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**Performance Audit Report on Management of Spectrum Presented in
Parliament**

Performance Audit Report No. 2 of 2022 on ‘Management of Spectrum assigned on the administrative basis to Government Departments/Agencies’ was tabled in the Parliament on 07.04.2022(Rajya Sabha) & today in Lok Sabha.

This Report of the Comptroller and Auditor General of India contains significant observations and recommendations emanating out of the Performance Audit conducted on ‘Management of Spectrum assigned on Administrative basis to Government Departments/Agencies’.

The Performance Audit covering the period 2012 to 2021 was conducted during March –July 2021. The selected Ministries/Departments/Agencies, covered all spectrum allotted in IMT bands under the Ministry of Communications (DoT), Ministry of Defence (MOD), Ministry of Railways (MOR), Ministry of Information and Broadcasting (MIB), Ministry of Home Affairs (MHA), Department of Space (DoS) and four Public Sector Undertakings viz. Oil and Natural gas Agency (ONGC), Indian Oil Corporation Limited (IOCL), Gas Authority of India Limited (GAIL) and Airports Authority of India (AAI). In case of spectrum in non-IMT bands, field audit units/areas/locations/frequency spots the audit was done on sample basis. The Audit scope included examining important aspects of Spectrum Management like process of assignment of spectrum and pricing of spectrum to captive users, licensing and database management of frequencies assigned to Government Users, sharing of spectrum and utilization of spectrum by the selected Government Departments/Agencies.

The Report contains seven Chapters. Chapter 1 gives introduction to the topic. Chapter 2 explains the audit scope, audit objectives, audit criteria and audit methodology applied and the constraints faced during audit. Chapter 3 contains audit findings on Spectrum Management and monitoring process in DoT whereas Chapter 4 containing audit findings on Spectrum Management in Ministry of Defence have been issued to MOD separately, due to security concerns. Chapter 5 contains audit findings on Spectrum Management in Department of Space and Chapter 6 describes audit findings on spectrum utilization by other ministries and /PSUs agencies under them. Finally, Chapter 7 gives the conclusion of the Audit Report.

Spectrum (radio waves) is an important natural, scarce resource with economic value and needed for all wireless applications. It has been recognized world-over as an important tool for socio-economic development of a nation. Spectrum Management involves regulatory,

administrative, supervisory, and specialized technical procedures necessary to ensure the efficient utilization of available spectrum. It includes frequency planning, assignment and licensing to spectrum users. The Nodal agency is required to balance the demands of Government users and private service providers. Government departments use spectrum for providing national public services, whereas private players contribute towards value-added services. In Spectrum Management short term, medium term and long-term planning is an absolute necessity for management of spectrum requirements in a dynamic changing environment of spectrum usage and technology.

Following are the **significant findings**:

1. One of the objectives of the National Digital Communication Policy (NDCP) 2018 is “Developing a transparent, normative and fair policy for spectrum assignments and allocations”, either through auction or administrative allotment. Post the Hon’ble Supreme Court judgement of February 2012 regarding allotment of spectrum for access services, it was seen that there were adhoc arrangement in Department of Telecommunication (DoT) for opening of application windows for three/six months for allotment/assignment of spectrum administratively for both captive uses as well as for other commercial services on provisional basis. This has not only caused uncertainties of availability of the resource among Government users but also delayed spectrum assignments and denial of spectrum in some cases.

DoT had also not reviewed pricing of spectrum assigned for captive users administratively, on formulae basis since 2012, though a Committee had recommended for a periodical review of the pricing policy in 2013. There was no differential pricing for spectrum, depending on features and usage of various spectrum bands assigned to Government users.

[Paragraphs 3.2 and 3.3]

2. There has been a Standing Committee since 1966 viz. SACFA (Standing Advisory Committee on Frequency Allocation) in DoT, to make recommendations on issues related to frequency allocation, deliberations at international forums etc. However, its role has been limited to giving siting clearances for wireless installations. DoT had not constituted a Permanent Committee/Group to advise them on complex issues related to Spectrum Management including refarming of spectrum, for efficient and optimal utilization of the scarce resource.

[Paragraphs 1.8, 3.4.1]

3. Decision making in DoT was plagued with adhocism and absence of any Permanent Mechanism in the Department, constituting all Government stake holders to advise them on important issues relating to Spectrum Management comprising of spectrum allocation/assignments/utilization of assigned spectrum, re-farming and sharing of spectrum amongst Government users etc. There were no arrangements in place to study technological developments worldwide for suggesting their deployment in India to spectrum users, as mandated by NDCP 2018.

DoT had instead constituted (June 2015) Seven Working Groups for identifying frequencies in specific spectrum bands viz. 470-520 MHz, 1215-1400 MHz, 1427-1500

MHz, 1800 MHz, 1880-1900 MHz, 2300-2400 MHz and 21.2-23.6 GHz for Government Users. Only four Groups had submitted their final recommendations between March 2016 and February 2021 though these working Groups were required to submit their recommendations within six months. However, DoT had not taken any final decision on recommendations received so far.

[Paragraph 3.4.1, 3.4.2, 3.4.3]

4. Spectrum allotted through auctions is liberalized one and can be utilised for all types of Access Services i.e. 2G/3G/4G and also 5G services with requisite technology. Spectrum allotted/assigned to Government Departments in Bands 470-646 MHz, 700 MHz, 900 MHz, 1427-1500 MHz, 1800 MHz, 2100 MHz, 2300-2400 MHz, 2500-2690 MHz, 3300-3670 MHz, 24.25-28.5GHz was found to be either sub-optimally utilized or not utilized at all for years together for various reasons. There was a large quantity of idle spectrum in these Bands, for which DoT had yet to take action for auction/allotment to Government/private users.

[Paragraph 3.5]

5. Utilization of spectrum by Ministry of Information and Broadcasting (MIB) in Band 470-698 MHz, allotted long ago (during the period from 1989 to 2013) to them and was suboptimal due to obsolete technology of Analogue Terrestrial Television (ATT) and non-viability of Digital Terrestrial Television (DTT). DoT had not finalized their decision with regard to the recommendations of the Working Group constituted for 470-520 MHz band and Committee of Secretaries (CoS) that 120 MHz (526-646 MHz) spectrum in these bands can be made available on pan India basis for IMT (5G) applications.

[Paragraphs 3.5, 6.2]

6. Railways had been allotted 1.6 MHz paired spectrum since 2003 on pan India basis in commercially important 900 MHz band for its GSM-R based Mobile Train Radio Communications (MTRC) system. They could commission MTRC equipment only in 57.90 per cent of routes planned covering nine out of 22 service areas. Utilisation of spectrum in this band is inefficient and sub optimal due to non-maintenance of equipment and unavailability of spare parts. However, this 1.6 MHz paired spectrum in 900 MHz band was not re-farmed from Railways as recommended by TRAI, where Railways has not commissioned its GSM-R based MTRC system (first in 13 service areas) and in phases in balance nine service areas.

Railways have been allotted 5 MHz Spectrum in 700 MHz IMT Band (June 2021) for roll-out of LTE based network, for which work was stated to be in progress.

[Paragraph 3.5]

7. Spectrum in 2100 MHz and 2300-2400 MHz frequency bands being IMT bands has huge commercial value. The spectrum in these commercially important bands were lying unutilized/sub-optimally utilized with Government users and DoT needed to be harmonize or vacate the unused spectrum.

[Paragraph 3.5]

8. Frequency band 2500-2690 MHz identified for IMT applications is currently being used for both terrestrial and satellite based services. Out of 190 MHz available Spectrum, only 40 MHz had been allotted/assigned for IMT applications and satellites (GSAT 6, 7 and 17) had been launched for 100 MHz for satellite-based services for users. Launch of satellite for balance 50 MHz was under process. It was seen that there was interference in the existing operations and lack of coordination between DoT and DoS for proper technology solution for co-existence of both services, leading to sub optimal use of spectrum in this band.

[Paragraph 3.5]

9. Similarly, Spectrum in 3.3 GHz - 3.6 GHz band had been identified for both terrestrial and satellite-based services. DoS and DoT had not identified an appropriate technology solution and limitations of use in such a manner that both services can co-exist in these bands. Therefore, out of the total capacity, reserved for Broadband Wireless Access services, it was observed that 175 MHz was not utilised.

[Paragraphs 3.5]

10. Automated Spectrum Management System (ASMS) implemented by DoT in 2005 for engineering calculation of interference free frequency assignments and processing of applications, issue of licenses, generation of invoices, integration with monitoring organization, etc. is not being used for full functionalities as per International Telecommunications Union (ITU) standards/ guidelines. Obsolete and poorly maintained equipment/systems lead to ineffective Spectrum Management in WPC (DoT). The National Frequency Register (NFR) was also not updated in the ASMS vis-à-vis cancellation and surrender of frequency authorization, change of frequency, etc. and there was large scale mismatch in the database, regarding spectrum assigned to Government Departments/PSUs/Agencies.

[Paragraph 3.6]

11. WPC (DoT) issues Agreement in Principle (AIP)/Decision Letters (DLs) before granting Wireless Operating licenses (WOL), which were legally required under Section 3 of Indian Wireless Telegraphy Act 1933 for establishing Wireless Telegraph Station. Audit observed that Several Departments/Agencies were found using spectrum without getting valid Wireless Operating licenses as required, due to delays in disposal of their applications by WPC wing or non-compliance of terms and conditions of AIP/Decision Letter by the users.

[Paragraphs 6.1.2, 6.4.3, 6.5.2, 6.7.3]

12. Monitoring of spectrum use is an important aspect of spectrum management. The Wireless Monitoring Organization (WMO), a field unit of DoT did not have sufficient and updated monitoring equipment, enforcement groups. Proposals for procurement of required equipment were pending at different stages awaiting approval in DoT. This

adversely affected the effectiveness of monitoring activities and action on unauthorized use of spectrum.

Further, DoT did not have any institutionalized mechanism or any apparent MIS for monitoring of spectrum use by the Government Departments/Agencies.

[Paragraph 3.7]

13. Bandwidth capacities on GSAT 29, GSAT 19 and GSAT 11 remained idle for long periods since their launch in June 2017, November 2018, and December 2018 respectively. DoS allotted spectrum bandwidth to users only in 2020/2021, resulting in non-utilization spectrum bandwidth for several years.

[Paragraph 5.2.2]

14. The Orbit Spectrum Coordination and Acquisition Wing (OSCA) functioning under Satellite Communication Programme Office (SATCOM PO) of ISRO is the focal point for spectrum coordination and its management. Audit observed weakness in the supervision and review mechanism in OSCA to maintain strict discipline in the usage, management and surrender of IMT band spectrum.

[Paragraph 5.2.4]

15. Directorate of Coordination, Police Wireless (DCPW) being the nodal advisory body to the MHA for the police telecommunication has not devised any policy guidelines regarding spectrum and equipment required for meeting all emergency requirements.

[Paragraph 6.3.1]

16. POLNET, a nationwide Satellite based Captive Communication Network/Digital Information Highway in C-band is not being utilised optimally as it was not yet fully commissioned due to some shortcomings in the Hub.

[Paragraph 6.3.2]

17. ONGC could not commission its planned networks due to poor contract management and surrendered the allotted spectrum in 3.3-3.4 GHz and 7 GHz bands respectively in December 2019 and November 2020. Thus, spectrum in these important bands remained unutilized for four to nine years.

[Paragraph 6.4.1]

18. Frequency spots assigned to Airports Authority of India remained unutilised for years together at various Airports owing to delayed procurement of equipment/non completion of projects in time.

[Paragraphs 6.7.1, 6.7.2]

The following **recommendations** have been given based on the PA findings:

(i) DoT may devise a policy for allotment and assignment of spectrum for Captive Users/other commercial usage, in alignment with statements made in NDCP 2018 and end adhocism in allotment of spectrum to Government Departments/Agencies.

[Paragraphs 3.2]

(ii) DoT may review the pricing mechanism of Spectrum for Captive Users in order to incentivize Ministries/Departments/Agencies to maintain spectrum management discipline. They may consider differential pricing depending on the features and usage of various Spectrum Bands.

[Paragraphs 3.3]

(iii) DoT may establish a Permanent set up comprising all stake holders for periodical review of spectrum planning, spectrum availability, allotments/assignments, pricing, etc. to expedite decisions for efficient management and optimal utilisation of spectrum in India. They may also ensure that a MIS is put in place in DoT to get details of actual spectrum utilized by Government user Departments and Agencies.

[Paragraphs 3.4.1]

(iv) DoT needs to encourage/support research studies and other technical initiatives by user Departments/entities for technology solutions for efficient spectrum utilization.

[Paragraphs 3.4.2]

(v) DoT in consultation with all the Departments may take proactive measures for finalization of recommendations of Working Groups and decisions of the Committee of Secretaries for reassignment/re-allotment/ re-farming of spectrum.

[Paragraphs 3.4.3]

(vi) In pursuance of NDCP 2018, DoT may coordinate with Government users to provide spectrum in substitute bands for users in 1427-1500 MHz and 2300-2400 MHz bands, conduct harmonization exercise in 2100 MHz and for sharing of spectrum in 700 MHz band as these had been identified for IMT use and have commercial scope for utilization.

[Paragraphs 3.5]

(vii) All the stakeholders in the 2500 MHz band viz. DoT, DoS and others need to ensure synergy, for which DoT may take the lead so that this important IMT band can be utilized optimally with proper technological solutions for co-existence of both terrestrial and satellite-based services, without causing harmful interference.

[Paragraphs 3.5]

(viii) DoT in consultation with Ministry of Information & Broadcasting may take immediate action to make available spectrum in frequency band 526-646 MHz for IMT/5G services, based on recommendation of Working Group and Committee of Secretaries that Doordarshan and Other Government users could coexist in 470-520 MHz frequency band.

[Paragraphs 3.5]

(ix) DoT and Railways may monitor the completion of LTE based network project in 700 MHz band so that Railways vacate the spectrum in 900 MHz band being used by them and it is made available for commercial utilization.

[Paragraphs 3.5]

(x) DoT in consultation with TRAI may take early action for the auction/utilization of IMT spectrum lying idle with them.

[Paragraphs 3.5]

(xi) DoT needs to acquire and implement an industry standard Automated Spectrum Management System. Further, DoT may update the existing database on spectrum users on priority before migration to the new system and make available the updated database on a timely basis to WMO for efficient monitoring of assigned Spectrum.

[Paragraphs 3.6]

(xii) DoT may urgently upgrade the infrastructure and equipment of its WMO offices and its field units to strengthen their monitoring of spectrum. Further, DoT may also conduct a comprehensive review of the manpower and resource requirements of WMO units to enable them to discharge their monitoring responsibilities effectively and efficiently in an increased environment of spectrum users.

[Paragraphs 3.7.1 and 3.7.2]

(xiii) DoT may review the international best practices in Spectrum Management, for suitable incorporation of these best practices for Spectrum Management in India.

[Paragraphs 3.8]

(xiv) DoS and DoT need to work together to identify an appropriate technology solution in such a manner that both services can coexist in important frequency bands.

[Paragraphs 5.2.1]

(xv) DoS needs to engage with client Departments and other potential users at an early stage before planning and launching the satellite capacity, to ensure maximum utilization of spectrum resources.

[Paragraphs 5.2.2]

(xvi) DoS needs to establish a mechanism for assessing and reviewing the utilization of spectrum in all bands, particularly in IMT bands and satellite bandwidth for ensuring optimal and efficient utilization of assigned spectrum. DoS may consolidate spectrum related information and make it available at a common platform for easy access and assessment of spectrum at Corporate Infocom level.

[Paragraphs 5.2.3 and 5.2.4]

(xvii) Ministry of Home Affairs may devise policy for spectrum management among Central Armed Police Forces. Further, efforts may be made for optimal utilisation of POLNET 2.0 by all State Police Departments and CAPFs and other related agencies for their operational requirements.

[Paragraphs 6.3.1 and 6.3.2]

(xviii) DoT may ensure that PSUs like ONGC and GAIL etc. use the assigned spectrum optimally and efficiently and surrender unutilised frequencies.

[Paragraphs 6.4, 6.5 and 6.6]

(xix) AAI may introduce a mechanism for periodical review of utilization of assigned frequencies and adhere to the regulatory provisions governing use of wireless equipment/networks.

[Paragraphs 6.7]