CHAPTER-II

DEPARTMENT OF TELECOMMUNICATIONS

2.1 Performance Audit on "Spectrum Management in DoT"

Spectrum Management Framework

2.1.1 Spectrum

Spectrum is a term to describe a band of electro-magnetic frequencies. Electromagnetic spectrum is the range of all possible frequencies of electromagnetic radiation, which in turn is a form of energy emitted and absorbed by charged particles as they travel through space exhibiting wave-like behaviour. It includes the visible spectrum (light), as well as infrared, ultraviolet and X-rays. Radio Frequency (RF) spectrum refers to the part of the electromagnetic spectrum that can be used for communication. It corresponds to frequencies from 3 KHz to 3000 GHz[1]. Spectrum (radio waves) is an important and essential natural scarce resource need for all wireless applications. Radio spectrum is always around us in the form of invisible waves. Radio spectrum is used by countless technologies that affect most aspects of our lives. These range from the more straightforward and longer established applications, such as listening to our favourite radio programme, watching live matches or using a mobile phone, to the more subtle and pervasive ones, such as remotely locking our car or using a satellite navigation system. Today, radio spectrum is affecting virtually everyone's life and has become a major political topic and a significant contributor to national gross domestic product (GDP). The radio spectrum has been recognized the world-over as an important tool for socio-economic development of a nation.

The radio frequency spectrum ranging from 8.3 KHz to 275 GHz has been allocated as per table of Frequency Allocation under Article 5 of International Telecommunication Union's (ITU) radio regulations for various radio communication services. There are 41 different type of services defined in Radio Regulations such as fixed service, mobile service, broadcasting service, radio navigation service, space operation service, radio astronomy service, aeronautical mobile service, amateur service, maritime mobile service, land mobile service, port operation service, radio determination service, mobile satellite service, radiolocation service, aeronautical satellite service, ship movement service, meteorological aids service, etc. Some spectrum (such as in the Ultra High Frequency (UHF band) - 300-3000 MHz) is suitable for a wide variety of services and is thus in great demand.

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[1] The number of cycles per unit of time is called the frequency. For convenience, frequency is most often measured in cycles per second (cps) or the interchangeable Hertz (Hz) (60 cps = 60 Hz). Hertz are commonly expressed in multiples: kilohertz (10^3 Hz, kHz), megahertz (10^6 Hz, MHz), gigahertz (10^9 Hz, GHz), and terahertz (10^{12} Hz, THz)

Spectrum Management is the combination of administrative and technical procedures necessary to ensure the efficient operation of radio communication services. Since radio waves do not stop at national frontiers, the need for international planning of frequency allocations and protection of the legitimate use of radio spectrum has long been recognised. On the global level, the task falls upon ITU which is a specialised agency within the United Nations System. It is responsible for the regulation, standardization and development of telecommunications.

2.1.2 National Frequency Allocation Plan (NFAP) and National Frequency Register (NFR)

National Frequency Allocation Plan (NFAP) is an important policy document for spectrum managers, wireless users and manufacturers in the country and facilitates optimal utilization of radio frequency spectrum for various services and applications. It is developed in consultation with stakeholders within the frame work of International Frequency Allocation Table of the ITU Radio Regulations. The current NFAP in vogue is NFAP-2011 which came into effect from 01 October 2011. National Frequency Register (NFR) is the basic record for all frequency assignments and it would be referred to identify assignable frequency for any new applicant. As such, it is utmost necessary to update the NFR by adding particulars of new assignments and deleting particulars of surrendered/withdrawn frequency assignments.

2.1.3 Process of allocation of spectrum

In India, assignment of frequencies for various uses is made on the basis of NFAP. All users intending to use radio frequency submit their application to the Wireless Planning and Coordination Wing (WPC) where they are processed first for issue of an Agreement in Principle (AIP) or Decision Letter (DL) and then issue of Wireless Operating License (WOL). WOL is issued after the applicant satisfies the conditions of the AIP/DL like equipment clearance, Standing Advisory Committee on Radio Frequency Allocations (SACFA) clearance and payment of required fee. In the case of telecom service providers, signing of telecom license precedes frequency allotment.

2.1.4 Radio Spectrum users and types of licences

In terms of spectrum allotment and pricing, the spectrum users are categorized in three types as Captive users, Commercial users and Broadcasters.

(i) A 'Captive user' of RF spectrum is a person to whom the WPC has assigned one or more radio frequencies within specified space-time combination(s) to meet his own needs, but not for providing any kind of broadcasting or telecommunication service(s) to others (third parties) directly using the said frequencies. Major captive users are Central/State Government Departments, Defence and Paramilitary Forces, Public Sector Undertakings (PSUs), State Police/fire services, Airport Authority and Aircrafts, Maritime, Ports and Ships, Private and other users. Spectrum assigned to State Police organizations, Central Para Military Forces, Civil Aviation are primarily

in non -International Mobile Telecommunications (IMT) bands[2] whereas spectrum to Defence and some PSUs are in both IMT and non-IMT bands.

(ii) A 'Commercial user' of RF spectrum is an entity to whom the WPC has assigned one or more radio frequencies within specified space-time combination(s) for providing any kind of broadcasting or telecommunication service(s) to others (third parties) directly using the said frequencies. Telecom Service Providers, Internet Service Providers, Commercial Very Small Aperture Terminal (VSAT) Service Providers, National Long Distance (NLD)/ International Long Distance (ILD) Service Providers, Public Mobile Trunking Service Providers and Private Frequency Modulation (FM) Broadcasters are major commercial users of Radio Spectrum.

(iii) Broadcasting Services users are Licensed Teleport Operators for Satellite uplinking, Licensed Digital Satellite News Gathering (DSNG) Operators, FM Broadcasting (Commercial/Community Radio), Sound and Terrestrial TV Broadcasting (Prasar Bharti), etc.

2.1.5 Formulation of Spectrum Management Policy

Use of spectrum in India is governed under the provisions of Indian Wireless Telegraphy Act, 1933 and allocation of spectrum is made under the frame work of National Frequency Allocation Plan (NFAP) which is revised from time to time. Cellular services using spectrum was introduced in the country in 1994 in pursuance of National Telecom Policy (NTP) 1994. However, NTP 1994 was silent about spectrum management policy. Subsequently a New Telecom Policy (NTP) 1999 was formulated which identified the issues relating to spectrum management. It emphasized that spectrum be utilised efficiently, economically, rationally and optimally. It also stated the need for a transparent process of allocation of frequency spectrum for use by a service and making it available to various users under specific conditions. It further identified the need for re-farming of spectrum from Defence and others and to charge spectrum usage fee. However, even after formulation of NTP 1999, DoT continued to adopt administrative approach of spectrum management. Allotment of spectrum was bundled with licences and minimum spectrum of 2x4.4 MHz for GSM technology based cellular services and 2x2.5 MHz for CDMA technology based cellular services was allotted by DoT (WPC) to the companies which obtained telecom licences. Additional Spectrum beyond this start up spectrum was allotted based on subscribers linked criteria prescribed by DoT. The bundled spectrum was not liberalized spectrum.

Though the telecom sector fuelled by cellular segment (mobile phones) witnessed significant growth and penetration of telecommunications services in the country contributing significantly to the growth of the economic and social sectors and country's Gross Domestic Product (GDP), the policy of continued administrative allocation of spectrum to telecom service providers raised controversies and thus

[2] IMT bands refers to spectrum band used for providing public mobile telecom services.

necessitated the revision of spectrum management policies. In this background, NTP 2012 was formulated. Major issues regarding spectrum management enumerated in NTP 2012 were as follows-

i) To delink spectrum in respect of all future licences and to make available Spectrum at a price determined through market related processes.

ii) To move at the earliest towards liberalisation of spectrum to enable use of spectrum in any band to provide any service in any technology as well as to permit spectrum pooling, sharing and later, trading to enable optimal utilisation of spectrum through appropriate regulatory framework.

iii) To re-farm spectrum and allot alternative frequency bands or media to service providers from time to time to make spectrum available for introduction of new technologies for telecom applications and prepare a roadmap for availability of additional spectrum every 5 years.

iv) To undertake periodic audit of spectrum utilisation to ensure its efficient use

v) To make available adequate globally harmonized International Mobile Telecommunications (IMT) spectrum in 450 MHz, 700 MHz, 1800 MHz, 1910 MHz, 2.1 GHz, 2.3 GHz, 2.5 GHz, 3.5 GHz bands and other bands to be identified by ITU for commercial mobile services.

vi) To identify additional frequency bands periodically, for exempting them from licensing requirements for operation of low power devices for public use.

vii) To consider requirement of spectrum in certain frequency bands in small chunks at specified locations for encouraging indigenous development of technologies/ products and their deployment.

viii) To review the existing geographical unit of allocation of spectrum with a view to identifying scope for optimization.

ix) To promote use of white spaces with low power devices, without causing harmful interference to the licensed applications in specific frequency bands by deployment of Software Define Radios (SDRs), Cognitive Radios (CRs), etc.

x) To establish and strengthen Institute of Advanced Radio Spectrum Engineering and Management Studies (IARSEMS) as a Government Society for undertaking policy research in radio spectrum engineering, management/radio monitoring and related aspects.

The whole country was divided in 23 Licensed Service Areas (LSA) for awarding telecom licences and allocation of spectrum. However, in September 2005, two LSAs of Chennai Metro and Tamil Nadu (excluding Chennai) were merged and made one LSA for award of licence.

In May 2012, the Union Cabinet approved the National Telecom Policy (NTP) 2012. One of the salient features of the policy was to make available broadband on demand and use of telecom infrastructure which in turn would enable businesses in urban as well as rural areas to engage in the web-economy and e-commerce for inclusive development. The NTP 2012 envisaged to ensure adequate availability of spectrum and its allocation in a transparent manner through market related processes. It also targeted to make available additional 300 MHz spectrum for IMT services by the year 2017 and another 200 MHz by 2020. It further provided periodic audit of spectrum utilization to ensure its efficient use. Details of the guidelines for Spectrum Management under NTP 2012 are given in para 2.1.7.1 of this Report.

2.1.6 Organisational Arrangement

2.1.6.1 Department of Telecommunications and Telecom Commission

The work relating to formulation of telecom policy, issue of licences for various telecom services and spectrum allocation are under the overall control of Department of Telecommunication (DoT) under Ministry of Communications. Telecom Commission (TC) is the apex body in DoT whose function include formulation of telecom policy, licensing of telecom services, assignment, monitoring and control of spectrum, cooperation with various international telecom bodies, etc. TC comprises of a chairman, four full time members (Member (Finance), Member (Technology), Member (Services), Member (Production) and four part time members. Secretary, DoT is the chairman of TC.

2.1.6.2 Wireless Planning & Coordination Wing

The Wireless Planning & Coordination (WPC) Wing of DoT, created in 1952, is the national radio regulatory nodal agency of the Government of India and is responsible for planning, regulating, and managing the limited resources of Radio Frequency (RF) spectrum and associated satellite orbits, including geo-stationary satellite orbit as well as licensing of wireless stations in the country. It is headed by the Wireless Advisor to the Government of India. It exercises the statutory functions of the Central Government and issues licenses to establish, maintain and operate wireless stations.

2.1.6.3 Standing Advisory Committee on Radio Frequency Allocations (SACFA)

Standing Advisory Committee on Radio Frequency Allocations (SACFA) is a high level committee chaired by Secretary (DOT)/Chairman, Telecom Commission. Heads of major wireless users/administrative ministries of the Govt. of India, Member (Technology), Telecom Commission, and Wireless Adviser to the Govt. of India, Joint Secretary, DoT are its members. WPC wing of the Ministry of Communications provides secretarial help to the committee. Joint Wireless Adviser, WPC wing is the member-secretary of the Committee.

The main functions of the committee are to make recommendations on:-

- Major frequency allocation issues,
- Formulation of National Frequency Allocation Plan,
- Making recommendations on various issues related to International Telecommunications Union (ITU),
- Asia Pacific Telecommunity (APT),
- To sort out the problems referred to the committee by various wireless users, site clearance of all wireless installations in the country, etc.

2.1.6.4 Regional Licensing Offices

In the past, spectrum users were predominantly in the Government sector and private sector were using spectrum for their captive uses. Wireless licences were being issued by WPC wing of DoT. With the increase in number of spectrum users, certain wireless licences (radio paging, import, maritime mobile station, experimental, etc.) were decentralized from WPC wing to five RLOs at Delhi, Mumbai, Kolkata, Chennai and Shillong since January 2007.

2.1.6.5 Wireless Monitoring Organisation (WMO)

The Wireless Monitoring Organisation (WMO) is the field organization of the WPC wing. Wireless monitoring is an integral part of the spectrum management and this monitoring is carried out by WMO through a network of one International Satellite Monitoring Earth Station (ISMES), five International Monitoring Stations (IMSs) and 22 Wireless Monitoring Stations (WMSs) located all over India. WMO has 10 Inspection Units which carry out physical inspection of wireless installations. WMO is headquartered at New Delhi and has four Regional Headquarters (RHQs) at Delhi, Mumbai, Kolkata and Chennai. WMO is also equipped with five Radio Noise Survey Units, which undertake detailed and complicated measurements to aid in the spectrum management activity. WMO has ten Inspection Units which carry out physical inspection of wireless installations.

2.1.6.6 Telecom Regulatory Authority of India (TRAI)

Telecom Regulatory Authority of India was established by an Act of Parliament in March 1997 to regulate the telecommunication services, and for matters connected therewith or incidental thereto.

2.1.6.7 Telecom Disputes Settlement and Appellate Tribunal (TDSAT)

Telecom Disputes Settlement and Appellate Tribunal (TDSAT) was established in 2000 by an amendment to TRAI Act 1997 to take over the adjudicatory dispute resolution functions of TRAI.

Scope and objective of Audit

The performance audit was conducted during October 2016 to January 2017 with a view to examine the efficiency and effectiveness of the spectrum management functions of Department of Telecommunications (DoT) on the basis of records/documents maintained at WPC and Wireless Planning & Finance (WPF) wings of DoT for the period from 2011-12 to 2016-17 (till December 2016). Also records of 10 Monitoring stations and Inspection units of WMO including regional and main headquarters of WMO and five (5) RLOs were also test checked.

Main objectives of conducting Performance Audit of Spectrum Management were to:-

- Examine the extent of efficient and optimal utilisation of the available spectrum in tune with the International Telecommunication Union (ITU) and internal frameworks.
- Examine realization of revenue from spectrum usage by DoT.
- Examine the monitoring mechanism of spectrum usage put in place by DoT.

Audit criteria

Important criteria used in audit are

- Telecom Policy of DoT (NTP - 1994, 1999 and 2012)
- ITU radio regulations, International Frequency Allocation Table and National Frequency Allocation Plan.
- Relevant TRAI recommendations, TDSAT and Hon'ble Supreme Court judgements
- DoT's relevant committees' report
- Relevant orders issued by WPC and WPF wings of DoT

Audit Methodology

An entry meeting was held with the Secretary, DoT and other senior officers of WPC and WPF wings of DoT on 27 October 2016 before actual commencement of audit. In the entry meeting, the scope and objectives of audit were explained. The audit was conducted on the basis of records/information made available by the WPC and WPF wings of DoT. Audit also accessed public documents available on the websites of DoT, TRAI, TDSAT, Supreme Court and ITU. Additional data, information and clarifications were obtained through issue of Audit Inspection Memos. Draft report was issued to DoT before holding an exit meeting with DoT on 05 October 2017. The Report takes into account, the replies by the WPC and WPF wings of DoT, which were received in October 2017.

Audit Acknowledgement

We place our sincere appreciation for the cooperation extended by DoT in facilitating this audit.

Audit Findings

Audit findings emanated from the Performance Audit are described in succeeding paragraphs.

2.1.7 Re-farming of spectrum

As per the NTP 2012, one of the major objectives of Spectrum Management was to re-farm spectrum and allot alternative frequency bands or media to service providers from time to time to make spectrum available for introduction of new technologies for telecom applications and prepare a roadmap for availability of additional spectrum every five years. However, it was observed that the objective was partially achieved as the spectrum has not been re-farmed from different users whose needs could be fulfilled by different frequency bands as well as with less bandwidths than that had been initially allotted. The Audit observations are as given in the succeeding paragraphs:

2.1.7.1 Spectrum re-farming from Defence Services for commercial telecommunication use

In India, total spectrum allocated for GSM based mobile (cellular) services (2G/2.5G) is 2X25 MHz in 900 MHz band and 2X75 MHz in 1800 MHz bands. Though the total spectrum available for cellular services in 1800 MHz is 2X75 MHz, major part of this spectrum was being used by Defence Services. Some part of 900 MHz band (upto 2x6.2 MHz) was being used by Defence till date. Also, spectrum in 2100 MHz band (2x60 MHz) was available for commercial applications for 3G services. This band was also extensively used by Defence Services.

DoT had identified the need way back in 1999 for re-farming of spectrum from Defence and others who had been historically major users.

The Government of India constituted a Group of Ministers (GoM) in September 2003 which recommended that adequate spectrum be made available for unimpeded growth of telecom services modalities which was to be jointly worked out by WPC of DoT and Defence Services.

The issue of Spectrum Management was also considered by the Parliamentary Standing Committee on Information Technology in its 28th Report presented to the both Houses of Parliament in December 2005. The committee urged DoT to make available additional spectrum for telecom services and also recommended for formulation of "Defence Band[3]" and "Defence Interest Zone[4]" (DB & DIZ) that would reduce the time

[3] Various spectrum blocks to be used by military forces

[4] 50km area near the international border where the defence ministry and DoT decide on spectrum use parameters during peace time and hostilities.

consuming process of continuous coordination, vacation and migration from assigned frequencies besides other benefits of proper planning for procurement and development of equipment by both Defence and telecom industry. This would also result in contiguous assignment of spectrum which results in optimum utilization of scarce resource like spectrum.

The Empowered Group of Ministers (EGoM) on vacation of spectrum and auction of 3G, in its meeting held on 05 March 2012, directed DoT for formal notification of "DB & DIZ". However, the formal notification of "DB & DIZ" could be made only in March 2015 subsequent to Cabinet decision on 21 January 2015. Out of total available spectrum of 2x75 MHz in 1800 MHz band, 2 x 55 MHz was designated as telecom band and 2x20MHz was designated as Defence band. Also, out of total available spectrum of 2x60 MHz in 2100 MHz band, 20 MHz in uplink band and 15 MHz in downlink band was designated as Defence band.

Pursuant to promulgation of "DB & DIZ", exercise of harmonization of spectrum allotted to TSPs in 1800 MHz was finalized by WPC by June 2016.

A committee constituted by DoT recommended (March 2013) that usage of spectrum by Space, AIR/TV, Defence and Railways in the IMT band (Telecom band) should be re-farmed/ reallocated for public telecom services at the earliest.

Though the action for re-farming of 1800/2100 MHz band from Defence had been taken, but no action/deliberation for re-farming of 900 MHz band was initiated by WPC (DoT). The continuing use of spectrum in these bands by Defence (may be due to its legacy network equipment) results in loss of opportunity cost for the nation as a whole.

DoT (WPC) stated (August and October 2017) that the delay in notification of "DB & DIZ" could not be attributed to WPC given the complexities and importance attached to it. Regarding 900 MHz band, it was stated that WPC did not feel any need to carry out harmonisation in this band as it had not received any request for harmonisation of 900 MHz band from TSPs. On the allotment of spectrum to the Defence in 1800 MHz band across the country, it stated that the allocation of spectrum to the Defence has been deliberated over a long period of time and decided by the highest level decision making body and as such it was to be implemented in letter and spirit.

Audit observes that the notification of "DB & DIZ" issued in March 2015 itself provided that Defence band would be revisited from time to time and Defence services would be given desired amount of spectrum as per requirement in the designated area (including commercial band) during pre-hostility period/when actual operations were imminent as per the provisions of union war book/any appropriate authority designated by government. In view of above provisions and TRAI's repeated recommendations, there may be scope for re-farming some part of 2x20 MHz spectrum in prime band of 1800 MHz and 35 MHz in 2100 MHz band presently earmarked across the country for

Defence use. Further, deliberation on re-farming of 2x6.2 MHz with Defence in 900 MHz also needs to be initiated by DoT without waiting for any request from TSP as the responsibility for ensuring efficient and optimum utilisation of spectrum lies with DoT (WPC) and not with TSPs.

2.1.7.2 Re-farming of Spectrum from Railway

Prior to 01 June 2004, the Central Government organizations/Ministries/ Departments were exempted from payment of License Fee and Royalty Charges (Spectrum charges) for their wireless network. However, DoT decided to levy Spectrum charges from all wireless users including Government organizations/Ministries/Departments at the existing rates with effect from 01 June 2004. Spectrum charges (Royalty) for captive users were revised w.e.f. April 2012.

Railways was assigned 1.6 MHz spectrum along seven railway tracks in 900 MHz band. Considering the increased requirement of spectrum for commercial use for telecom services, TRAI in its recommendations dated 13 May 2005 and 11 May 2010 on Spectrum related issues recommended for re-farming of spectrum in 900 MHz from incumbents for its utilization for commercial use by telecom operators.

For the purpose of efficient and optimum utilization of spectrum by a user, charging of spectrum should be based on its economic value. Spectrum in 900 MHz band is a commercial band for telecom use which has been auctioned since February 2014. In February-June 2015, the WPC wing arrived at the annual charges of 1.6 MHz spectrum assigned to Railway based on auction price as ₹ 308.47 crore which was much higher compared to annual charges of ₹ 37.82 crore being levied on formulae basis.

Telecom Commission also decided (April 2016) that captive frequency assignments in the commercial bands used for telecom services would be re-examined due to the high differential between the auction determined price and the charges payable by captive users as per extant orders. However, no final decision has been taken till date in this regard.

Though TRAI emphasized time and again for re-farming of spectrum assigned to Railway in 900 MHz for telecom uses which was also concurred by DoT's own committee, WPC had not taken any action in this regard.

As stated to audit, Spectrum in 900 MHz band had been assigned to Railway in select train routes only. This suggests that spectrum in 900 MHz was not an absolute necessity for Railway and its wireless communication need would have been met in other bands normally allotted to Captive users. Moreover, Railway had been assigned spectrum in VHF band for its more than one lakh walkie-talkie for its operational use.

Assignment of spectrum to Railway in 900 MHz band hampered the contiguous assignment of spectrum to telecom operators which in turn adversely affected the optimal utilization of spectrum.

DoT replied (August and October 2017) that allotment in respect of spectrum in 900 MHz band had been done in line with NFAP for safety of passengers for communication in Railway. Spectrum is also utilised for national security and safety. Railway is a Government carrier for transportation and public utilities. Hence the passenger safety can not be undermined with commercial usage. This frequency band is not allocated exclusively for TSPs for commercial usage. Ecosystem is also not available for such application in other frequency band. So Railway has been allocated spectrum in this band keeping overall interest of the public safety. As far as the use of this frequency band in other places not used by Railway, the same can be taken into consideration for use by other services on case to case basis. So it can not be said that valuable spectrum in 900 MHz is in inefficient use, considering commercial utilisation only.

Audit is of the view that though the allotment of spectrum to railway in 900 MHz was in line with the NFAP that provides that certain frequency spots in the frequency band may be considered for train control and mobile train radio system for specific locations on a case to case basis, however, Railway actually uses such frequency spots across the railway tracks only. As per the data furnished (April 2016) by WPC to Audit, allocation of frequency spots of 200 KHz spectrum in 900 MHz band had been made for whole circle as this spot had not been assigned to TSP. In other words, such frequency spots remain susceptible for unauthorised use which would remain undetected in view of inadequate monitoring of spectrum as deduced in Para 2.1.11. DoT itself accepted the fact that use of this frequency band in other places not used by Railway can be taken into consideration for use by other services that indicates that this valuable frequency in 900 MHz band was not being utilised efficiently. Moreover, 900 MHz band is a commercial band and its optimum and efficient utilisation should be ensured by refarming/harmonising. WPC didn't respond on the audit query on the methods of charging for spectrum used in 900 MHz by Railway in view of DoT's own committee recommendations. This is causing inefficient use of scarce and valuable spectrum in 900 MHz in view of its commercial utilisation.

2.1.8 Harmonization of spectrum

Harmonization of Spectrum entails making the Spectrum assigned to the Service Providers in Contiguous frequencies thereby increasing the efficiency and economies. The NTP 2012 had stated that one of the objectives of the Spectrum Management was to make available adequate globally harmonized International Mobile Telecommunications (IMT) spectrum in 450 MHz, 700 MHz, 1800 MHz, 1910 MHz, 2.1 GHz, 2.3 GHz, 2.5 GHz, 3.5 GHz bands and other bands to be identified by ITU for commercial mobile services. DoT has taken steps to harmonize spectrum in 800 MHz and 1800 MHz band by June 2016. Audit scrutiny of files relating to harmonization of spectrum in 1800 MHz and 800 MHz bands revealed the following-

2.1.8.1 Additional guard band in 1800 MHz band leading to non-utilization of spectrum

A guard band is a narrow frequency range that separates two ranges of wider frequency. This ensures that simultaneously used communication channels do not experience interference which would result in decreased quality for both transmissions.

TRAI in its recommendation (27 January 2016), indicated for guard band of 0.2 MHz in each LSA out of total 55 MHz (1710-1765 MHz paired with 1805-1860 MHz) spectrum earmarked for commercial use in 1800 MHz band. Audit noticed that during harmonization of 1800 MHz band, DoT made a provision for 0.2 MHz guard band (0.1 MHz at each side of the band, i.e. in the start and in the end of the total 55 MHz spectrum) and one additional guard band of 0.2 MHz in between this spectrum band in all 22 LSAs. It was also noticed that the location (frequency spot) of the additional guard band of 0.2 MHz considered by the DoT was varying from LSA to LSA i.e., in Jammu & Kashmir, it was close to start of the band (1715.1-1715.3/ 1810.1-1810.3) whereas in Tamil Nadu (TN) it was close to the end (1743.3-1743.5/ 1838.3/1838.5).

DoT (WPC) replied (August and October 2017) that in 1800 MHz band, GSM and LTE (FDD) are the two technologies which are currently being used in India for providing telecom services. Deploying two different technologies – GSM and LTE – in the adjacent frequency channels may cause interference. Keeping in view of this fact, during harmonization, as per the international practice, it was decided to make allotment to TSPs having more than or equal to 5 MHz of auction acquired spectrum, preferably in the starting of the frequency band, followed by a guard band equal to 0.2 MHz and thereafter allotment made to TSPs having less than 5 MHz of auction acquired spectrum and lastly TSPs with administratively allotted spectrum so as to ensure co-existence of both the technologies viz. GSM and LTE, in the same band. As the number of TSPs who acquired 5 MHz or more than 5 MHz spectrum through auction varies from LSA to LSA, the position of this 0.2 MHz guard band also varies from LSA to LSA. It is international practice to keep guard band on either side of the frequency band to avoid interference from the services working in the adjacent bands. Accordingly, 0.1 MHz spectrum has been kept as guard band on either side of the 1800 MHz band. To sum up, the allocation of the guard band in the 1800 MHz band and quantum of guard band (0.2 MHz or 0.4 MHz) is determined by the consideration of administrative allotted spectrum and auction acquired spectrum, and also technology considerations. At the first opportunity, the guard band in 1800 MHz band would be eliminated.

Reply of the Department is not acceptable as the reasons/conditions for additional guard band given in the reply are not satisfied in case of three LSAs (Uttar Pradesh (UP) (West), Haryana and Himachal Pradesh (HP)). In UP (West) LSA, auction acquired spectrum of only 2.2 MHz by Idea lies between auction acquired spectrum of Telewings (7 MHz) and Videocon (5 MHz) and the provision for guard band equal to 0.2 MHz is

followed by spectrum allocated to Videocon. Similarly in Haryana LSA, auction acquired spectrum of 5 MHz pertaining to Videocon is followed by auction acquired spectrum of 3.4 MHz spectrum allocated to Bharti and the provision for guard band equal to 0.2 MHz is followed by spectrum allocated to Bharti. In HP LSA also, auction acquired spectrum of 5.4 MHz pertaining to Reliance Jio is followed by auction acquired spectrum of 4.8 MHz allocated to Idea and the provision for guard band equal to 0.2 MHz is followed by spectrum allocated to Idea. If in the above three circles deployment of two different technologies, GSM and LTE, in the adjacent frequency channels is not causing interference then on the similar lines, this additional guard band can be removed in other LSAs too. The Department also accepted the fact that guard band in 1800 MHz band would be eliminated.

As a result, while putting up spectrum in 1800 MHz band for auction, this portion of additional guard band spectrum was not considered for sale and thus 4.4 MHz spectrum (0.2 MHz spectrum in each 22 LSAs) in 1800 MHz, which is a prime band, remained unutilized. The annual loss on account of 4.4 MHz spectrum on account of additional guard band is ₹ 30.92 crore [5] (**Annexure- I**). The provision of additional guard band needs a review by DoT as further misutilisation of this spectrum cannot be ruled out.

2.1.9 Underutilization/non utilization of IMT spectrum

Spectrum in 1800 MHz band remained unutilized due to various reasons as detailed below:

2.1.9.1 Idling of administratively assigned spectrum surrendered by Tata Teleservices Limited (TTSL) and Tata Teleservices (Maharashtra) Limited (TTML)

DoT prescribed (March 2013) levy of one time spectrum charge (OTSC) for spectrum held beyond 2.5 MHz by CDMA operators and issued (March 2013) demand note of ₹ 1152.68 crore to Tata Teleservices Limited (TTSL)/Tata Teleservices (Maharashtra) Limited (TTML). DoT order provided that licencees not willing to pay OTSC may surrender spectrum beyond 2.5 MHz.

In this background, TTSL/TTML surrendered (April 2013) the CDMA spectrum held by them beyond 2.5+2.5 MHz in 13 LSAs (Kolkata, Chennai, Bihar, Gujarat, Haryana, Karnataka, Kerala, Punjab, Rajasthan, UP (E), UP (W), Maharashtra and Andhra Pradesh). It surrendered 2.5 MHz each in Maharashtra and Andhra Pradesh and 1.25 MHz each in rest 11 LSAs under protest). Also, it surrendered 1.25 MHz in Delhi and Mumbai and retained 3.75+3.75 MHz and paid first instalment of ₹ 62.91 crore as OTSC in respect of Delhi and Mumbai under protest. It also filed writ petitions challenging levy of OTSC in High courts of Mumbai and Kolkata.

[5] As the selling price of October 2016 auction

Above surrendered spectrum was not put to auction held subsequently in February 2014 and March 2015 by DoT on the plea that the matter was sub-judice. However, High Courts had not restrained DoT from putting the surrendered spectrum to auction.

In February 2014 auction, 800 MHz band spectrum was not put to auction and in March 2015 auction of 800 MHz band, following was observed:

- 108.75 MHz in 20 LSAs were put to auction, out of which 86.25 MHz spectrum (i.e. about 80 *per cent*) was sold out.
- In eight LSAs, all spectrum (30 MHz spectrum) put to auction was sold out and out of these eight LSAs, in case of seven LSAs 11.25 MHz spectrum (1.25 MHz in each LSA surrendered by TTSL) was available with DoT, but the same was not put to auction.
- Further, in two LSAs no spectrum was put to auction, despite 2.5 MHz spectrum (1.25 MHz in each LSA surrendered by TTSL) was available with DoT.

TRAI while giving its recommendations (January 2016) viewed that DoT should have ensured that the spectrum surrendered by TTSL/TTML was not kept idle and should take appropriate legal remedies to put it in the upcoming auction.

Based on legal opinion taken by DoT on this TRAI's recommendation, a DoT committee noted that TTSL/TTML had filed Writ petitions in the Hon'ble High Courts and the matter was sub-judice and thus the proposed auction of spectrum surrendered by TTSL/TTML during the pendency of Writ Petitions might create third party interest, leading to legal complications and would affect the complete auction process. Therefore, TRAI was requested to reconsider its recommendation.

TRAI in its response (April 2016) on DoT's reference reiterated its recommendation that DoT should take legal course of action so as to ensure that this stalemate does not continue for long. It also stated that the Hon'ble Court(s) may be apprised that by keeping the spectrum surrendered by TTSL idle, the Government was losing substantial revenue in form of spectrum charges which was recurring and irreparable.

In the auction held in October 2016, spectrum surrendered by TTSL/TTML pertaining to Mumbai, Andhra Pradesh and Maharashtra LSAs was put to auction (as license was expiring during September 2017). But for remaining 12 LSAs it was not put to auction, despite the fact that this spectrum (12x1.25 MHz) was already lying idle for the past three and half years.

DoT (WPC) replied (August 2017) that TTSL and TTML surrendered the spectrum under protest but went to court when OTSC was charged from them. In this matter, the opinion of Legal Adviser of DoT was sought, who opined that auction of spectrum surrendered by TTSL/TTML may lead to third party interest so long as the court does

not deliver its judgment. Effort for speedy disposal of various legal cases relating to OTSC was made by filing Transfer Petitions in the Hon'ble Supreme Court, which was not admitted and disposed off on 19 January 2015. As the matter is sub-judice, the spectrum in question may not be considered as idling and suitable for auction.

Reply of the Department is not tenable as TTSL/TTML surrendered the spectrum in April 2013 to absolve it from any liability arising out of the OTSC on spectrum holding beyond 2.5 MHz in the 800 MHz band and paid OTSC where it retained spectrum beyond 2.5 MHz. Moreover, High Courts did not restrain DoT from auctioning the spectrum surrendered by TTSL/TTML when they challenged the OTSC demand issued to by DoT in the courts.

Thus, by not putting to auction (in three LSAs till October 2016 and in 12 LSAs till date) the surrendered spectrum in 800 MHz by TTSL/TTML, the valuable spectrum was lying unutilised. Further, the unauthorized use of these spectrums cannot be ruled out. The annual value of spectrum surrendered by TTSL but not put to auction in three LSAs till October 2016 and in 12 LSAs till date is ₹ 57.78 crore and ₹ 69.55 crore[6] respectively **(Annexure – II).**

2.1.9.2 Withdrawal of excess spectrum from BSNL

DoT was assigning additional GSM spectrum beyond initial allocation of 4.4 MHz to service providers on subscriber based criteria since February 2002 and it was last revisited in January 2008. It was noticed that most of the service providers were requesting for allocation of 2G spectrum since March 2008 on the basis of subscriber based criteria.

BSNL was allotted start up spectrum of 6.2 MHz in 900 MHz band in all its Service Areas during 2000 and 2003. Subsequently it was allotted additional 1.8 MHz in Jammu & Kashmir in 900 MHz, 1.2 MHz in Gujarat, 1.8 MHz in Rajasthan and West Bengal and 3.8 MHz in rest of 15 LSAs except Punjab in 1800 MHz band during 2004 to 2007. It was only after DoT's decision to levy OTSC, BSNL proposed to surrender (January 2013) 1.8 MHz in 15 LSAs in 1800 MHz band. However, DoT has not withdrawn the excess spectrum proposed to be surrendered by BSNL till date (March 2018).

DoT (WPC) stated (August and October 2017) that audit observation regarding raising the issue of surrender of excess spectrum held by them for efficient utilization of spectrum would be complied with. It also stated that WPC Wing had not received any letter from BSNL regarding surrender of 1.8 MHz spectrum in these 15 LSAs where it has been allotted 3.8 MHz spectrum in 1800 MHz band. However, WPC Wing had received a letter from BSNL in October 2012 on the subject "Retention of CDMA and

[6] At the reserve/selling price of March 2013 auction.

GSM spectrum by BSNL" in which M/s BSNL, among others, also stated that GSM spectrum beyond 4.4 MHz is necessary to be retained by them for serving its customers.

Reply of the Department is not tenable since BSNL in its letter of October 2012 to DoT stated that it required to retain spectrum beyond 4.4 MHz and requested the Government to bear the due payment for spectrum beyond 4.4 MHz. Subsequently, BSNL intimated DoT its decision to surrender (January 2013) 1.8 MHz in 15 LSAs where it had been allotted additional 3.8 MHz in 1800 MHz band. Despite this proposed surrender, BSNL still would have spectrum beyond 4.4 MHz in each service areas. Non receipt of any letter from BSNL for surrender of spectrum was an indication of lack of coordination and communication between different wings of DoT.

Financial impact due to delay in withdrawal of excess spectrum held by BSNL is ₹ 520.79 crore[7] **(Annexure –III).**

2.1.10 Inequitable allotment of Microwave Access Spectrum to Telecom Service Providers

The mobile backhaul (Microwave) is an integral part of the cellular telecom network which connects cell sites (Base Transceiver Stations) with Base Station Controllers. Microwave (MW) frequencies are generally assigned in chunks of 2x28 MHz, known as MW carriers. There are two types of MW carrier viz. Microwave Access (MWA) carriers and Microwave Backbone (MWB) carriers.

MWA carriers are generally in the frequency bands of 10 GHz and beyond. These are assigned for short-haul systems which are used to carry traffic through relatively shorter distances. MWA carriers are typically used in the mobile backhaul networks (mainly in the pre-aggregation part). In India, currently 13 GHz (12.750-13.250 GHz), 15 GHz (14.5-15.5 GHz), 18 GHz (17.7-19.7 GHz) and 21 GHz (21.2-23.6 GHz) bands are used for the assignment of frequencies for MWA carriers.

MWB carriers are assigned for relatively longer links of minimum link length of 15 KMs and in the hilly terrains, these are assigned for minimum link length of 10 KM.

Presently, in India, the assignment of MW backhaul carriers is made administratively, subject to availability of spectrum. Regarding the assignment of carriers for MW access and backbone networks, the order of 18 April 2002 issued by the Wireless Planning and Coordination (WPC) wing of the DoT stated that-

"Assignment of frequencies for MW access and MW backbone networks for cellular operations would continue to be considered on the basis of full justification on the requirements and availability of the spectrum on case-to case and link-to-link basis after taking into consideration the interest of the other users with a view to ensure electromagnetic compatibility, etc. The complete technical analysis and all related

[7] At the selling price of 2014 auction.

aspects of frequency assignments, including efficient use of spectrum will apply before assigning frequencies for various MW access/backbone links. There will be no obligations on the part of the Government to assign frequencies for such purposes".

In order to maintain the level playing field among all telecom operators, it was declared (29 January 2011) by DoT that "in future, the spectrum will not be bundled with licence and spectrum will be made available only through market driven process."

Subsequent to this decision, access spectrum for various telecom access services (i.e. 2G/3G/4G) in 800/900/1800/2100/2300/2500 MHz band were auctioned during November 2012, March 2013, February 2014, March 2015 and October 2016.

DoT constituted a committee in December 2012 to look into the allotment/assignment of spectrum in various categories of spectrum users covering different categories of licences and authorizations. In terms of the deliberations (General principles governing allotment of spectrum) of the Committee, Spectrum could be auctioned where:-

(i) Demand outstrips Supply

(ii) Spectrum is allotted on exclusive basis

(iii) Spectrum is allotted over wide areas(State/Circle level)

(iv) Revenue from auction is expected to fetch more revenue than through administrative pricing

(v) Spectrum is used for providing public commercial services

(vi) Spectrum bands identified for providing public commercial service i.e. even presently used by captive users.

On the basis of the above principles, it was proposed by the Committee that the spectrum allotment in Microwave band on service area/area basis for terrestrial operations to all the service providers including ISP/NLD/ILD operators for providing telecom services should be allotted through market related process (auction).

However, in contravention of the Committee's recommendations, allocation of MW Access spectrum had been done on First Come First Serve (FCFS) basis till date as was being done for 2G license/Access Spectrum till 2009. This was despite the fact that it was used for providing public commercial services and MW Access spectrum was allotted for the entire service area (first carrier) and/or at least for some cities, as being done in case of access services spectrum (2G/3G/4G spectrum).

It was also found that allotment of MWA to Access Service providers was withheld by DoT since June 2010 and allotment against only one application was made in December 2015. There were 101 applications pending till November 2016 for allotment of MWA.

It was also observed that all available carriers in the 15 GHz band have already been assigned to the existing (initial) operators (viz. Vodafone, Bharti, Tata, Reliance etc.);

there was no carrier available in this band. Now in this band, the demand had outstripped the supply. MW carriers in 13 GHz have also been allotted to BSNL and other non TSPs. However, carriers were available in other bands. It may be noted that propagation characteristics of MWA spectrum in lower bands (say 13/15 GHz) was better compared with higher bands (18/21 GHz and beyond).

DoT issued guidelines (October 2015) for allotment of MWA and MWB for interim period provisionally pending the final decision by the Government. The guidelines stated that TSPs would be allotted, including the present holdings, a maximum of 4 carriers (each MWA carrier refers to 2x28 MHz) for Metro and Category A Service Area, 3 carriers for Category B and Category C Service Areas. However, initial incumbent TSPs had been allotted five to seven MWA carriers and they were allowed to hold the allotted carriers. However, DoT has not taken final decision on method of allocation of MWA spectrum yet.

Thus by non-allotment of MWA spectrum to Access Service Providers despite availability resulted in loss of revenue to the Government. Further by allowing initial incumbent TSPs to hold administratively allotted excess MWA carriers and allotment of MWA to one applicant in December 2015, the principle of providing level playing field to all TSPs was not being followed. Considering above facts and DoT's committee recommendations, the allotment of MWA spectrum should have been made only through auctions.

DoT (WPC) replied (August and October 2017) that

a) TRAI recommended (August 2014), among others, that the allocation of MWA & MWB carriers should be done administratively i.e. not through the auction mode. The Department (October 2015) sent back reference to the TRAI and TRAI sent its response (November 2015).The Department was still considering the above TRAI recommendation and response to the back-reference. Meanwhile, an interim guideline dated 16 October 2015 for allotment of MWA and MWB carriers was issued, till a final decision was taken by Government on pricing and allotment of MWA/MWB carriers.

b) As regards pendency of 101 applications for allotment of MWA/MWB spectrum, it was clarified that majority of the applications pertained to the erstwhile quashed 2G licenses and may be treated as require no action. However, some of the 101 applications pertain to the applicants who got their license renewed after their expiry of UAS licenses from 2014 onwards. The main reason for pendency of such applications (renewal cases) was that the applicants were unwilling to comply with the existing (provisional) guidelines dated 16 October 2015 in which pricing has been upwardly revised, among other issues.

c) Regarding equitable distribution of MWA/MWB carriers among the TSPs, it is worth mentioning that the existing provisional guidelines provide for retention of

earlier allotted MWA/MWB carriers to the incumbent licensees, pending the final decision on the TRAI recommendations which also takes care of the quantum of MWA/MWB to be allotted to the TSPs based upon the amount of access spectrum. Once the decision is taken finally, the issue of equitable distribution would also be taken care of.

Reply of the Management is not tenable as-

i. In order to maintain the level playing field among all telecom operators DoT decided in 2011 that in future spectrum would be made available only through market driven process. DoT had started auction of access spectrum but also continued allotment of MWA spectrum administratively (FCFS) to Telecom Service Providers. This shows contradictions in DoT's own policy implementation.

ii. As regards pendency of 101 applications, if majority of the applications pertained to the erstwhile quashed 2G licenses and remaining applications were renewal cases and the applicants were unwilling to comply with the guidelines (October 2015), then what was the need for continuance of their name in the pending list maintained by DoT, if no action was required for those cases. Moreover, provisional guidelines dated 16 October 2015 for allotment MWA/MWB carriers did not contain any upward price revision rather it was to be provisional subject to final decision of the Government.

iii. Regarding equitable distribution of MWA/MWB carriers among the TSPs, Department accepted the contention of audit and stated that once the decision is taken finally, the issue of equitable distribution would also be taken care of. However, the final decision regarding method of allocation of MWA/MWB is pending since 2012. Meanwhile, allotment of MWA was made to one applicant in December 2015.

Thus, Audit is of the view that allotment of MWA carriers to TSPs should be made equitably and through market related process.

2.1.10.1 Charging for MW spectrum for NLD/ILD networks on formulae basis instead of AGR basis

The New Telecom Policy 1999 (NTP 1999) allowed the then existing Cellular Mobile Service licensees to migrate from a Fixed Licensee Fee Regime to a Revenue Share arrangement with effect from 01 August 1999. The revenue sharing was to be done as a fixed percentage of their Adjusted Gross Revenue (AGR).

Subsequently, spectrum charges for access spectrum were also brought into Revenue Share (percentage of AGR) w.e.f. 01 August 1999. Similarly, spectrum charges for MW Access networks and Backbone networks for cellular operations were also fixed as a percentage of AGR from 18 April 2002 onwards as per the use of MW Access/Backbone bandwidth.

This percentage rate of MW Access/Backbone[8] spectrum for cellular networks were further revised vide WPC order dated 03 November 2006 and 10 November 2008.

Audit observed that the spectrum charges for MW access/backbone Spectrum and satellite Spectrum of NLD and ILD networks were still levied on formula basis[9] instead of revenue share basis (i.e. percentage of AGR), as being done for MW access spectrum of cellular network.

There are many cellular operators viz. Airtel, Vodafone, Reliance, Tata, Idea, BSNL, etc. who have Cellular as well as NLD and ILD networks and Microwave spectrum were used for Cellular as well as NLD and ILD networks also. There was no mechanism to monitor or identify the use of Microwave spectrum by an operator for a specific network and thus charging for MW spectrum for different networks differently (AGR based for cellular and formulae based for NLD/ILD networks) appeared to be flawed and subject to manipulation. It is pertinent to mention here that MW access/backbone Spectrum and satellite Spectrum of NLD and ILD networks were used for providing public commercial service. Charging one part of commercial spectrum (Access/MW spectrum for cellular networks) based on percentage of AGR and charging other parts of commercial spectrum (MW spectrum for NLD/ILD networks) on formulae basis exhibit inherent contradictions in larger policy implementation of Revenue Share regime.

DoT (WPC) replied (August and October 2017) that NLD/ILD network was recognized as a separate kind of service under Unified Licencing (UL) i.e. for existing licencing regime. Further NLD/ILD services have been existing prior to the advent of cellular services in the country. It is important that, while deciding the charging for NLD/ILD, a common criterion be evolved for this service, irrespective of the NLD/ILD holder having licence to operate any other kind of services for which charging policy/criterion may be different. In case any suspicion on unauthorized usage is brought to the notice of WPC, it is possible to find out the same through monitoring/inspection by Wireless Monitoring Organization (WMO).

Reply of the Department is not tenable as the NLD/ILD service is different service but it is a type of commercial telecom service and licence fee on these services is also based on percentage of AGR similar to that of access services. Levy of spectrum charges for MW access spectrum of cellular network are on revenue share basis (i.e. percentage of AGR) whereas spectrum charges for MW access/backbone spectrum and satellite

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[8] The mobile backhaul (Microwave) is an integral part of the cellular telecom network which connects cell sites (BTS) with Base Station Controllers. There are two types of MW carrier viz. Microwave Access (MWA) carriers and Microwave Backbone (MWB) carriers. MW Access is normally in the frequency band 10 GHz and beyond and MW Backbone networks are generally below 10 GHz

[9] Annual royalty =MXWXC; (M= Constant Multiplier depending upon the end to end distance for MW Links; W= Weight decided by adjacent channel separation for RF channeling plan deployed; C= Number of RF Channels used.)

spectrum of NLD and ILD networks are levied on formula basis. This was indicative of non-uniform policy in DoT and needs to be reviewed.

2.1.11 Monitoring of Spectrum Use

Wireless monitoring is an integral part of the spectrum management. The ability to do extensive monitoring is important to DoT for a number of reasons. In addition to making sure that spectrum policy is being complied with and tracking down sources of interference such as GPS jammers and nonconforming sources of radio frequencies, good spectrum-monitoring data can help in taking informed licensing decisions and give DoT insight into whether and how occupied a particular band is, whether bands might be good candidates for re-farming and how successful an agency's spectrum policies are.

This monitoring is carried out by the Wireless Monitoring Organisation (WMO), a field unit of the WPC Wing of DoT. Main function of the WMO is to ensure compliance of licence conditions by all wireless licensees and to monitor any un-authorised use of spectrum so that interference-free communication can be provided to all authorized licensees. Such monitoring is also done to find unutilized/under-utilized spectrum by licensees.

During the performance audit, 10 Inspection units situated at Delhi, Mumbai, Chennai, Kolkata, Nagpur, Hyderabad, Bangalore, Shillong, Jallandhar and Ajmer along with 10 International Monitoring Station (IMS)/Wireless Monitoring Station (WMS) situated at these stations and four Regional Headquarters (RHQs) of WMO at Delhi, Mumbai, Kolkata and Chennai as well as Wireless Monitoring Headquarter (MHQ) at Delhi were audited. Audit findings are given in succeeding paragraphs.

2.1.11.1 Non-updation of National Frequency Register (NFR)

National Frequency Register (NFR) is the basic record for all frequency assignments and it would be referred to identify assignable frequency for any new applicant. As such, it is utmost necessary to update the NFR by adding particulars of new assignments and deleting particulars of surrendered/withdrawn frequency assignments.

WPC implemented (January 2005) **"**Automatic Spectrum Management System (ASMS)" which caters to the requirement of application, assignment, channeling plan, SACFA clearance, etc. Based on the data maintained in the ASMS, NFR in soft version (Access table excluding secret data) was made available to audit.

Audit analysis of the NFR revealed that

- Frequency assignment in 1800 MHz band to TSPs whose licences were quashed in 2012 and who did not acquire licences subsequently, were still appearing in NFR as assigned (Allianz Infratech (P) Ltd, Etisalat DB reality, Loop Telecom Ltd, S Tel Ltd)

- Microwave Backbone (MWB) spectrum had been allotted to SSTL and RJIL in 2014 and 2016. However, no particulars of assignment of MWB frequency in the frequency range of 3 GHz to 10 GHz to above TSPs were noticed in the NFR.
- MWA spectrum assigned to Telenor/Uninor/Telewing was not found in NFR whereas it was allotted to them.
- Data Access (India) Limited, previously an International Long Distance Operator (ILDO), ceased its operations long ago. However, frequency assignments against this entity were still appearing in the NFR. A few similar instances are Deccan Airlines and Kingfisher Airlines.

DoT (WPC) stated (August and October 2017) that records related to spectrum assignment including details of base stations of TSPs are available in the NFR/ASMS, were processed for grant of Wireless Operating Licences (WOL), in force during that time. Recently during 2016 the requirement of WOL has been done away. However, spectrum in 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, and 2500 MHz bands assigned to TSPs in 22 services areas through auction process and these assignment details are available on the DoT website. It was further stated that necessary action would be taken to delete the records of frequency assignment in respect of quashed licences as pointed out by audit and that was to be done manually after verification. However, presence of such old records of these TSPs does not affect the process of spectrum allotment as it is being carried out through auction process only after verification of auction data and not the NFR. Regarding no particulars of assignment of MWB/MWA frequency available in ASMS, it was stated that MW carriers assigned to TSPs were limited in number and generally assigned administratively by processing the case on file and a separate physical record was maintained for the purpose in the respective file. Further, M/s SSTL, RJIL and Telenor had not submitted deployment plan for MWA/MWB assignment till November 2016 and in absence of which it would not be possible to update NFR in ASMS. However, efforts are being taken to update the NFR database in co-ordination with NIC.

The reply confirms that NFR in ASMS was not being updated at the time of assignment of new frequencies and/or surrender/withdrawal of previously assigned frequencies. It defeats the purpose of having a system like ASMS for efficient management of valuable resource like spectrum. When data in NFR relating to frequency assignment of major spectrum band having immense commercial value was in such a state, the situation regarding data relating to private captive users would not be any better. Further, as mentioned later at para 2.1.11.2 of the report providing outdated NFR data to WMO units was compromising the monitoring of unauthorized spectrum use.

Frequency allocation data of NFR which is of non-strategic uses should be uploaded in the DoT website so that all the stake holders have equal footing and thereby increasing transparency in this field.

2.1.11.2 Non-availability of updated database of wireless licensees with WMO headquarter and Monitoring Stations

For efficient frequency management and regulation, it is necessary that monitored information and data are accurate and reliable. Monitoring of RF spectrum is carried out to ensure compliance with regulatory provisions governing radio communications and to intervene with national or foreign stations contravening these provisions. Monitoring is also carried out to eliminate interference from other wireless users, jamming by man-made noise, etc. and also to study the occupancy of the radio spectrum. Wireless users are also to be monitored for their activeness on their authorised frequencies to identify unused frequencies so that those frequencies may be allocated to the needy wireless users. In order to achieve monitoring objectives, it is essential that MHQ/RHQ and Monitoring Stations have accurate, complete and timely information on allocated Band/ frequencies and wireless licences. The need for updated data/records with MHQ/RHQ and Monitoring Stations is clearly spelt out in Wireless Monitoring Stations Manual.

It was observed during audit that neither MHQ/RHQs nor IMS/WMS/Inspection units had updated base of wireless licensees and frequency assignments since 2009-10. MHQ informed (November 2016) that in the year 2009-10, a soft copy of licences was received from WPC wing and forwarded to all the monitoring stations/Inspection units. Similar reply was also furnished by other units. It was further stated that MHQ was planning to provide an updated list of licences as on date to the monitoring stations/inspection units after fetching the data from WPC wing. It was also stated that efforts would be made to get access to the database of WOLs maintained by WPC wing. Further WPC in its reply (August 2017) stated that updated list of licences in NFR was being distributed to all monitoring stations/inspection units. It also stated that whenever data regarding frequency allocation were needed by the Wireless Monitoring Stations/inspection units for resolving interference cases/carrying out inspection, the same was sought from respective Regional Licencing Office/WPC Wing for fruitful conclusion.

Reply of the Department is not convincing in view of the fact stated earlier that NFR itself was not updated. In absence of updated data base of wireless licensees and frequency assignments with WMO headquarter and monitoring stations, the monitoring of spectrum users would be totally ineffective. This is an indication of state of affairs in respect of monitoring of spectrum which is an important aspect of Spectrum Management, that information is being given to WMO units only in case of need expressed by them and there is no automatic transfer of information relevant for them.

2.1.11.3 Non maintenance of monitoring equipment supplied under World Bank funded project

Large number of equipment/Mobile Monitoring System (MMS) vehicles were supplied around 2004-05 under World Bank funded Project to all the wireless monitoring stations for carrying out the various types of monitoring activities. These equipment/MMS vehicles went faulty and remained so for several years.

Annual Maintenance Contract (AMC) for the maintenance of equipment/MMS vehicle with M/s HFCL was terminated by WPC wing on 06 May 2011 due to inconsistent and unsatisfactory performance.

WMO was to take suitable action regarding maintenance of facilities (National Spectrum Monitoring System) installed under National Radio Spectrum Management and Monitoring System (NRSMMS) at WMO and its field offices. Above mentioned critical equipment were proprietary items of Thales Communications, France. The proprietary items can only be maintained and spare parts like LO Cards be supplied by M/s Thales Communications, France and M/s Himachal Futuristic Communications Limited (Tripartite agreement). However, they didn't respond to the request of WMO to maintain and repair these equipments. Hence, these equipments remained faulty. Recently, in November 2016, WMO has written to M/s Thales Communications, France for purchase of LO Card.

Only third party equipment supplied under this project could be repaired by the respective parties. 15 Spectrum Analyzers became faulty at different dates starting from 2007 to January 2012. The work orders for repairing these 'Spectrum Analyzers' were issued on 31 October 2013 only and was repaired by 26 November 2013. It took around seven years to get one equipment (Spectrum analyzer) repaired which is heart of monitoring activities. UPS batteries remained dead for more than nine years. Many critical types of equipment like LO2000 cards, High Frequency Direction Finder (HFDF) fixed, Esmeralda Miniport Receiver, Signal Power Meter, HFDF Transportable Direction Finder (TDF) 2030, RF Antenna, Direction Finder Mast, etc. remained faulty for several years.

WMO authorities stated (February 2017) that after the termination of AMC in May 2011 (matter still under arbitration), WMO processed the case of repair of 15 Spectrum Analyzers which had become faulty between 2007 to 2012, however, the financial concurrence could be obtained only in October 2013. WMO processed the case of AMC of 21 Spectrum Analyzers in October 2014 which was under consideration till January 2016 but it was not approved as these equipments had outlived their useful life. Now these important equipments which were heart of monitoring activities were repaired on case to case basis. WPC in its reply (August 2017) narrating above facts further stated that there was no laxity on the part of DoT for repairing of third party equipments supplied under the World Bank projects.

The facts stated above confirm that due importance was not given to maintenance of equipments to ensure effective monitoring activities. This was when spectrum monitoring needed to be at full effectiveness to discourage unauthorized use of commercial spectrum.

2.1.11.4 Inadequate mobile monitoring due to non-movement of mobile vehicles

Mobile monitoring function is essential in VHF and UHF frequency bands because of line of site constraints. Therefore vehicles fitted with Mobile Receiver, Portable Antenna, Direction Finder, Measurement Equipment and Batteries are provided to carry out mobile monitoring of the signals from close range. Mobile monitoring is done for technical, specific, unauthorized and illicit transmission.

Audit observed that 21 mobile monitoring Vehicles fitted with expensive electronic equipment under World Bank aided NRSMMS project procured between the year 2005 and 2007 were provided one vehicle each to all 21 WMSs/IMSs centers. Audit noticed that more than 75 *per cent* vehicles could not be used for mobile monitoring as depicted below.

Table - 2

Year	Total vehicles available	No of vehicles which remained idle	Reasons for idling
2012-13	21	12 -16	Equipment fault/vehicle faults.
2013-14	21	12-19	Equipment fault/non availability of drivers/ vehicle faults
2014-15	21	17	Equipment fault/non availability of drivers/ vehicle faults.
2015-16	21	18-20	Equipment fault/non availability of drivers/ vehicle faults

As can be seen from the above that 12 vehicles in April 2012 were off the road (Distance covered was zero) due to equipment fault/non availability of drivers/vehicle faults. This number increased to 20 in March 2016 due to similar reasons.

WMO stated (December 2016) that monitoring of spectrum to detect un-authorised/ illegal use at various wireless monitoring stations were carried out by available equipment such as hand held spectrum analyzer and portable spectrum analyzer. WPC in its reply (August 2017) also stated after verification of details mentioned by audit that idling of monitoring vehicles supplied under World Bank aided NRSMMS project to some extents affected the monitoring activity. However, mobile monitoring at various Wireless Stations in the given period was carried out by other available vehicles and equipments (hand held spectrum analyzer, EB 200, Agilent spectrum analyzer etc.). It further stated that many serious interference cases had been resolved by WMO by utilizing existing monitoring facilities with affirmative results. However, deploying

equipments with latest technology and other infrastructures would definitely help in strengthening the wireless monitoring activities.

Reply of the Department confirms that there was little mobile monitoring activity which was supposed to be done through these vehicles as these vehicles remained idle due to various faults. This also showed not only the poor system of maintenance of technical equipment used for monitoring purposes but entailed the loss of Channel Hours of monitoring work also. Further, the DoT reply is only talking about removal of interference. The reply is silent about monitoring the use of unauthorized/unallocated spectrum.

As side-wise bands of the band allotted to a licensee may remain vacant, possibilities of un-authorised use of spectrum by a licensee (Telecom or captive) or illegal use by unscrupulous elements cannot be ruled out. Also unauthorized use of spectrum which is suitable for commercial use but earmarked for Defence cannot be ruled out since spectrum is kept reserved for Defence on pan India basis but Defence uses it in selected and limited geographical areas. Considering the risk of commercial exploitation by unauthorized entities/illegal use of spectrum, technical competence of WMO needs to be strengthened by deploying proper equipment and other infrastructure.

2.1.11.5 Non-achievement of inspection target by the Inspection units

The authorized wireless stations are required to be inspected to ensure that they are established, maintained and worked in conformity with the terms and conditions of license, Radio Regulations and statutory rules and have established operating procedures and practices. Each wireless station is scheduled to be inspected at least once in three years.

MHQ has been assigning the inspection target of 10 wireless users per month to all ten Inspections units. It was also made clear that if post of Engineer (Inspection) was vacant, Officer in Charge (OIC) had to carry out the inspection works in addition to his own duties and the target was kept 50 *per cent* only i.e. five wireless users per month.

A review of Performance Reports of various Inspection units for the periods from 2011-12 to 2015-16 revealed that the Inspection units could not achieve the target in any year during the last five years **(Annexure - IV).** There was a shortfall ranging from 44 *per cent* to 76 *per cent* in conducting inspections in Kolkata, Delhi, Jalandhar, Ajmer, Nagpur and Hyderabad Inspection units. No inspection was conducted from October 2010 to October 2016 by Shillong unit whereas target of inspection was fully achieved by Mumbai unit.

WPC stated (August 2017) in its reply that posting of sufficient manpower was to be ensured to carry out inspection work properly. Efforts would be made to fully achieve the targets of inspection after posting of sufficient manpower in WMSs/IMSs under which the inspection units are working.

Above reply confirms failure of DoT (WPC) in carrying out the inspections as per the assigned targets, any possible violations by wireless licensees such as non-payment of royalty & license fees by licensee, unauthorized use of wireless stations, etc. reportable to WPC, remained incomplete.

2.1.11.6 Deficiency in monitoring assignments by MHQ/RHQ

MHQ/RHQ assign monitoring assignments to WMSs that can be classified into two broad categories viz. Specific assignments and Routine assignments. Specific assignments pertain to resolving interference cases, identification/locating unauthorized operations, occupancy/vacancy of specific band, etc. Routine assignments are carried out regularly on predetermined schedule as per monthly monitoring programme coordinated by RHQ.

Audit analysis of monthly monitoring assignments made by North RHQ Delhi to monitoring stations in its jurisdiction revealed that in absence of updated wireless licences issued and vacant spectrum details, large range of spectrum band was assigned for monitoring giving no detail of assigned or vacant spectrum.

DoT (WPC) stated (August 2017) that copy of frequency assignment letter is forwarded to Director (WMO) for monitoring the frequencies and distribution to concerned monitoring stations. However, it will be ensured to provide the relevant information to all the monitoring stations on priority.

The facts remains that the lack of proper details of frequency assignments and vacant spectrum bands with monitoring stations provide them little scope for detecting unauthorized use of vacant spectrum while carrying out the routine monitoring with whatever monitoring equipment WMS had at its disposal. This deficiency had economic risks also.

2.1.11.7 Functioning of Regional Licensing Offices (RLOs)

In the past, spectrum users were predominantly in the Government sector and private sector was using spectrum for its captive uses. Wireless licences were being issued by WPC wing of DoT. With the increase in number of spectrum users, certain wireless licences were decentralized from WPC wing to five RLOs at Delhi, Mumbai, Kolkata, Chennai and Shillong (shifted at Guwahati) since January 2007. The issue/grant of following types of wireless licences were transferred to the Regional Licensing Offices (RLOs).

(a) Radio Paging (Captive) Licences

(b) Import Licence

(c) Maritime Mobile Station Licence

(d) Aeronautical Mobile Station Licence

(e) Radio Control of Models Licence

(f) Experimental Licence

(g) Demonstration Licence

(h) Short Range UHF Hand-Held Licence.

Audit was also conducted at the five RLOs to examine the process of issue of licences. Main audit findings are described as follow-

(A) Data base of licences issued by RLOs not maintained

In addition to grant/issue of new licences by RLOs, renewal of such licences is also to be done by RLOs itself. Audit noticed that out of five RLOs, three RLOs namely Kolkata, Guwahati and Chennai had not maintained the data base of licenses issued/renewed in different categories. However, Mumbai and Delhi RLOs have been maintaining data base.

DoT (WPC) stated (August 2017) that the records of licences and renewals are being maintained by almost all RLOs with the help of a software and also in MS Word files stored in computer systems and as well as in the form of register/hardcopy.

The reply confirms that maintenance of data base of licences issued was not uniform across all RLOs.

(B) Non-renewal of wireless licences issued by RLOs to captive users

Issue of certain types of wireless licences as mentioned above were decentralized to RLOs. The orders prescribing the rates of Licence fee and other fees, Surcharge/Late fee and charging methodologies for Royalty/Licensee fees for different type of assignments of frequencies to these 'Captive Users' stipulated *inter-alia* that

(i) No radio frequency shall be assigned, reserved, or blocked unless the applicant pays, in advance, all applicable license fees and royalty charges for the full duration of authorization/assignment of the radio frequency.

(ii) Where the period is greater than one year, the wireless/users applicant has to pay the license fee and royalty in annual installments in advance every year

(iii) Surcharge/Late fee for delayed renewal of various licenses shall be levied on the total amount due (i.e. license fee plus royalty charges) @ 2 *per cent* per month or part thereof, subject to the minimum of ₹ 250 per license. In case the delay is more than one year the said late fee shall be applied in an annually compounded manner.

Test check of records at RLOs Chennai, Delhi, Kolkata and Mumbai revealed that renewal charges for the period after the expiry of their validity had not been collected in respect of 2660 licensees, even though the licences had expired long back as detailed below:

Table - 3

(₹ in crore)

Sl. No.	Name of RLO	Earliest Date since expiry of License	No. of Captive Users whose licenses were not renewed	Amount of License Fee and Royalty Due
1.	Chennai	31 December 2009	182	0.48
2.	Delhi	31 December 2007	1176	2.37
3.	Kolkata	31 December 2009	51	0.07
4.	Mumbai	12 July 2007	1251	5.05
Total			**2660**	**7.97**

DoT (WPC) in its reply (August 2017) reiterated that renewal of wireless licence was a continuous process and every licencee had to renew or surrender it and late fee in case of delay renewal of licences was levied. It also stated that based on the observation by audit, all the licencees were served demand notices to regularize their licences by the RLOs. It was further stated that the strength of officers was grossly inadequate for the effective and efficient function of the RLOs. As regard ensuring timely receipt of revenue dues, a proposal for creation of enforcement group was under process. The proposed enforcement group consists of legal and finance officers to advice for proper function. The enforcement group would ensure timely renewal of the existing wireless licences by sending reminders/notices and subsequent follow up, if required in a comprehensive manner.

The reply is not tenable as justifying non-renewal by shifting onus on the licensees for renewal or to shortage of staff, the Department cannot abdicate from its responsibility in ensuring to take necessary action to put in place effective monitoring mechanism so that Government dues are recovered timely. The above replies indicate that there was neither monitoring of the use of spectrum nor the users were communicated to renew the license by licensor. It also implies that there was no mechanism put in place in RLOs to monitor timely collection of revenues due to the Government. Thus, failure of DoT to take timely action in renewing the captive licenses resulted in non-realisation of ₹ 7.97 crore **(Annexure - V)** on account of license fee and royalty in addition to late fee due for the licences issued by RLOs.

2.1.12 Other Issues

2.1.12.1 Establishing and strengthening Institute of Advanced Radio Spectrum Engineering and Management Studies (IARSEMS)

Foundation stone for establishing Institute of Advanced Radio Spectrum Engineering and Management Studies (IARSEMS) was laid in March 2011with the objective to ensure an efficient spectrum planning and engineering to achieve optimal spectrum use in present and future. NTP 2012 also envisaged strengthening of the IARSEMS as a

Government Society for undertaking policy research in radio spectrum engineering, management/radio monitoring and related aspects. This institute was to be a Research and Development (R & D) institute and not a training institute. A committee on Establishment and Strengthening of IARSEMS recommended (March 2015) various measures to be taken up for establishment of the institute. However, no progress was made towards establishment of the institute.

DoT stated (October 2017) that a major decision (in principle approval of Telecom Commission) regarding establishment of IARSEMS was taken.

The need for the Institute may be reviewed by DoT as no concrete progress has been made so far and there are already centres for excellence for telecom in Indian Institutes of Technology (IITs). Further, DoT has its own telecom technology development centre as Centre for Development of Telematics (C-DoT).

2.1.12.2 Non-recovery of Spectrum charges from SPOs, CPMFs, Doordarshan and All India Radio (Prasar Bharti)

Prior to 01 June 2004, the Central Government organizations/Ministries/Departments were exempted from payment of License Fee and Royalty Charges (Spectrum charges) for their wireless network. The State Police Organisations (SPOs) were exempted from payment of Royalty charges on spectrum usage, however, they were required to pay Licence Fee for the spectrum. DoT decided (April 2004) to charge for spectrum from all the wireless users including Government departments/organizations as per the existing fixed formula with effect from 01 June 2004. Further, spectrum charges (Royalty) for captive users were revised with effect from April 2012.

Audit noticed that-

(a) There were 35 SPOs and eight Central Para Military Forces (CPMFs) who were assigned spectrum for their wireless network. The decision to levy spectrum charges was taken in April 2004 but even after elapse of 13 years, reconciliation of authorized frequency could be made in respect of only 20 SPOs and CPMFs. In respect of these 20 SPOs and CPMFs, total spectrum charges for the spectrum assigned before 01 June 2004 levied was ₹ 163.58 crore and late fee levied was ₹ 284.11 crore for the period 2004-14. Out of these amounts, only ₹ 100.86 crore had been received. In respect of spectrum assigned during 01 June 2004 to 31 March 2012 to two SPOs and CPMFs, ₹ 64.20 crore was levied as Spectrum charge and ₹ 85.60 crore was levied as late fee, out of which only ₹ 13.93 crore has been received. After 01 April 2012, the users were required to pay spectrum charges for the first year in advance before issue of frequency allotment.

Telecom Commission (TC) in April 2016 decided that late fee component from the spectrum charges conveyed towards the reconciled assignments issued to SPOs and CPMFs against the spectrum assignment made prior to 01 June 2004 may not be made

applicable but for frequency authorized during 01 June 2004 to 31 March 2012, spectrum charges along with late fee as applicable would be charged as per extant rules from the date of issue of the frequency allotment.

DoT (WPC) stated (August and October 2017) that in addition to demand notes issued to 20 SPOs (as on March 2017), 10 more SPOs have been issued demand notes and only five were pending, which was expected to be completed in a short period. Further out of eight CPMFs, two CPMFs (NDRF & SSB) were paying both spectrum fee and late fee. Remaining six CPMFs have reconciled their network and demand note is being issued for payment of spectrum charges shortly. In view of the decision of TC, late fee for spectrum charges prior to 01 June 2004 has been dropped.

This indicated the lackadaisical approach of WPC in resolving issues having huge financial implications. Though the demands stated to have been issued, no details of demand notes issued and payments received were furnished to audit.

(b) Similarly, Doordarshan (DD) provided details of frequency assignment to WPC during 2010 and 2012. Further, DD and All India Radio (AIR) informed WPC during 2013-14 that the Government waived off their spectrum charges due upto 31 March 2011 (₹ 455.89 crore- DD and ₹ 32.48 crore- AIR) and requested WPC to reconcile the spectrum charges in respect of its transmitters with effect from 01 April 2011. AIR further requested WPC to reconcile old frequency assignments for its transmitters and reiterated its intention to clear all its liabilities pending since 01 April 2011.

It was observed that WPC had not been able to reconcile the issues relating to the frequency assignments as well as the amount waived off by the Government. It was also found that DD and AIR were paying spectrum charges after March 2011 whenever it applies for frequency assignments for its new transmitters or replacements for existing transmitters. Letter of Intent (LoI) and subsequently Decision Letters (DLs) for 38 High Power Transmitters (HPTs) and 111 Low Power Transmitters (LPTs) were issued to DD during 2013-15. Considering the lowest rate for HPT/LPT, annual spectrum charges for Transmitters of DD as on 01 April 2010 would be ₹ 72.20 crore[10] for the year 2012-13 and onwards. Further, revised annual spectrum charges for one transmitter/station of AIR was in the range of ₹ 50,500 to ₹ 3,38,000.

WPC had not raised demands for annual spectrum charges in respect of old existing frequency assignments as well as for newly frequency assignments made to DD and AIR though they expressed repeated willingness of paying spectrum charges from 01 April 2012.

[10] Annual spectrum charges for 103 LPTs were levied @₹ 361000 and @₹ 541000 for 8 LPTs. Also, Annual spectrum charges for 23 HPTs were levied @₹ 2026000 and @₹ 1351000 for 15 HPTs. (213 HPT x1351000+1203 LPT x361000)

DoT (WPC) stated (August and October 2017) that letter for reconciliation of spectrum dues to DD and AIR was issued (November 2016). It was also stated that licensees were required to apply for renewal of their licences and pay the dues timely. It was further stated that formation of Enforcement Group was also under active consideration which would ensure regular monitoring and timely receipts of dues.

The reply is not acceptable in view of the fact that though the decision to levy spectrum charges from all captive users including government organizations was taken in April 2004, demands for annual spectrum charges due from DD and AIR for old existing frequency assignments as well as newly frequency assignments (after March 2011) have not been made. This resulted in non- realization of revenues to DoT despite details furnished by DD and AIR and their expressed willingness to pay dues to DoT. National Frequency Register (NFR) is the basic document and it is referred by the concerned sections of WPC for any new frequency assignment. So, instead of taking proactive action to reconcile frequency assignments based on data already provided by DD and AIR as well as details as per NFR maintained by WPC itself, it had been awaiting for reconciliation provided by DD and AIR seriously compromising the revenue of DoT.

2.1.12.3 Waiving off of Spectrum Charges receivable from Defence Services

DoT decided to levy Spectrum charges (License Fee and Royalty Charges) from all wireless users including Government organizations/Ministries/Departments at the existing rates with effect from 01-06-2004.

Defence Services were identified as major user of spectrum in NFAP 1981 and continued to be so, however, no spectrum charges was received from Defence after 2004 till date. Meanwhile a Memorandum of Understanding (MoU) was signed between Ministry of Communication (DoT) and Ministry of Defence (MoD) for Vacation of spectrum and setting up of exclusive, dedicated OFC network for Armed Forces on 22 May 2009. In terms of the MoU, one of the triggers to release the spectrum by Defence Forces was "Waiving of Spectrum Charges for Defence Forces".

In terms of Cabinet note on "Notification of Defence Band and Defence Interest Zone, which was approved by the Cabinet on 21 January 2015, a separate proposal for waiver of Spectrum Charges payable by Defence was to be submitted for the approval of the Cabinet.

However, it was noted that no such proposal for waiver of Spectrum Charges for Defence Forces has been got approved from the Cabinet till date. As such, as a matter of routine, WPC raises demands while issuing Letter of Intent (LoI) for any new frequency assignments requested by the Defence Forces but Defence Forces have not been paying any spectrum charges in view of provisions made in the MoU and the Cabinet note.

DoT (WPC) stated (August 2017) that in principle approval for waiver of spectrum charges for Defence had been obtained from finance Ministry on 21 March 2011 and it had been mentioned to quantify the exact amount for waiver. However, Defence has not provided complete details of assignments made prior to 2004 for calculating exact amount of dues for waiver. The exact amount of spectrum charges can be calculated after reconciliation of entire network of Defence. A proposal for approval of cabinet will be made after the entire network is reconciled.

Above confirms the laxity of WPC authorities in maintaining proper details of assignments made to important organisations like Defence and unreasonable delay in reconciliations and carrying out the decision of the Cabinet.

2.1.12.4 Recovery of Spectrum charges from Private Captive users

DoT committee constituted (December 2012) to look into the allotment/assignment of spectrum in the various categories (Commercial as well as captive users) in its report noted (March 2013) that data linking spectrum bandwidth utilization with spectrum earmarked in respect of licences in various categories of services along with revenue realized in respect of licences and frequency assignments was incomplete and opined that reconciliation of licensing records and revenue realization in coordination with Finance Branch needs to be urgently completed.

Spectrum for captive users to private as well as government users is primarily allotted in spectrum band below 806 MHz. No of licences under various categories of users (below 806 MHz) are as follows-

Table - 4

Licence Series	No. of licences	Remarks
P	6217	Private Licences
L	3304	Government Licences
G	556	PSUs Licences
M	113	Meteorological Licences
FL	1528	Government Licences
FP	1832	Private Licences
E	154	Electricity Deptt. Licences
EOT	102	Crain Related Licences
RP	200	Radio Paging Licences
FAA	53	AAI Licences

Particulars relating to realization of Spectrum charges from above users are maintained in Manual registers. Some registers relating to FL, FP, E and G licence series were test checked by audit to ascertain the realization of spectrum charges from such captive users.

Audit noted that there was no mechanism put in place by WPC to review realization of spectrum charges and to raise demands regularly (annually) for timely realization of

revenue from captive users. It was up to the users to pay spectrum charges on their own or WPC raised demands whenever users approached to WPC for renewal/surrender of licences. Particulars of licences test checked and cases of non- payment of spectrum charges are as follows-

Table - 5

Licence Series	Total no. Licence issued	Total no. of Licences test checked as per register	Cases of non payment
FL	1528	(Sl. No. 1094 to 1240)=147 (Sl. no. 931 to 1093)=163 **Total = 310**	18
FP	1832	(Sl. No. 336 to 500)=165 (Sl. no. 851 to 1030)=180 (Sl. No. 182 to 355)=154 (Sl. No. 501 to 665)=165 **Total = 664**	150
E	154	(Sl. No. 03 to 81)=79 **Total = 79**	14
G	556	(Sl. No. 01 to 117)=117 **Total = 117**	07
Total	**4070**	**1170**	**189**

Since the number of licences issued to captive users is huge, monitoring of realization of spectrum charges from individual users can be better managed through the system only. WPC implemented one system namely Automated Spectrum Management System (ASMS) in 2005 but realization of revenue was still manual and hence WPC was not been able to review realization of spectrum charges and raise demands leading to non realization of spectrum charges in time. Spectrum charges for captive users were revised w.e.f 01 April 2012. Due to non realization of annual spectrum charges in time, even when demand was raised for a long period, the licensees disputed the increased demand on some pretext or other. One such instance having substantial financial implication was noticed in respect of MRF Tyres Limited Chennai which was granted licence to operate VHF Wireless Radios for providing communication between their vehicles participating in the motor races and rallies conducted in different parts of India. MRF paid (September 2012) renewal charges of ₹ 1,36,150 for the period from 01 October 2012 to 30 September 2013. Subsequent to payment of renewal charge by MRF Tyres, WPC issued a demand for ₹ 9,38,358 as per revised rate for the period till September 2013. MRF contested the demand stating that the wireless operations were made by them within 5 KM radius only, even though it was an all India licence and requested (December 2012) DoT to reconsider the revision of spectrum charges notice. It was noticed that MRF did not obtain WOL and had not paid spectrum charges as yet. The spectrum charges along with penalty due for the period from 01 April 2012 to 30 September 2017 at revised rates worked out to be ₹ 55.33 lakh.

DoT (WPC) stated (August and October 2017) that unless otherwise requested by the applicant, Wireless Operating License (WOL), was granted for a period of one year with an option given to the licensee to renew the license for subsequent years by paying the license fee and royalty. The license fee and royalty are not changed every year. It also stated that spectrum charges were fixed one time charges and were not automatically recurring in nature and a parallel cannot be drawn with services such as telephone, electricity, gas etc. The wireless operating license grants the right of use of the specified frequency for a period of one year only. Presently, there is no rule to force the licensee to renew the license. However, in the cases where licencees are not renewing in time, late fee is levied in addition to normal charges.

It was further added that a proposal for creation of enforcement cell under WPC Wing was under consideration, which would ensure timely renewal of wireless licences among others. To prevent misuse of spectrum, inspection engineers are posted in the Regional Monitoring Headquarters and Monitoring Stations under Wireless Monitoring Headquarters (MHQ). The inspection engineers guide the wireless users in managing the licenses granted to them. However, considering that the captive use of wireless have increased considerably in the last decade, and based on past audit observations, a proposal to establish enforcement directorate was under submission.

As regard to the example of MRF Tyres Limited, it was stated that the error in issuing demand would be rectified and contested the amount arrived out by audit up to September 2017 as WOL had not been obtained by MRF Tyres Limited.

Audit observed that on one hand, Department justified non-renewal of licences by captive users and on the other hand considered a proposal to establish enforcement group. This contradiction in approach of the Department and inadequate monitoring and inspection mechanism for spectrum usage by various licencees indicates lack of any mechanism/system to realize due revenue in time from private captive users leading to loss of revenue. In case of MRF Tyres Limited, WPC could not revisit its demand even after the request made by it in 2012. Audit worked out the charges recoverable from MRF as per demand notes issued by WPC itself and assuming that it was using spectrum assigned to it as WPC had not debarred nor withdrawn the spectrum assigned to it.

Conclusion

The spectrum as an economic resource is unusual in that it is both non-exhaustible and non-storable. Unlike oil and water, the spectrum will never run out, although it may become increasingly congested. Also, it cannot be accumulated for later use. These factors put a premium on a streamlined process for making spectrum available for purposes which are useful to society. How the RF spectrum is managed, has profound impact on the society, on its education, culture, prosperity and security. NTP 2012 had cast immense responsibilities on DoT for Spectrum Management. This included

re-farming of spectrum, harmonization of spectrum, promoting use of white spaces, strengthening of Institute of Advanced Radio Spectrum Engineering and Management Studies (IARSEMS) and above all undertaking periodic audit of spectrum utilisation to ensure its efficient use.

Although Spectrum Audit has been initiated by DoT in October 2017, action was still due in most of the areas of Spectrum Management by DoT. The NFAP 2011 was not updated although two World Radio Congresses have taken place in 2012 and 2015. The National Frequency Register remained un-updated and was not the correct reflection of the frequency assignments with various users.

A substantial amount of spectrum as identified for commercial use was allotted to Defence and Railway on pan India (all LSAs) basis. Defence and Railway use such spectrum in limited geographical areas in a LSA leaving such spectrum in rest of the LSA as unused/vacant. Further, large amount of spectrum was kept unused/vacant in various LSAs.

There was good deal of action in re-farming of Spectrum from Defence. However, refarming needs to be further taken forward not only in respect of spectrum held by Defence but also in respect of spectrum held by Space and Railway departments.

There were serious deficiencies in the maintenance of infrastructure for effective monitoring of spectrum even though it was one of the most critical responsibility of DoT. The updated database of wireless licences issued had not been provided to WMO and its monitoring stations thus making the whole monitoring process an ineffective exercise. Available equipment procured under World Bank funded scheme were not maintained and no action for suitable replacements of such monitoring equipment was made. Due to available vehicles not being in operational conditions, mobile monitoring could not be done upto desired level.

Spectrum is susceptible to harmful, illegal and unauthorized uses by unscrupulous agencies. Possibility of unauthorized use of vacant spectrum suitable for commercial use (2G/3G/4G) partially spectrum unused lying with Defence/Railway/DoT can’t be ruled out in view of ineffective spectrum monitoring mechanism put in place.