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NAVIGATING INDIAN SPECTRUM AUCTIONS: A CRITICAL EXAMINATION OF POLICY AND LAW

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ABSTRACT

Indian spectrum allocation policy has faced severe criticism over the years, especially in light of the 2g spectrum scam of 2008. The need for transparency and equitability in the allocation procedure highlighted by the scam has inspired many reforms and changes in the practice. The enactment of the Telecommunications Act of 2023 is a step towards reform in the same direction. The Act intends to mark a pivotal shift in the practice of spectrum allocation by modernizing the regulatory framework and providing auctions as the preferred mode of spectrum allocation in India. This article aims to analyse the spectrum allocation process in India and its impact on the current practice. It aims to critically analyze the impact of the Telecommunications Act, 2023 on the practice of spectrum allocation while exploring the challenges that continue to hinder the efficiency of spectrum allocation in India. The article also analyzes the framework and outcome of the recent spectrum auctions organized in 2022 and 2024, in an attempt to explore India's preparedness to adopt 5g technology and the upcoming 6g technology. While the Telecommunications Act has attempted to lay down the basic principles governing the process of spectrum auctions in India, the need for further reforms to address the persistent issues like the lack of available spectrum, high reserve prices, and inflexibility, can not be overlooked. We argue that the adopting more dynamic measures and reforming the existing regulatory framework for spectrum auctions can prove to be helpful for the Indian spectrum market and telecom sector, ultimately leading to economic growth and social development.

Keywords: Spectrum, allocation, auction, telecommunication, technology.

INTRODUCTION

Following the footsteps of the 2012 Supreme Court judgment[167], the legislature has established auction as the preferred mode for spectrum allocation in the Telecommunications Act, 2023 (hereinafter, *"the Act"*). Intended to replace the Indian Telegraph Act of 1885 and the Indian Wireless Telegraphy Act of 1933, the Act lays down various foundational principles regarding the distribution and use of spectrum. It also paves the way for future trends regarding spectrum auctions in India with the advent of the 5th generation of cellular network technology.

The Act defines spectrum as the range of frequencies of Hertzian or radio waves.[168] Spectrum is a term used to describe a band of electromagnetic frequencies.[169] Spectrum has often been treated as a property in states like the US. However, it must be noted that it can not be treated as property per se as what is

[167] Center for Public Interest Litigation and Ors. v. Union Of India, (2012) 3 SCC 1.

[168] The Telecommunications Act, 2023, §2(o).

[169] Ministry of Communications and Ministry of Electronics & Information Technology. *Report of the Comptroller and Auditor General of India*. Chapter 2. Report No. 21 of 2018.

transferred is not the ownership but instead the use of the frequency transmissions[170]. Spectrum allocation and assignment is an unignorable part of the Indian legal system, given the backdrop of the 2g Spectrum Scam and the numerous attempts made to forge a mode of allocation that is capable of preventing another blunder of the like. After the 2008 scam that stirred the political systems of the nation and caused a loss as colossal as 176,000 crore INR or 21 Billion USD[171], the mode of spectrum allocation has been the center of many debates and deliberations. The treatment of auction as the mandate for the allotment of spectrum is the result of long years of discussion, a judgment from the apex court, and the history of spectrum allocation. The Telecommunications Act aims to reform and streamline the process of spectrum allocation and utilization in India. It has been subjected to several criticisms because of its failure to address many issues of prime importance while the Indian spectrum market faces numerous challenges affecting its productivity, efficiency, and economic growth. 5g spectrum has been one of the major agendas in the telecom market for India and the two spectrum auctions organized in this regard highlight many trends and problems in Indian spectrum auctions. While the Indian government has time and again reiterated its commitment to digital reforms, there are many stones still left unturned.

HISTORY AND EVOLUTION OF SPECTRUM ALLOCATION PRACTICES IN INDIA

Spectrum allocation in India has had a very vibrant history. The first auction for spectrum allocation was organized as early as 1994 in the backdrop of the newly adopted LPG (Liberalization, Privatization, and Globalization) scheme. The Department of Telecommunications (hereinafter DoT) has played a central role in the process of spectrum allocation and assignment since. Prior to this, the spectrum was not separately auctioned. Only the licenses were auctioned which were bundled with the spectrum. The second auction was held under the New National Telecom Policy in the year 1999 and the third in 2001. It must be noted that after 2001, the process of auctioning the licenses was abandoned and the government adopted administrative allocation instead. This new mode also became the breeding ground for the infamous 2g spectrum scam which toppled the Indian telecom sector. With revenue losses of over 21 billion USD, not only did the scam hamper the Indian economy and cause political and administrative chaos but it also blotched India's image on the international stage. As a result of the scam, India slipped to the 14th spot on the list of the countries that attracted FDI and the inflows declined by a whopping 10-25 Billion USD.[172] While this was surely a setback for the Indian economy, it was also a lesson learned that shaped Indian spectrum allocation as we know it today. As a result of the cases filed against the then Telecom Minister, A. Raja, the Apex Court established that the State is duty-bound to adopt the method of auction[173] in the landmark case of CPIL v. UOI.[174]

With the advent of 5g technology, TRAI and DoT successfully conducted the first auction for 5g spectrum in India in July 2022. The Telecommunications Act, 2023 provides the legal framework for spectrum auctions in India, including the 5g spectrum, which has been the talk of the hour. While Section 4 of the Act clearly states "the Central Government shall assign spectrum for telecommunication through auction….",[175] it also enables the central government to grant spectrum licenses on the basis of its discretion through an administrative process. As enacted in the Telecom Act, of 2023, only very limited and narrowly defined cases, including spectrum for walkie-talkie for police organizations, radar for weather forecasting, radar and communication for ships, communication for space and satellite

[170] 47 U.S.C. §301 (2000).
[171] Jigeesh, A.M. *CAG says Raja caused Rs 1.76 lakh cr loss in scam.* India Today. Nov, 30, 2010.
[172] World Investment Report, 2011.
[173] Center for Public Interest Litigation and Ors. v. UOI, (2012) 3 SCC 1.
[174] (2012) 3 SCC 1.
[175] The Telecommunications Act, 2023, §4(4).

applications, communication and radar for the Army, Air Force and Navy and state-owned telecom corporation like BSNL, airwaves will be given on administrative basis.[176] Since its advent in 2019, among many other countries, India has also been preparing itself to begin 5G offerings as quickly as possible, with a goal to capitalize on the higher community speeds and electricity that the generation promised.[177]

CURRENT PRACTICE OF SPECTRUM ALLOCATION IN INDIA

The process of spectrum allocation in India is overlooked by the Wireless Planning and Coordination Wing of the Ministry of Communications which was created in the year 1952. The Indian system of spectrum allocation is largely governed by the National Frequency Allocation Plan (hereinafter NFAP). This foundational document consisting of various frequency bands, lays down the regulatory guidelines and technical specifications for spectrum allocation. Originally, spectrum allocation was understood to be an administrative procedure and it remained so till 1994, changing only after the Indian government adopted the policy of LPG.

Presently, all users intending to use radio frequency submit their application to the Wireless Planning and Coordination Wing (WPC) where they are processed first for the issue of an Agreement in Principle (AIP) or Decision Letter (DL) and then the issue of Wireless Operating License (WOL).[178]

The current status of the procedure is greatly influenced by the 2012 judgment of the Supreme Court. In leading cases like CPIL v. UOI[179] and Subramanian Swamy v. A. Raja[180], the court laid down auction as the primary mode for spectrum allocation, thereby eliminating any administrative discretion in the procedure. This mandate provides for a more transparent and competitive allocation process, allowing standardized auction procedures and open bidding. Since 2012, the government has organized regular and systematic auctions, thereby giving effect to the above-mentioned Supreme Court judgments. Auctions in the post-scam period cover a wide range of frequencies like 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, and 2500 MHz, keeping up with the technological needs.

Presently, 22 telecom circles exist in India. Any company that is willing to obtain a spectrum license in any of these circles is first required to obtain a license to operate in that particular circle, such a license is called a Unified Access Service License. UASL was converted to a Universal License (UL) after the 2012 Supreme Court decision[181] on the 2G scam delinked spectrum from licenses.[182] After a license has been awarded, the licensee can operate in that particular circle for a fixed period of time. Subsequent to its expiry, the licensee has to renew the license to be able to operate again.

The whole procedure of spectrum allocation is overlooked by the DoT and the Telecom Regulatory Authority of India (hereinafter TRAI). The procedure can be broadly divided into the following steps;

1. **Consultation and Assessment:** The first step involves the assessment of demand which is carried out by DoT in consultation with TRAI. This assessment provides an estimate of the demand of spectrum with reference to the needs of the industry, future projections, etc. An assessment of the demand for spectrum involves both an assessment of the number of subscribers and the nature of telecommunication services in the next

[176] *Auction route for spectrum will continue; administrative allocation only in limited cases: Sources*. The Economic Times. Apr 23, 2024.
[177] Karthick. N, Logesh. K, and Logeshwaran. K.S. *Study on 5G Auction.* (IJRPR. , Vol 4, no 2, Feb 2023) 1273-1275.
[178] Ministry of Communications and Ministry of Electronics & Information Technology. *Report of the Comptroller and Auditor General of India*. Chapter 2. Report No. 21 of 2018.
[179] (2012) 3 SCC 1.
[180] (2012) 9 SCC 257.
[181] (2012) 3 SCC 1 [34].
[182] Bedi, Navjot Singh. *RF Spectrum Allocation Process in India.* (Centre for Joint Warfare Studies (CENJOWS), New Delhi, 2019).

five years.[183] This is followed by a consultation with stakeholders.

2. **Reserve Price:** After identifying the spectrum band to be auctioned, the reserve price or the base price on which the auction starts is fixed upon the recommendations of TRAI. The significance of setting an optimal and fair price lies in the fact that any disproportionate extreme stands to distort market coherence.[184]
3. **Auction Format:** The DoT decides the format of the auction. India currently follows a Simultaneous Multi-Round Ascending Auction (hereinafter SMRA).[185] [In an SMRA auction, all of the licenses are put up for bid at the same time. This approach allows bidders to place bids on the licenses they need to complete their business plan.][186]
4. **Pre-Auction Procedures:** The DoT issues an NIA (Notice Inviting Applications) and after the submission of applications, the DoT verifies the eligibility of the applicants based on the documents submitted by them.
5. **Auction Process:** It mainly involves two components; bidding rounds and real-time tracking whereby the bidders can track the progress of the auction in real time thereby, enabling them to adjust their bid accordingly.
6. **Post Auction Procedures:** After the completion of the auction, the winning bid is announced which is followed by the payment and compliance and finally, the license is issued.

DoT and TRAI have also formulated certain guidelines with regard to future auctions relating to spectrum, keeping in mind the requirements for the auction of spectrum in the frequency bands identified for 5g. Department of Telecommunications (DoT), through its letter dated 13.09.2021, had requested TRAI to provide recommendations on "Auction of spectrum in the frequencies identified for International Mobile Telecommunications (IMT) / 5G"[187]. These recommendations were featured in TRAI's Recommendations on Auction of Spectrum in frequency bands identified for IMT/5G,[188] dated May 9, 2022. Some of the major decisions regarding these recommendations include;

1. For future auctions, rationalized bank guarantees are to be dispensed with to secure a deferred annual payment spectrum.
2. Spectrum auctions are to be held at regular intervals, i.e., during the last quarter of every financial year, except in cases of exigencies.
3. The licensees will also be permitted to surrender their licenses after a minimum period of ten years from the date of grant of such license.
4. Spectrum Usage Charge (SUC) will be removed.
5. Spectrum Sharing will not be liable to an increase in the SUC rate by 0.5%.

CHALLENGES IN THE PRE-ACT REGIME

While 5G spectrum auctions have been the center of headlines since the first auction in 2022, the road to such auctions has not been easy at all and India, along with other nations, faces many challenges that have a severe impact on this process. Business leaders complain that the spectrum is scarce, fragmented, overpriced, and inflexible.[189]

Scarcity: The availability of spectrum in the desired bands is very scarce and limited. This

[183] Telecom Regulatory Authority of India, Recommendations on Spectrum Management and Licensing Framework. May 11, 2010.
[184] Saidha, Manvee Kumar. *Spectrum (Mis)Management: Why India's Approach to Reserve Pricing Needs a Revisit.* (CCL NLUO. Nov 26, 2021).
[185] Kathuria, Rajat and others. *Evaluating Spectrum Auctions in India.* (ICRIER. April 2019).
[186] *Auction Best Practice GSMA Public Policy Position*. Sep 2021. (Available at: https://www.gsma.com/connectivity-for-good/spectrum/wp-content/uploads/2021/09/Auction-Best-Practice.pdf)
[187] Press Release. Ministry of Communications. Apr 6, 2023.
[188] Telecom Regulatory Authority of India. *Recommendations on Auction of Spectrum in frequency bands identified for IMT/5G.* May 9, 2022.
[189] Ravi, Shamika and West, Darrell M. *Spectrum Policy in India.* (The Brookings Institution. Aug 2015).

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gives rise to increased competition which in turn affects the price of the bands. The Director-General of Cellular Operators Associations of India remarked "....we have less than 40% of the spectrum we require."[190] As per the report of the Standing Committee, the availability of 5g spectrum in India is almost half the global average, standing at around 50 MHz per operator against the global average of 100 MHz per operator. The same has been the case with 4g spectrum where the availability of spectrum per operator in India was only one-fourth of the global average.[191] While the already existing scarcity has been a major problem for the Indian telecommunication industry, the fragmentation of this scarce resource adds to the already existing problem.

Technical and Infrastructure Challenges: Upgrading the existing infrastructure to support the 5g network requires a significant investment in technology and resources, including investments in base stations, fiber-optic cables, and other supporting equipment. The expensive cost of this infrastructure is a key impediment to the broad implementation of 5G networks, particularly in developing countries[192] like India.

Demand Forecasting: Uncertain demands for 5g services have been a huge challenge for the authorities while preparing for auctions. It is difficult to forecast accurate demands and this in turn adversely affects the bidders' strategies and investment plans for the auctions. The Indian market maturity and readiness to adopt 5g technology remains uncertain, thereby, impacting the potential return on investments.

Fragmentation and Inflexibility: Fragmentation and inflexibility in the use of spectrum bands lead to underutilization of the resource. Despite claiming to be technologically neutral, in many instances, the uses for certain bands are fixed by the government and it is difficult for firms to adjust to new demands or deploy new solutions. They have to operate within the confines of existing policies, and this has limited their options for innovation.[193]

High Costs: A primary reason for spectrum remaining unsold in Indian auctions is the high reserve price.[194] High reserve prices have become a problem for potential bidders, especially smaller telecom companies. These high prices also affect a bidder's ability to invest in other resources like network infrastructure and services, thereby, rendering the technology futile.

Apart from this, the inter-ministerial coordination to provide a smooth ride for spectrum auctions and ensure efficient use and fuller utilization of spectrum was also absent.

IMPACT OF TELECOMMUNICATIONS ACT 2023 ON SPECTRUM AUCTIONS IN INDIA

The Telecommunications Act 2023 has laid down a concrete framework for the allocation of spectrum. The Act also exhibits a profound influence of the Supreme Court judgment relating to spectrum allocation. Post the spectrum allocation in 2008 where the method of auction was not complied with and the spectrum was allocated on a first come first serve basis, the Supreme Court canceled all of the 122 licenses that were granted. The scam that shook the nation's telecommunication sector paved the way for reforms in the process of spectrum allocation. These reforms, as declared by the Apex Court in the case of CPIL v. Union of India[195] and Subramanian Swamy v. A. Raja[196] were materialized in the form of legislation by the Parliament in the form of the Act. The Act is a reformatory legislation and has been enacted recognizing the need to replace outdated laws. However, this initial promise of reform did not last long as upon analysis, it is evident that many of the provisions have been

[190] Tomas, Juan Pedro. *Lack of spectrum challenges 5G rollout in India: COAI.* RCR Wireless News. June 15, 2023.
[191] Committee on Communications and Information Technology. *Twenty-first Report on India's Preparedness for 5G relating to the Ministry of Communications (Department of Telecommunications).* Feb 8, 2021.
[192] Gupta, Amit. *5G Networks: Technologies, Applications and Challenges.* (TJCME. Vol.11 No.01, 2020) 857-861.
[193] Ravi, Shamika and West, Darrell M. *Spectrum Policy in India.* (The Brookings Institution. Aug 2015).
[194] Ramachandran, T.V. *Spectrum Pricing in India.* (Broadband India Forum. Dec 8, 2020) (Available at: https://broadbandindiaforum.in/wp-content/uploads/2020/12/Spectrum_Pricing_in_India_F24332783.pdf)
[195] (2012) 3 SCC 1.
[196] (2012) 9 SCC 257.

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replicated from the 1885 Act and thus, resonate with the colonial rules. While the Act has surely rephrased many of the provisions, this rephrasing can not be equated with reform. For example, provisions relating to the suspension of the internet and surveillance are a replica of the provisions of the 1885 Act.[197] The Act embodies similar principles with language and phrases being the only change. The Act has been heavily criticized for its privacy-breaching provisions.

While the Act provides for auctions for the assignment of spectrum, Dr. Subramanian Swamy has argued that the provision has been somewhat diluted and so has the Supreme Court judgment[198]. This argument is founded on the basis of the latter part of Section 4(4) of the Act which reads, "....except for entries listed in the First Schedule for which assignment shall be done by administrative process."[199] It is submitted that this provision allows the government to deviate from the mandate of auctions for spectrum allocation which is against the ratio of Supreme Court judgment. Allowing this not only dilutes the judgment but also weakens public trust in the process of spectrum allocation. While the government claims that this is important for ensuring the assignment of spectrum for some essential services, it also leaves a scope for discretion which may be abused. In 2012, the Apex Court clearly stated a duly publicized auction conducted fairly and impartially is perhaps the best, and methods like a first-come-first-served basis are likely to be misused.[200] It must also be noted that the Act provides that satellite spectrum shall be assigned administratively. Satellite spectrum does not follow national limits unlike territorial spectrum; hence, it falls under the ambit of the control of the International Telecommunications Union (ITU). This is important as it implies that the assignment of satellite spectrum is not covered by the Supreme Court judgment. However, the administrative assignment is not limited to the satellite spectrum and covers 19 entries. The government also pleaded to the Supreme Court to allow for administrative assignment but the plea was denied, upholding the ratio of the 2012 judgment[201]. Section 57 of the Act also allows the government to amend the first schedule containing the entries where spectrum can be allocated administratively. It reads; Subject to the provisions of this section, the Central Government may, by notification,— (a) amend the First Schedule.[202] Allowing the government to amend the schedule and remove or add entries, simply by a notification, is rather arbitrary as it implies that the government has unchecked power to allow any type of spectrum to be assigned administratively. In Sachidanand Pandey v. State of West Bengal, the court established that state-owned or public-owned property is not to be dealt with at the absolute discretion of the executive.[203] Arbitrary exercise of executive power is liable to be quashed[204]. Not only does this dilute the 2012 judgment, but it also provides a breeding ground for many more scams like the one we witnessed with the 2g spectrum.

The hope for reform in spectrum auctions has also been shattered as despite many objections against the high reserve prices, the same remains unchanged and this can be seen in the last two auctions as well, as illustrated in the case studies below. The failure to include any substantial provisions to control reserve prices or manage the same has been criticized as it deters smaller players from participating in the auctions, thereby, making the market more like an oligopoly. In the past few auctions, three to four major bidders have acquired almost all the spectrum and no small players have been able to even register their presence. Ultimately, this

[197] See: https://internetfreedom.in/first-read-telecom-bill-2023/

[198] See: https://www.moneylife.in/article/subramanian-swamy-approaches-sc-on-govts-petition-to-modify-2g-scam-judgement-to-avoid-auction-of-satellite-spectrum/74014.html

[199] The Telecommunications Act, 2023, §4(4).

[200] (2012) 3 SCC 1 [96].

[201] See:https://www.thehindu.com/news/national/supreme-court-declines-to-receive-government-plea-on-administrative-allocation-of-spectrum/article68129263.ece

[202] The Telecommunications Act, 2023, § 57(1).

[203] (1987) 2 SCC 295 [40]

[204] Onkar Lal Bajaj v. Union of India. (2003) 2 SCC 673 [27].

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causes loss to the consumers who are deprived of affordable prices and innovation. The Act has also been the cause of bureaucratic delays and confusion. Conferring the Central Government with unchecked power, the Act enables the government to decide upon pricing, fees, charges, etc. involved in spectrum auctions.

CASE STUDY: SPECTRUM AUCTION 2022

India organized its 8th spectrum auction in July 2022. On June 14, India's Union Cabinet, chaired by Prime Minister Narendra Modi, approved the auction of airwaves capable of offering fifth-generation (5G) telecom services, including ultra-high-speed internet to both telecom operators as well as non-telecom enterprises.[205] 5G services were launched in India by the Hon'ble Prime Minister on 1st October 2022.[206] The 2022 auction marked the 5g rollout in 13 major cities including the national capital. Lasting over a period of 7 days, the auction marked a major milestone with the introduction of 5g technology. With the highest-ever auction revenue proceeds[207], a total of 51,236 MHz[208] spectrum was sold, amounting to 71%[209] of the total put up for sale.

Regulatory Framework:

The auction was regulated by the DoT and TRAI. The National Digital Communications Policy also played a major role in directing the auction and spectrum management. The auction also accounted for many reforms including the removal of spectrum usage charges. All the spectrum acquired from the 8th auction onwards is free from any mandatory up-front payments. Following TRAI's Recommendations on the Auction of Spectrum in frequency bands identified for IMT/5G, the new licensees are also free to surrender their licenses after a minimum threshold period of ten years, thereby, encouraging better utilization of the spectrum.[210]

Auction Format and Design:

Like the 4g spectrum auction, the 2022 5g spectrum auction also followed the pattern laid down by the 3g spectrum auction in 2010 and followed the SMRA format, contrary to the sealed bid auctions practiced prior to 2010. Pioneered by Milgrom, Wilson, and McAfee in 1994, SMRA has become a de facto standard auction mechanism for the award of radio spectrum.[211] SMRA offers the bidders the opportunity to bid simultaneously, thereby, enabling them to be flexible and work out strategies. With multiple bidding rounds, it allows the bidders to adjust their bids in response to those of other bidders. These rounds continue till there are no new bids. The prices are ascending, i.e., they increase with each round. This format also provides transparency which is much desired, especially after the 2g spectrum scam. Further, as compared to a sealed-bid auction, an open auction as followed under the SMRA format, reduces uncertainties associated with valuation assessments and diminishes the chances of winner's curse (players tend to value the commodity much more than its real valuation and thus over-bid).[212]

Frequency Bands:

A total of 72,098 MHz[213] spectrum was put up for the first 5g spectrum auction in 2022. The auction was held for a total of 10 frequency bands which can be divided into three categories as follows;

[205] Bharadwaj, Naina. *India's 5G Spectrum Auction: A Look at the Bids and Commercial Roll-Out.* (India Briefing. Aug 12, 2022).
[206] Year End Review: Ministry of Communications. PIB Delhi. Dec 16, 2022.
[207] Ibid.
[208] Ibid.
[209] Ibid.
[210] Telecom Regulatory Authority of India. *Recommendations on Auction of Spectrum in frequency bands identified for IMT/5G.* May 9, 2022.
[211] Sridhar, V. Prasad, Rohit. *Analysis of spectrum pricing for commercial mobile services: A cross country study.* Telecommunications Policy. Vol 45, Issue 9. Oct 2021.
[212] Sahay, Abhilash. *Re-examining Auction Design for Telecom Spectrum in India.* (ICRIER Think Ink) (Available at: https://icrier.org/publications/re-examining-auction-design-for-telecom-spectrum-in-india/)
[213] Year End Review: Ministry of Communications. PIB Delhi. Dec 16 2022.

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Table 1: Categorization of frequency bands auctioned in 2022

Categories	Frequency band
Low	600 MHz, 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz
Mid	3300 MHz
High	26 GHz

(Source: https://www.india-briefing.com/news/indias-5g-spectrum-auction-list-of-bidders-expected-commercial-roll-out-25328.html/)

Reserve Prices:

A total of 72097.85 MHz spectrum in different band-LSA combinations worth Rs. 4,31,605 crores (at Reserve Price) were made available for bidding.[214] As per the recommendation of TRAI in May 2022, the reserve prices for the 2022 auction were considerably reduced by 39%[215].

Participants and Bidders:

Apart from the requirement of having a net worth of at least INR 1 billion, eligible bidders included the following three categories; (1) any licensee holding a Unified Access Service License or a Unified License (hereinafter UL) with authorization for access services for that Licensed Service Area; (2) or a licensee who fulfills the eligibility criterion to obtain a UL with authorization for access services and submits an undertaking signifying that he will obtain a UL; (3) or any entity that submits an undertaking to obtain a UL with authorization for access services through a New Entrant Nominee as per the Department of Telecommunications (DoT) guidelines/ license conditions.[216]

The auction, organized from July 26 2022 to August 1, 2022, was India's biggest 5g spectrum auction. The auction consisted of 40 rounds of bidding with four major bidders; Reliance Jio, Bharti Airtel, Vodafone Idea, and Adani Group.

Auction Results:

A record over ₹1.5 lakh crore worth of 5G telecom spectrum was sold, with billionaire Mukesh Ambani's Jio emerging as the top bidder, cornering nearly half of all the airwaves (worth ₹88,078 crore).[217] While Jio and Airtel acquired the spectrum in the high-frequency bands, Vodafone mainly focused on acquiring the spectrum in its priority circles. At the same time, the Adani Group acquired it with the motive of setting up the organization's own private network. Union Minister of Communications Ashwini Vaishnaw stated the whole spectrum offered became "exact enough" for protecting all circles within the country, estimating "exact coverage" of 5G within the subsequent two 3 years.[218]

[214] Telecom Regulatory Authority of India. *Consultation Paper on Auction of Frequency Spectrum in 37-37.5 GHz, 37.5-40 GHz, and 42.5-43.5 GHz bands Identified for IMT.* Apr 4, 2024.

[215] Bhatnagar, Rishabh. *India's 5G Spectrum Auction: Pricing, Timeline And More.* NDTV Profit. June 16, 2022.

[216] Bharadwaj, Naina. *India's 5G Spectrum Auction: A Look at the Bids and Commercial Roll-Out.* (India Briefing. Aug 12, 2022).

[217] *Spectrum auction ends in just two days with bids worth ₹11,340 crore.* The Hindu. June 26, 2024.

[218] Karthick. N, Logesh. K, and Logeshwaran. K.S. *Study on 5G Auction.* IJRPR. , Vol 4, no 2, pp 1273-1275, February 2023.

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Table 2: Auction Results- 2022

Bidder	Band Acquired	Amount
Reliance Jio	700 MHz, 800 MHz, 1800 MHz, 3300 MHz, 26 GHz	INR 880.78 billion
Bharti Airtel	900 MHz, 1800 MHz, 2100 MHz, 3300 MHz, 26 GHz	INR 430.84 billion
Vodafone Jio	1800 MHz, 2100 MHz, 2500 MHz, 3300 MHz, 26 GHz	INR 187.99 billion
Adani Group	26 GHz	INR 2.12 billion

(Source: *https://dot.gov.in/spectrum-management/2886*)

As one of the most significant spectrum auctions in the history of India, not only did the 2022 auction pave the way for the rollout of 5g technology in India but it also accounted for the highest ever auction revenue proceeds. It was also the last revenue auction to be governed by the Indian Telegraph Act of 1885, with the subsequent auctions being governed by the provisions of the Indian Telecommunications Act, 2023. The revenue from the auction can be illustrated as follows;

Table 3: Revenue generated from spectrum auction in 2022

Operator	700 Mhz	800 MHz	900 MHz	1800 MHz	2100 MHz	2500 MHz	3300 MHz	26 GHz	Total
M/s Adani Data Networks Limited	0	0	0	0	0	0	0	212	212
Bharti Airtel limited	0	0	349	2763	2680	0	31700	5592	43084
Reliance Jio Infocomm Limited	39270	1050	0	7082	0	0	33740	6990	88078
Vodafone Idea	0	0	0	584	500	650	15150	1915	18799

Limited									
Total	**39270**	**1050**	**349**	**10375**	**3180**	**650**	**80590**	**14709**	**150173**

(Source: https://www.pib.gov.in/PressReleseDetailm.aspx?PRID=1847279)

CASE STUDY: SPECTRUM AUCTION 2024

The 2024 spectrum auction was a major milestone in the Indian history of spectrum auctions as it was the first to be governed by the provisions of the Telecommunications Act of 2023. Intended to streamline and modernize the regulatory framework of Indian spectrum auctions, the Act provided the legal framework for the 2024 auction. The auction was a pivotal event; as the country's second 5g auction, it was intended to enhance the telecommunications infrastructure in light of the advent of 5g technology. The expiring spectrum in 2024 and the unsold spectrum of the previous Spectrum Auction held in 2022 were put to auction.[219]

Regulatory Framework:

Governed by the DoT and TRAI, the strategic framework for the auction was provided by the National Digital Communications Policy of 2018. The auction was the first to be governed by the provisions of the Telecommunications Act 2023. Successful bidders will be allowed to make payment in 20 equal annual installments, duly protecting the NPV at the interest rate of 8.65%.[220] Following a pattern similar to that of the 2022 auction, the licensees are allowed to surrender their licenses after a period of ten years.

Auction Format:

Like previous auctions, the 2024 auction also followed the SMRA format. The auction was organized in a virtual mode with an online bidding process as a testament to the government's commitment to providing affordable and high-quality telecom services.

Frequency Bands Auctioned:

The auction accounted for the bidding for 533.6 MHz Spectrum[221] in 8 frequency bands. All the available spectrum in 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz, and 26 GHz bands were put to auction.[222]

Reserve Price:

The spectrum licenses on offer had a combined reserve price of INR 962.4 billion ($11.53 billion).[223] The reserve prices for the various frequency bands can be illustrated as follows;

[219] Ministry of Communications. *Spectrum Auction 2023-24 concludes successfully.* June 26 2024.
[220] Ministry of Communications. *DoT initiates Spectrum Auction to augment the existing telecom services and maintain continuity of services Issues Notice Inviting Applications today to this effect.* Mar 8 2024.
[221] Ibid.
[222] Ibid.
[223] Tomas, Juan Pedro. *India Kicks Off New 5g Spectrum Auction.* RCR Wireless News. June 26, 2024.

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Table 4: Reserve Prices in spectrum auction in 2024

Bands	Total Spectrum Put in Auction (in MHz)	Reserve Price
800 MHz	118.75	21341.25
900 MHz	117.2	15619.6
1800 MHz	221.4	21752.4
2100 MHz	125	11810
2300 MHz	60	4430
2500 MHz	70	2300
3300 MHz	1110	16251.2
26 GHz	8700	2734
Total	**10522.35**	**96238.45**

(Source: Ministry of Communications)

The frequency bands of 800 MHZ and 1800 MHz accounted for 44.8% of the total spectrum being offered.

Participants and Bidders:

All the three TSPs i.e., M/s Bharti Airtel Limited, M/s Reliance Jio Infocomm Limited, and M/s Vodafone Idea Limited have successfully bid and taken spectrum in this auction also for growth and continuity of services.[224] The auction was organized for a very short period, lasting from 25th June 2024 to 26th June 2024, with seven rounds of bidding, which was much less in comparison to the auction of 2022.

Auction Results:

A total quantum of 141.4 MHz spectrum worth Rs 11,340 Crores was sold[225] among three major bidders, Bharti Airtel, Reliance Jio, and Vodafone Idea. Reliance Jio, the largest telecom operator and the highest bidder in the previous auction restricted itself to acquiring spectrum in the 1800 MHz frequency band. On the other hand, Bharti Airtel emerged as the highest bidder followed by Vodafone India. The two also renewed their expired spectrum in the 900 MHz and 1800 MHz frequency bands.

[224] Ministry of Communications. *Spectrum Auction 2023-24 concludes successfully.* June 26, 2024.

[225] Ibid.

Table 5: Auction Results- 2024

S. No.	Name of the Bidder	900 MHz	1800 MHz	2100 MHz	2500MHz	Total
1	M/s Bharti Airtel Ltd.	3825	2486.76	545	0	6856.76
2	M/s Reliance Jio Infocomm Ltd.	0	973.62	0	0	973.62
3	M/s Vodafone Idea Ltd.	3241.6	118.80	0	150	3510.40
Grand Total		**7066.6**	**3579.8**	**545**	**150**	**11340.78**

(Source: https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2028885)

The auction ended within two days on June 26, garnering less than 12% of the ₹96,238 crore minimum value that the government had estimated for the spectrum on offer.[226] No bidding took place in the 800 MHz, 2300 MHz, 3300 MHz, and 26 GHz frequency bands. This is also because 5g monetization is still in progress. A total quantum of 141.4 MHz (26.5%) was sold from the balance 533.6 MHz Spectrum.[227] Not only is this the lowest revenue generated from spectrum auction in the last three years, but it is the third-lowest auction in terms of revenue, with 2012 and 2013 occupying the second last and last places, respectively.[228]

It was also notified that the unsold spectrum would be auctioned again next time. The bidding trends also show an inclination towards 4g spectrum bands instead of the 5g bands. Reliance Jio urged TRAI to provide more high-frequency spectrum bands in the auction stating that further availability of 5G spectrum will aid in the proliferation of the 5G network.[229]

UNDERMINING RESPONSE IN THE 2024 AUCTION

From the above data, it can be clearly inferred that the results of the 2024 auction were rather undermining and disappointing. Held in the background of the 2022 auction which accounted for the highest-ever revenue generated from an auction, the 2024 auction witnessed a subdued response. The same can be attributed to a number of reasons. Major frequency bands were already acquired by the operators back in 2022, as pointed out by a DoT spokesperson as well. Moreover, the infrastructure to support the technology still lacks in many aspects and hence, the spectrum has not rendered much use. The reason for this response can also be attributed to the fact that an auction for 5G spectrum was held recently & 5G Monetization is still in progress[230]. In the 2024 auction, operators focused on lower-frequency bands while the high-frequency bands remained untouched. Also, the Telecommunications Act, although intended to provide certainty, caused a change in the regulatory framework. It is submitted that this shift may have caused a sense of uncertainty among the operators, making them hold off on significant investments for a while.

[226] *Spectrum auction ends in just two days with bids worth ₹11,340 crore.*The Hindu. June 26, 2024.
[227] Ministry of Communications. *Spectrum Auction 2023-24 concludes successfully.* June 26, 2024.
[228] Kar, Ayushi. *Spectrum auctions end with muted bidding amid strategy shift by telcos.* The Hindu. June 27, 2024.
[229] Kar, Ayushi. *5G spectrum went unsold but telcos want more bands put up for auction.* The Hindu. July 1, 2024.
[230] Ministry of Communications. *Spectrum Auction 2023-24 concludes successfully.* June 26, 2024.

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Despite many recommendations from major telecom operators, including Reliance Jio, to include more frequency bands, the bands offered were limited and the same as the 2022 auction. The operators already have the bands that were being auctioned and expecting them to bid again or something that they have already acquired is irrational. It can also be argued that high reserve prices were a major problem for many operators. Indian reserve prices have always been really high as compared to the global average and the scarcity of spectrum only adds to the problem. A huge portion of the resource is reserved for defense services and space research. This only adds to the problem and now the Act also provides for administrative assignment of spectrum. Going back decades, the Ministry has gotten large blocks of contiguous spectrum and has not been required to relinquish any of it. Even though a lot of it is unused or underutilized, it is not available for commercial development.[231] This is a major problem as the spectrum that is available for auctions is already less and reserving a portion of it for administrative allocation only takes away from this scarce resource, along with causing a hike in the prices of whatever spectrum is left for auctions. Deployment of 5g networks is not an easy task as the shorter wavelengths of the higher frequencies utilized by 5G networks make them more easily obstructed by obstructions such as buildings and trees. This can cause interference and signal deterioration, especially in metropolitan areas.[232] Problems like this have delayed the deployment of 5g networks. Consequently, low 5g penetration and zero monetization, coupled with the sufficient availability of spectrum[233] with the operators, lead to a muted response. It is submitted that prior to auctions, the government needs to focus on 5g monetization as auctions will render no results if the spectrum being auctioned has no use.

WAY FORWARD

Indian spectrum auctions have time and again reiterated the need for reform and the 2023 Act has come with a hope for the same. However, the Act remains silent on many crucial issues. An analysis of the spectrum policies of many other countries reveals that sound spectrum policies drive major economic growth. The outcome of the last two auctions, coupled with the recommendations from major telecom operators and TRAI itself, form the basis for major reforms in the framework for spectrum auctions in India.

1. **Cobtrolling Reserve Prices:**

   Indian spectrum prices have always been a problem for the operators and it has also often led to undermining results in the auctions. In developing countries like India, high spectrum costs form a barrier in the path of economic growth as it deters many smaller operators from participating. A solution to this can be relying on a more data-driven approach to set the reserve prices. This may include an analysis of market demand, the health of the telecom industry, global benchmarks, the financial status of telecom operators, etc. Setting more realistic reserve prices would encourage participation from smaller players, hence, also countering the problem of concentration of spectrum in the hands of few big players.

2. **Availability of Spectrum:**

   As discussed earlier, more than the spectrum available for auctions in India is needed. While one may argue that large amounts of spectrum remain unsold in every auction, we must note that the spectrum put up for auction every year lacks variety and the bands offered remain very limited as was the case in the auction of 2024. The

[231] Ravi, Shamika and West, Darrell M. *Spectrum Policy in India.* (The Brookings Institution. Aug 2015).
[232] Gupta, Amit. *5G Networks: Technologies, Applications and Challenges.* (TJCME. Vol.11 No.01, 2020) 857-861.
[233] *Spectrum auction may see muted demand.* The Economic Times. Mar 12, 2024.

government fails to include many frequency bands required by the operators because they are reserved for defense and other purposes. It is crucial to note that this spectrum that is reserved falls in the mid-frequency range which, at the moment, is also very crucial for commercial purposes. While the government has made several attempts to counter this problem, there is still much to be done. Recognizing the shortage of available spectrum, the government needs to focus on working out a collaborative scheme for the use of spectrum between telecom operators and defense and related services. Unless there is sufficient licensed spectrum, it will be hard for India to achieve its goals of higher economic growth and greater social inclusion.[234]

3. **Dynamic Spectrum Allocation and Sharing:**

The 2023 Act provides for spectrum sharing. Section 7(1) of the Act reads, "The Central Government may, to promote optimal use of the available spectrum, assign a particular part of a spectrum that has already been assigned to an entity, known as the primary assignee, to one or more additional entities, known as the secondary assignee…"[235] As technology needs evolve, traditional modes of allocation fail to satisfy the growing demand. Section 7(1) of the Act signifies the government's intention to adopt more and more non-conventional modes of spectrum utilization in an attempt to counter the problem of lack of availability of spectrum. The government can also explore more dynamic modes of spectrum allocation like secondary markets and unlicensed spectrum usage. A major reason for the problem of inefficient underuse (the 'tragedy of the anticommons') is the failure to assign spectrum usage rights so that the resource may be effectively used by those who value it the most. Secondary markets will enable spectrum resources to shift from low-value uses to higher-value uses.[236] Spectrum mortgage is also a method that can be adopted to ensure greater utilization of the resource. Under this plan, businesses can retain spectrum ownership but use their holdings to leverage capital formation.[237]

4. **Encouraging New Participants:**

Indian spectrum market is not only dominated by a few players but these few players also constitute the total players. As discussed above, the spectrum auctions of 2022 and 2024 witnessed participation from the same operators which include, Reliance Jio, Bharti Airtel, and Vodafone Idea. This oligopoly creates a lack of competition and innovation in the market. The government can encourage the entry of new participants by doing away with the humongous barriers. This can be done by lowering financial guarantees and simplifying the auction registration process for new entrants. Entry of new players ensures competition leading to greater innovation in the sector which will ultimately benefit the consumers and also contribute to economic development.

5. **Reducing Spectrum Fragmentation:**

A larger contiguous bandwidth has more capacity than its two halves owing to trunking efficiency losses when the spectrum is fragmented.[238] Reducing

[234] Ravi, Shamika and West, Darrell M. *Spectrum Policy in India.* (The Brookings Institution. Aug 2015).
[235] The Telecommunications Act, 2023, § 7(1).
[236] *Secondary Markets for Spectrum: Policy Issues.* (OECD Digital Economy Papers No. 95. Apr 20, 2005).
[237] Ravi, Shamika and West, Darrell M. *Spectrum Policy in India.* (The Brookings Institution. Aug 2015).
[238] *ASSOCHAM's Discussion Paper on TRAI's Consultation on Valuation & Reserve Price of Spectrum.* Telecom regulatory Authority of India.

fragmentation helps improve network efficiency and also reduces deployment costs. More advanced technologies require contiguous blocks of spectrum and this can be ensured through practices like spectrum refarming and reallocation, i.e., refarming the older spectrum bands to use them for newer technologies. Another downside of fragmented holdings is the proliferation of towers as there is a discernible trade-off between spectrum and infrastructure.[239] Encouraging the consolidation of various spectrum blocks held by a single operator across different bands can help improve the overall efficiency and quality of service.

CONCLUSION

Indian spectrum allocation has evolved over the years as a vital part of telecom laws. Reflecting a complex interplay of historical practices of allocation, regulatory frameworks, market dynamics, and technological advancements, the process has been institutionalized in the Telecommunications Act of 2023. With a hope for greater transparency, efficiency, and fairer competition, the Act attempts to address and solve the problems in the process of spectrum allocation. However, this has not been as effective as it was anticipated and the same is also evident from the results of the 2024 spectrum auction. The need to explore and implement more dynamic methods can not be ignored. Although the Act intends reform, this intention is harder to find in the provisions of the Act which embody the essence of the colonial laws it intended to repeal.[240] The Act can not be looked upon as a complete solution to the problems faced in spectrum auctions. Other institutional reforms like controlling the reserve prices, ensuring the availability of spectrum, etc. are essential steps in reforming the auction practices for spectrum allocation in India. In conclusion, to address the challenges discussed above-mentioned, it is crucial to focus on regulatory reforms and policy adjustments. Adopting more dynamic methods and adapting the regulatory framework and policies to technological advancements can help India stay on its trajectory to becoming a global leader in the telecommunication sector, inspiring social development and economic growth in the process.

[239] Ibid.
[240] See: https://internetfreedom.in/the-telecom-act-2023-partial-notification/#:~:text=The%20Act%2C%20after%20it%20comes,it%20purportedly%20aims%20to%20overhaul.