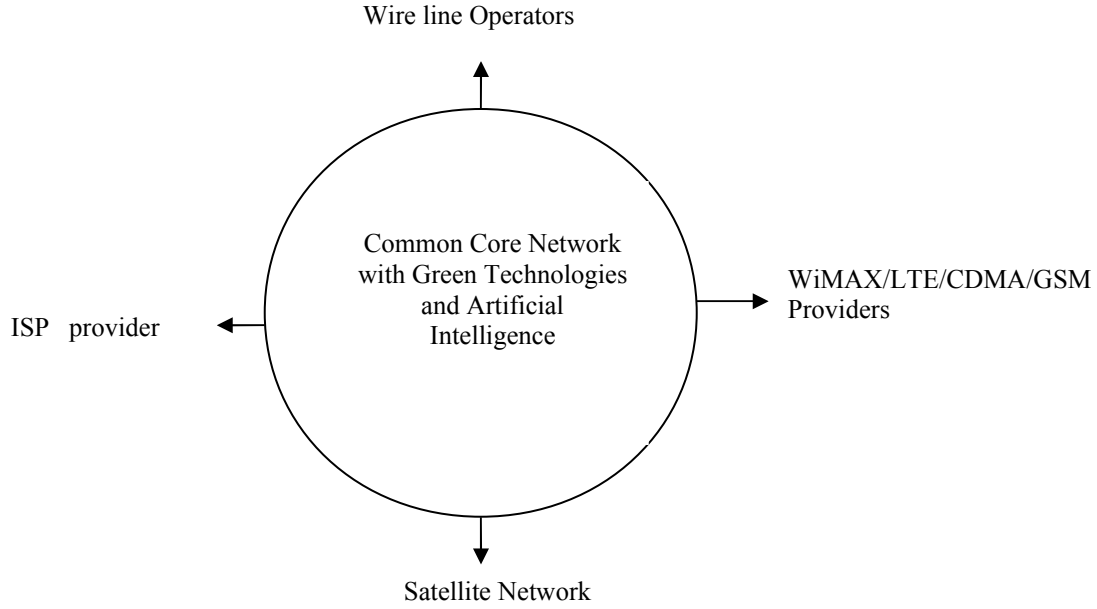

FIGURE-2: 5G NETWORK ARCHITECTURE

IV.IN BUILDING SOLUTIONS USING DISTRIBUTED ANTENNA SYSTEM

Some years ago, most of the telecom service providers were providing the mobile services generally by installing macro cells mounted on mobile towers. However, with the raise in the usage for voice and data services, the macro cells are not sufficient to endow with seamless and good quality of service inside the building. Moreover, because of signal loss inside the buildings, these macro cells need to radiate at high power from outside the building, which results in smaller cell size and inter cell interference. In building solutions and Distributed antenna systems are the solutions to overcome the problem and also to ensure that the spectrum is utilized efficiently. Technologies like In building solution and Distributed antenna system can be developed for effective utilization of spectrum [3]. In distributed antenna system, the transmitted power is split among several antenna elements, separated in space so as to provide coverage over the same area as a single antenna but with less power and improved reliability. A single antenna radiating at high power is replaced by a group of low-power antennas to cover the same area [10]. Distributed antenna system can be used for In building solutions (IBS). In building solutions are required to provide indoor seamless services to DTH, Mobile and broadband Internet users. Figure-3 shows the worldwide in building market size from 2008 to 2014.

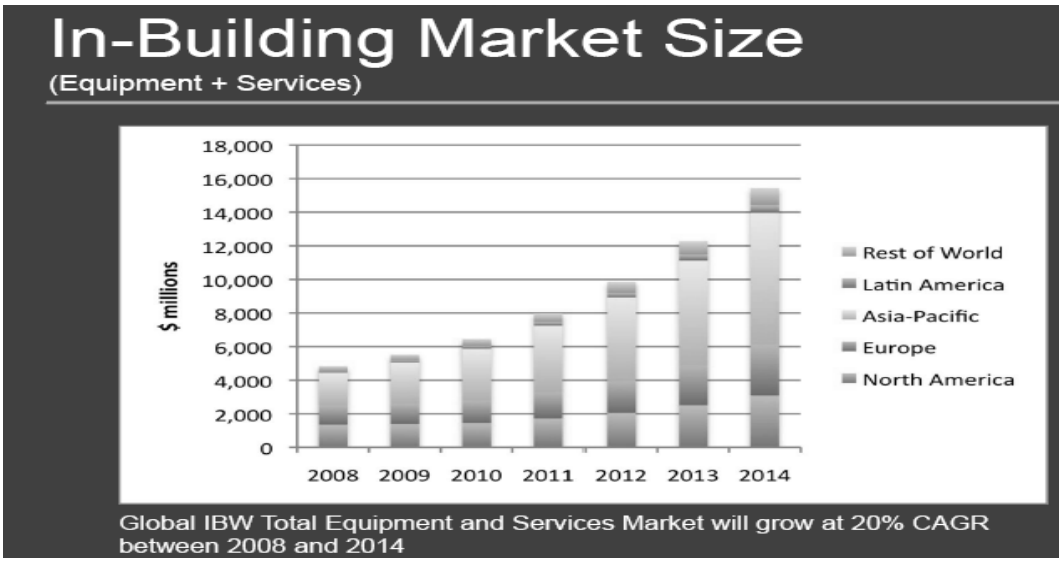

FIGURE-3: IN BUILDING MARKET SIZE (Source: ABI Research)

Cellular telecom service providers can deploy Distributed Antenna System to overcome the coverage and capacity problems. A DAS system uses many smaller antennas located very close to the mobile users. As Distributed Antenna System is a low power application, it also reduces the impact of the radiation. The cellular network with Distributed antenna system enhanced in-building coverage may provide effectual coverage, but may be challenged to endow with sufficient bandwidth for promising mobile multimedia services. A private wireless LAN can also be installed to carry the remises network mobile multimedia applications. A representative deployment of Distributed Antenna System providing both mobile and Internet service using common infrastructure is shown in figure-4.

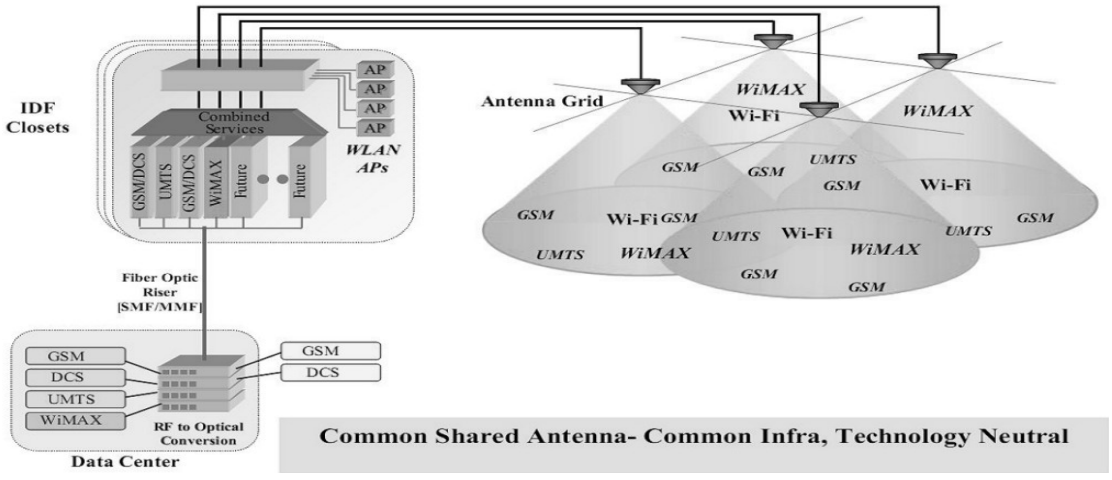

FIGURE-4: A REPRESENTATIVE DEPLOYMENT OF DAS PROVIDING BOTH MOBILE AND INTERNET SERVICE [11]

IV. CONCLUSION

An Indian telecom sector is witnessing a very fast escalation. With the rapid growth of telecom growth, many legislative, regulatory, environmental and energy related issues are also intensifying in front of policy makers and service providers. It demands for a global unified standard with energy efficient technologies and transparent legal framework and spectrum

allocation. The technologies like 3D cells, Green wireless communication, 5G technology with integration of different energy efficient technologies, In building solutions and Distributive antenna systems can be the solutions to these challenges.

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