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**STANDING COMMITTEE ON
INFORMATION TECHNOLOGY
(2005-2006)**

FOURTEENTH LOK SABHA

**MINISTRY OF COMMUNICATIONS AND
INFORMATION TECHNOLOGY
(DEPARTMENT OF TELECOMMUNICATIONS)**

SPECTRUM MANAGEMENT

TWENTY-EIGHTH REPORT



सयमेव जयते

**LOK SABHA SECRETARIAT
NEW DELHI**

December, 2005/Agrahayana, 1927 (Saka)

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Presented to Lok Sabha on 23.12.2005

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LOK SABHA SECRETARIAT
NEW DELHI

December, 2005/Agrahayana, 1927 (Saka)

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COMPOSITION OF THE STANDING COMMITTEE ON
INFORMATION TECHNOLOGY (2005-2006)

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*Nominated *w.e.f.* 27.9.2005.

INTRODUCTION

1. I, the Chairman Standing Committee on Information Technology (2005-06) having been authorised by the Committee to submit the Report on their behalf, present this Twenty Eighth Report on 'Spectrum Management' relating to the Ministry of Communications and Information Technology (Department of Telecommunications).

2. The Committee obtained written information from the Ministry of Defence, Ministry of Communication and Information Technology (Department of Telecommunications), the Cellular Associations/ Operators on Spectrum Management and related issues.

3. The Committee took oral evidence of the representatives of the Department of Telecommunications (DoT) on 9 February, 2005 and 25 October, 2005 and that of Ministry of Defence on 24 October, 2005. They also took non-official evidence of the representatives of the Cellular Operators Association of India (COAI), Association of Unified Service Providers of India (AUSPI) and individual GSM and CDMA service providers on 24th and 25th October, 2005. The Committee had the benefit of being presented with various technical and related submissions with respect to the issues relating to Spectrum Management. The Committee record that their recommendations do not represent on contain a definite conclusion relating to the technical aspects presented before the Committee.

4. In this Report, the Committee have highlighted amongst other aspects the urgent spectrum requirement of the GSM and CDMA operators in urban areas and Metros; vacation of spectrum from Defence; Creation of 'Defence Band' and formalization of Defence Interest Zone; deployment of spectrum efficient equipment by both Defence and non-Defence sectors; early allocation of spectrum for roll out of 3G and emerging services; utilization of spectrum in an efficient, optimum and rational manner; co-existence of both GSM and CDMA technologies and a noticeable penetration of the mobile operators in rural areas. The Committee have urged the Department to come out with a comprehensive and transparent Spectrum Policy, taking into consideration all the above issues and catering to the requirement of both Defence and non-Defence sectors.

5. The Report was considered and adopted by the Committee at their sitting held on 21 December, 2005.

6. The Committee wish to express their thanks to the representatives of the Department of Telecommunications (DoT), Ministry of Defence, the Cellular Operators Association of India (COAI), the Association of Unified Service Providers of India (AUSPI) and the individual GSM and CDMA operators for appearing before the Committee and furnishing information in connection with the examination of the subject.

7. For facility of reference and convenience, the observations and recommendations of the Committee have been printed in bold letters in body of the Report.

NEW DELHI;
21 December, 2005
30 Agrahayana, 1927 (Saka)

M.M. PALLAM RAJU,
Chairman,
Standing Committee on
Information Technology.

REPORT

SPECTRUM MANAGEMENT

INTRODUCTORY

In markets worldwide, wireless is replacing fixed lines as the *de facto* communication service that is perceived as a public utility. Mobile connections have overtaken fixed lines across all regions from emerging markets to developed markets. In developed markets, this is driven by fixed to mobile substitution, fixed to mobile number portability etc. In emerging markets, the weak fixed line infrastructure has created an opportunity for mobile to leap frog over fixed connection. In India, proper regulatory and policy environment coupled with intense competition has led to an explosion in growth in the mobile sector in addition to substantial reduction in tariffs. At the end of March, 2005 the total mobile subscriber base was around 52.17 million, out of which GSM and CDMA subscriber base was around 41.07 million and 11.10 million respectively. During the year 2004, about 19.50 million mobile subscribers were added and thus the mobile subscriber base crossed the fixed line subscriber base. Similarly, mobile tariffs were reduced from the level of about Rs. 16 per minute in 1995-96 for both incoming and outgoing calls to levels comparable with fixed line tariffs at the calling party end and free for incoming calls in 2005.

2. Thus, it is apparent that the growth of telecom services is synonymous with the growth of wireless services. As a matter of fact, wireless is giving impetus to future growth in telecommunications, be it increase in rural tele-density or growth in least developed countries. In wireless communication, the signal is transmitted from one point to another without any wire and it requires use of radio frequency spectrum. The radio frequency spectrum is generally from 3 KHz to 3000 GHz.

3. To put it simply, telecom operators send and receive signals at various frequencies to enable communication, through what is known as radio spectrum frequencies, which are electromagnetic waves and are natural phenomena governed by laws of physics. This radio spectrum only contains a limited number of frequencies due to various factors such as propagation characteristics of different bands, equipment availability for different types of allocations and suitability of different

frequency bands for specific allocations. It is also used by the Defence Services, Railways etc.

4. Thus, Radio Frequency Spectrum is a limited natural resource. It can only be shared amongst various countries, services, users, technologies etc. It is susceptible to harmful interference. Assignment of Spectrum is governed by National Frequency Allocation Plan (NFAP) and the International Radio Regulations of the International Telecommunication Union (ITU).

5. The Spectrum Management functions in India are performed by the Wireless Planning and Coordination (WPC) wing of the Department of Telecommunications (DoT). WPC is the national nodal agency for all matters related to radio communication aspects of the International Telecommunication Union (ITU) and Asia Pacific Tele-community and is responsible for treaty obligations on behalf of the Government. Broad functions of WPC wing include Spectrum Management Policy and Planning; frequency authorization/assignment, spectrum charging and licensing; standards, specifications and equipment authorization; notification and registration with ITU for international recognition and protection; international cooperation/coordination; Spectrum Control, monitoring and Enforcement and Secretarial assistance for Standing Advisory Committee on Frequency Allocations (SACFA).

6. The broad functions of SACFA are to formulate/review the National Frequency Allocation Plan (NFAP); to clear sites of all wireless installations in the country; to evolve technical criteria equipment standards, channeling plans, introduction of new technologies etc; and to formulate national proposals for international conferences/meetings.

7. Besides, there is the National Radio Spectrum Management and Monitoring System (NRSMMMS). The two important NRSMMMS components are (i) Automated Spectrum Management System (ASMs) which include licensing, billing, technical analysis, frequency assignment, coordination and planning, digital terrain model etc. and (ii) National Spectrum Monitoring System (NSMS) which include fixed, mobile and satellite monitoring; Spectrum bands like HF, VHF, UHF, SHF, EHF (partial); Direction finding; spectrum occupancy; signal characterization; monitoring task plans etc.

8. Historically, Spectrum was allotted on need based where higher commercial requirement was not envisaged. This was allotted mostly to Government Organisations, Defence being the largest users of it in India. However, due to an unprecedented growth of telecommunication

services and increase in the number of radio users all along the international border, requirement of spectrum by both the telecom and defence sectors has increased manifold.

9. In India, wireless telecommunication service are provided through three technologies *i.e.* Global System of Mobile (GSM), Code Division Multiple Access (CDMA) and CorDECT. The frequency Bands allocated to these technologies are as follows:

- (i) GSM 900 — 890-915 MHz paired with 935-960 MHz
- (ii) GSM 1800 — 1710-1785 MHz paired with 1805-1880 MHz
- (iii) CDMA 800 — 824-844 MHz paired with 869-889 MHz
- (iv) CorDECT — 1880-1990 MHz (TDD-unpaired)

10. As per the New Telecom Policy 1999 (NTP-99), availability of adequate frequency spectrum is essential not only for providing optimal bandwidth to every operator but also for entry of additional operators. NTP'99 further mentioned that it is proposed to review the spectrum utilization from time-to-time keeping in view the emerging scenario of spectrum availability, optimal use of spectrum, requirements of market, competition and other interest of public. It also states that the entry of more operators in a service area shall be based on the recommendations of Telecom Regulatory Authority of India (TRAI), which will review this as and when required and not later than every two years.

11. With the proliferation of new technologies and the growing demand for telecommunication services, the demand on spectrum has increased manifold for which it has become essential that 'Spectrum' be utilized efficiently, economically, rationally and optimally. Moreover, in view of the growing, conflicting and competing demand on spectrum, there is a 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.

12. Against this backdrop, the Committee took up the subject for detailed examination and in the process received numerous write ups from and heard the valuable views of the Ministry of Defence, the Cellular Operators Association of India (COAI), the Association of Unified Telecom Service Providers of India (AUSPI), individual GSM and CDMA Service Providers besides getting clarifications from the Department of Telecommunications (DoT) and consulting TRAI's Recommendations on Spectrum Related Issues. Such views, counter views, clarifications and consultations have been broached upon in the

succeeding paragraphs followed by the Committee's own Conclusions/ Observations/Recommendations.

Defence as a major user of Spectrum

13. Defence has always been the major user of Spectrum in India. Through a written note the Committee have been informed that prior to 1999, Defence had exclusive rights over its spectrum since the allocated spectrum was categorized as the Defence Band. Spectrum is a primary requirement for warfare and normal day-to-day operations for the Defence services. All Defence requirements of spectrum go through the process of vetting and detailed technical analysis by the Wireless Planning and Coordination (WPC) wing, before assignment. Hence there is no spare capacity with the defence. The nature and peculiarities of Defence usage of spectrum are as under:

Defence operations are mobile in nature, due to which wireless is the main means of communication.

- (a) Defence services need a large amount of spectrum for ensuring information and weapon superiority. These requirements will increase to a great extent in network centric operations as the requirements of situational awareness, precision targeting and remote guidance will increase.
- (b) Defence forces need to use systems with special characteristics such as frequency hopping, to survive in the electronic warfare environment. Frequency hopping sets require more spectrum as compared to any other radio set. Therefore, the spectrum utilized by Defence appears to be large.
- (c) Due to the nature of operations, the density of radio sets in an area of approx. 100 km. X 100 km. during operations work out to be approx. 10,000. This requires considerable spectrum and degrades re-use capability.

14. On the availability of Spectrum the Committee were informed during evidence that the Defence did not occupy anything in the 824-844/869-889 MHz band. In 890-915/935-960 MHz band, Defence has been occupying 4.8+4.8 MHz. Similarly, in 1710-1785/1805-1880 MHz. Defence has been occupying 60+60 MHz in Metros and 65 + 65 MHz in other areas. The balance of 15 + 15 MHz in Metros and 10 + 10 MHz in other places had been coordinated by Defence. In 1920-1980/2110-2170 MHz Defence has been holding 60+60 MHz.

15. The Committee were anxious to know how the Defence needed more spectrum although it had the maximum spectrum. The representative explained:

“For the Defence forces also there is an additional requirement of spectrum as it is for the commercial world because the Defence forces also have to keep pace with the technology and have an edge over the adversaries to fight successful combat operations.”

16. He further explained that the defence is now switching over to spectrum efficient technology and frequency hopping. The Bharat Electronics makes equipment to give Defence 250 to 300 hops. They are migrating to 500 hops per second and they will soon go to 1000 hops per second. In future Defence will be requiring more spectrum as frequency hops increase to 1000. The requirement of spectrum will go up and not come down.

Influence of NATO equipment on frequency requirements

17. The Committee have been informed that Europe and other Western Countries separated their military bands for NATO Forces & civilian bands based on EUROCOM standards. Soviet Union also did the same, but interchanged the bands so that their military band does not operate in the same band as that of NATO forces. India's present military equipment is of erstwhile Soviet origin while civilian equipment is of Western origin leading to direct clashes of the two types of users. Presently, the world order in this respect is fast changing with the breaking up of the Eastern block and many a countries of this block joining the European Union, the shift to NATO specification the world over is on its way including that of Russia. Defence's own procurement of present telecom equipment, therefore, by default is drifting to the NATO Defence band.

18. Giving information on the equipment profile through a written note that presently owing to the large size of the Indian armed forces, it is not possible to modernize it all at once, due to budgetary constraints, as five generations of equipment are always concurrently in service. Re-framing of spectrum will, therefore, be a slow process keeping a long time perspective in mind.

19. Trying to clarify the plan process of replacing equipment and the cost of doing so, the representative clarified during evidence stating:

“.....We are doing a 15 year Plan. We have plan to replace but I think as a country with limited resources, this will have to be

done very deliberately..... we are actually looking forward to using equipment as much as we can till it become functionally obsolete and not technologically obsolete. If you want to have state-of-the-art best in the world, the American Defence Budget is 500 billion dollars and we are working on a defence budget of 14 to 17 billion dollars.”

20. The Committee were interested to know whether there was any clear cut plan for phasing out some of the older technologies and what was the priority of the Defence in phasing out the older technologies for a better usage of spectrum. The representatives have clarified stating that Defence have five generations of equipment. If one compares the fifth generation with the first generation equipment, it will be inefficient use of spectrum. But when the fifth generation equipment was procured, that was the best spectrum efficient equipment during that period. So, if defence phases that out and gets to the first one, the first one which is replacing the fifth one will again be the best spectrum efficient equipment.

21. It was further stated that an internal study could be done. However, the Defence cannot keep buying and spreading equipment and that the Defence does try to look into more spectrum efficient technology at the time it is inducted. But thereafter, the Defence has to live with it for 20 to 25 years.

Spectrum Co-ordination

22. The Committee were informed through a written note that the National Frequency Allocation Policy (NFAP-81) was based on the concept of major users and the general users of spectrum. In the year 1999, the National Telecom Policy underwent a change and Telecommunication Industry was allowed to establish its communication infrastructure in the country in a big way. In order to achieve this, a need was thus felt to reallocate the entire spectrum from the concept of major and general users to the concept of “types of services”. Now as the Defence and industry are sharing a common band, there was a requirement of shedding certain spectrum from the erstwhile Defence Band for the Industry.

23. In connection with the release of spectrum the representatives of Ministry of Defence during evidence stated:

“Notwithstanding the constraints which I talk about, notwithstanding the numerous systems which operate in the battle fields, the central theme of our strategy for spectrum management

has been thought of cooperating, co-existing with the commercial world being proactive and making spectrum available for the growth of telecom industry.□The Committee on whose recommendation the spectrum is being made available are; the first Committee was constituted under the PMO in 1998, the Group of Telecom; the second Committee was the Group of Ministers which was constituted in 2003, for additional requirement of spectrum. In addition to that, we keep on getting it as and when the requirement of spectrum arises. There are further demands in the same very band which, by the Spectrum Management Committee of the GOT, was given that the defence will be compensated by alternate spectrum in 2000-2300 MHz band; as also the financial compensation will be given for migration. I would like to bring to the notice of the Committee that both these recommendations have not yet been implemented.”

24. The Committee enquired about the estimated compensation at that time for migration. The representative replied as under:

“It was Rs. 345 crore and that was in the year 1998-1999.”

25. Based on the requirement projected from time-to-time, a substantial part of the requirement of the cellular industry has already been coordinated or is under the process of coordination except the areas where the coordination cannot be done without adversely affecting the requirement of Defence Forces. The spectrum that has been coordinated is as under:

- (a) 800 MHz (20 + 20 MHz) for CDMA operators is already coordinated.
- (b) 900 MHz (25 + 25 MHz) for GSM operators and Railways already coordinated less 4.8 + 4.8 MHz.
- (c) 1800 MHz (25 + 25 MHz) for GSM operators has been partly coordinated.
- (d) 1900 MHz (20 MHz) for CDMA operators has not been agreed to by the Defence forces due to overriding defence considerations.
- (e) 2000 MHz Band for IMT 2000 under coordination process with Ministry of Communication & IT.

26. Clarifying the position on the 1900 MHz band, the representative during evidence stated that 1900-1910 MHz paired with

1980-1990 MHz had been requested for coordination, as an additional band for CDMA services. This requirement was never brought either by the Group of Ministers or Group of Telecom. It was not possible to coordinate the required spectrum in this band as it was being utilized for the Air Defence Network. The representative further submitted that the demand in this case was not justified as the already available band in 800 MHz had not yet been fully utilized by the CDMA operators.

27. The representatives of the M/o Defence had a very open view on sharing of spectrum between the Defence and the civil usages. In this connection they stated:

“In so far as sharing of the spectrum is concerned, we fully agree that we need to share the spectrum because we have finite resource. So, towards that end, we have a Committee which is working out the requirement about migrating wherever we can to spare the spectrum in 1800 MHz and 2000 MHz band so that the requirement of the civilians also are being met. The Committee is working out the details.”

28. Showing their concern towards the defence requirement of spectrum during war/national crisis of the civilian operators stated:

“I am going to step further to say that if there is a national crisis, we would be bound to release on first demand without any contest.”

Creation of an exclusive Defence Band

29. In the course of evidence on spectrum management on 24.10.2005 the representatives of the Ministry of Defence touched upon the need of earmarking spectrum in every Band, thus forming a separate band for defence purposes in place of the interspersed spreads of spectrum. The representative stated:

“For defence operations in all the service and in the interest of national security, there is a need to earmark spectrum in every band for defence, depending on its justified needs. The spectrum thus earmarked shall form the Defence Band. This shall be different from the erstwhile major user band and shall not hinder in the launch of any service in future. Almost all the countries, like USA, China, United Kingdom, France, Germany follow this pattern to earmark their Defence Band.”

30. Stating the benefits from such a Band they stated:

“Formation of the Defence Band would enable adequate spectrum for the service providers as well as for the Defence services and would have additional benefits by better planning for procurement and development of equipment by both Defence and the industry. Moreover, waiting period for assignment of frequencies will reduce considerably and there will be no need for regular coordination, vacation and migration which is time consuming.”

31. Informing the Committee on how Defence Band will help in avoiding delay in clearance the representative stated:

“For the defence forces also there is an additional requirement of spectrum as it is for the commercial world because the Defence forces also have to keep pace with the technology and have an edge over the adversaries to fight successful combat operations. We are also getting ready for the network centering operations. Delay in assignment of spectrum; hon. Chairman it takes Defence cases nearly two to three years for clearance from the Wireless Planning and Coordination Cell, whenever we have to induct new equipment, a new technology or we develop a new technology or equipment. This requirement can be met if we form the Defence Band.”

32. Agreeing to the proposal of having a separate Defence Band, the private operators stated that as in the case of USA where the entire spectrum whether it was in 800 or 900 or 1800 or in the latest 2000 MHz band was entirely vacated by the private operators and released to Defence for use in their new equipments, the operators in India were also willing to do the same. They clarified:

“If the Defence, over a period of next few years was to vacate the commercially required spectrum for the benefit of the commercial needs of the nation, it would be in the interest of the country to have a secured and dedicated spectrum allocation for the Defence. It would be ideal to do so.”

33. The Committee put forth the proposal of having a Defence Band to the representatives of Department of Telecommunications and asked for their views. The DoT stated that the technical experts of DoT and the Defence should sit together and examine the proposal thoroughly.

Defence Interest Zone

34. In the course of evidence the representatives of the Ministry of Defence stated that there was a necessity of having a defence interest zone. The defence interest zone would be an area of 100 km. contiguous to the international boundary as defined by spectrum Management Committee (GoT) the representatives requested for inclusion of the provision in the next National Frequency Allocation Plan (NFAP) which is under revision.

Growth of Mobile Services in India

35. The country is witnessing an unprecedented growth in the mobile sector. At the end of March 2005, the total mobile subscriber base was around 52.17 million, out of which GSM and CDMA subscriber base was around 41.07 million and 11.10 million respectively. A target to achieve around 200 million mobile phones by 2007 has been set.

36. According to TRAI, today, the mobile coverage in rural areas is very small and almost incidental. Though there is no spectrum constraint in such areas but mobile coverage is yet to reach in such areas. The major operators in the GSM mobile services are Bharti, Hutch, MTNL, Idea and those in the CDMA mobile services are MTNL, BSNL, Reliance Infocom and Tata Tele Services. The Association representing the GSM mobile operators is the Cellular Operators Association of India (COAI) and that representing the CDMA mobile operators is the Association of Unified Telecom Service Providers of India (AUSPI). Both the Associations and some of the individual mobile operators were called by the Committee to get their views on issues pertaining to spectrum allocation, co-ordination, efficiency etc. and the problems before them.

Spectrum allocation

37. The Committee were informed by DoT that originally when the mobile services were started there was no expectation of the type of growth which has happened lately and there were limitations in the availability of spectrum. Accordingly, spectrum in small quantities was allocated to GSM and CDMA operators in comparison to international average allocation which are of the order of 2 x 20 MHz for GSM and 2 x 14 MHz for CDMA. Currently, spectrum varying from 2 x 4.4 MHz to 2 x 10 MHz has been allocated to service providers using GSM technology, while 2 x 2.5 MHz to 2 x 5 MHz has been allocated to service providers using CDMA technology.

38. In the course of examination the Committee were informed that the policy of allotment of spectrum in the GSM category is subscriber based. 4.4 MHz is allotted immediately on successful consideration of application. 6.2 MHz is allotted when the need is felt by the service provider. Additional spectrum after 6.2 MHz to the tune of 8 MHz is given to the service provider after he attains a subscriber base of 5 lakh. A further allocation of 2.0 MHz after 8.0 MHz is given to the provider on attaining a subscriber base of 10 lakh. Thus, 10 MHz is the maximum given to an operator in this technology. However, further allocation beyond 2 x 10 MHz could be considered on achieving a subscriber base of 12 lakh.

39. The Committee were further informed that under the Unified Access Services Licence (UASL) an initial spectrum of 2.5 MHz is given to CDMA operators on case by case basis subject to availability. Additional spectrum beyond 2.5 MHz is to be considered for allocation after ensuring optimal and efficient utilization of the already allocated spectrum taking into account all types of traffic and guidelines/criteria prescribed from time to time. The criteria for allocation/release of 3rd and 4th CDMA carrier is as under:

Criteria for release of 3rd CDMA carrier:

Service area	The minimum subscriber base required for allotment of 3rd carrier
1	2
Metro Service Area	
Delhi & Mumbai	3 Lakhs
Chennai & Kolkata	2 Lakhs
Telecom Circle Service Area	
Category "A" Circle	4 Lakhs
Category "B" Circle	3 Lakhs
Category "Subscriber" Circle	1.5 Lakhs

Criteria for release of 4th CDMA carrier:

Metro Service Area	
Delhi & Mumbai	10 Lakhs
Chennai & Kolkata	6 Lakhs

 Telecom Circle Service Area

Category "A" Circle	12 Lakhs
Category "B" Circle	10 Lakhs
Category "Subscriber" Circle	5 lakhs

Note: The SDCA wise assignment of 3rd carrier will continue, in case of any specific operator who may establish technical reasons for not achieved the revised norms but having at least achieve the earlier prescribed norms *i.e.* 2 lakh subscriber in a SDCA, on the basis of which other operators have been given 3rd CDMA carrier.

Similarly, the SDCA wise assignment of 4th carrier will continue, where customer base has surpassed 3 lakhs. However, in addition to the subscriber base criteria, it shall also be ensured that the density of BTS by the Service Provider should be more than 16 BTS per hundred square Kms. For the largest (area-wise) city of the SDCA where the 4th CDMA carrier is requested.

40. The spectrum that has been allotted to the GSM based system and the CDMA based systems in different service areas is as given in Annexures 1 & 2.

Spectrum Efficiency and Spectrum Utilization

41. Spectrum efficiency is a complex issue. To make the point on complexity clear the representative of the Department of Telecommunication during evidence on 9th February, 2005 stated:

"In case of GSM, one carrier which carries the signals, the minimum width of the carrier is 200 KH. You cannot carry signals less than 200 KH. In case of CDMA carrier, the width is 1.23 MH, that is 1230 KH, which is much higher. For a single operator, you could allot multiple of 200 KH for GSM. You could allot any amount. The whole of 25 KH can be allotted. 25 MH divided into 200 KH can be allotted to any number of operators depending on your choice. There is no limitation. Whereas, in case of CDMA you have to divide 1.23 MH and then allot it to as many operators as you want. That is one aspect.

The second aspect is how much is the traffic a single carrier can carry. In 200 KH how much is the traffic that a carrier can carry in terms of the number of users and how much they can talk. We define the traffic in Arlancs. Now, in 200 KH verses 1.23 MH, if

you join is multiplied by 200 KH and make it 1.2 MH GSM, then the comparison is that 1.2 MH of CDMA can carry more traffic than the GSM. Therefore, to that extent, CDMA is more efficient for carrying traffic. That is the second aspect.

The third aspect is that the development of GSM somehow took place earlier. GSM was the early technology and it has spread very fast. Basically it is Europe based. It was certain advantages. Roaming was one great advantage of GSM. With that frequency of 890 MH and also 1710 MH dual band telephone mobiles are available. It can operate in that frequency as well as that frequency. Anywhere one goes with these two frequencies it will operate anywhere if the signals are available because it can roam. That advantage was not here in case of CDMA. The world over today, both technologies are moving very fast. The CDMA technology came later. It also is a propriety technology of an American company. There was that difficulty also with regard to CDMA. Today, the world over about 1.5 billion total mobile telephones are available of which about 1.2 billion are still GSM. So, you can see that a very large percentage is of GSM even though GSM had started much earlier and CDMA started much later, they are trying to catch up. The number has gone up substantially, but not too much. In our country likewise you will find that out of 46 million, which was told earlier, about 36 million are GSM and about 10 million is CDMA. That is the kind of comparison we have."

42. TRAI in their recommendations have stated that a methodology for bench marking for efficient utilization of spectrum in terms of Erlang/MHz/Sq. Km. was discussed. It has emerged that on account of dependence of benchmarking on large number of variables like technology used, the pattern of traffic (voice, data, video etc.) and various other demographic factors etc., this methodology is not very practical. All these parameters may have different values in different situations which really increases in size of benchmarking matrix.

43. TRAI have come to the conclusion that while the concept of efficient utilization of spectrum is a must, actual implementation through measurements is somewhat impractical. Very considerable effort and analysis will be needed to carry out such measurements and even after doing so, they could easily be questioned.

44. The representatives of the Ministry of Defence commenting upon the efficiency in utilization of spectrum in Defence Services stated during evidence that avenues were there for improvement and they

could do some internal studies to find out the extent of efficient utilization of spectrum by Defence forces. They, however, clarified that the efficiency could be measured generation-wise of the five generations of equipment that they have at present. They, however, clarified that if comparison is made globally just in regard to spectrum and not going into individual bands, then it may be 32 to 33 per cent being used by the US and around 11 to 12 per cent being used by India. But approximately that is the difference.

45. The representatives of Ministry of Defence further giving their views on efficient usage of spectrum by civil bodies stated that the equipment deployed by the operators is one of the lowest in the world. They expressed that spectrum efficient technologies must be encouraged, which do come at a cost, but, it will improve quality of service and availability of spectrum.

46. To make the point clear, if we consider two operators A & B, who have been allocated 2 MHz each, having 10 subscribers each with the following calculations can be arrived at:

Operator	Spectrum	Subscribers	Minute of Usage (per subscr.)	Total Minutes 4 = 2x3	Subscriber (per MHz) 5=2/1	Minutes (per MHz) 6=4/1
A	2 MHz	10	20	200	5	100
B	2 MHz	10	50	500	5	250

It is observed that operator 'A' appears to be equally efficient as operator 'B', using the parameter of subscriber per MHz. However, operator 'B' may also be more efficient, from the minutes/MHz matrix. Therefore, unless the parameter is fixed efficiency cannot be gauged and is a complex issue as informed to the Committee by an operator.

47. The representatives have put forth that efficiency assessment must be holistic, comprising technical, commercial and functional parameters and not just limit efficiency to technical matters which varies according to the assumptions made and the circumstances applied.

GSM V/s. CDMA—efficiency

48. The Associations of both the GSM services and CDMA services deposed before the Committee on 24th October, 2005. Operators from both the services were also present during the evidence.

49. The GSM Association informed the Committee that when cellular services were first introduced in 1995, GSM was the mandated technology. The technology choice was made by the Government after a critical examination of all possible technology options. According to COAI, India has benefited from this far-seeing decision of the Government as GSM continues to be the predominant technology both worldwide and in India. The Committee were also apprised that the global GSM subscriber base has crossed 150 crore (1.5 billion) mobile consumers by September, 2005. GSM presently accounts for over 75 per cent of all digital mobile subscribers in the world and 80 per cent of all new subscriber additions. Some of the reasons for GSM's overwhelming predominance were stated to be GSM's commitment to open standards and interoperability, economies of scale, global roaming, technology innovations and the like.

50. As regards the spectrum related issues, the Committee were informed that given India's enormous teledensity responsibilities, which will primarily be met through mobile services, it was crucial that each MHz of spectrum was most optimally and efficiently utilized by all mobile operators. Similarly, Government's policy on important issues related to spectrum i.e. its allotment, pricing, efficient usage etc. will play a crucial role in deciding the future role of the Indian wireless sector in contributing to the country's national telecom objectives. For GSM to play a predominant role in achieving India's teledensity objectives, it is important that spectrum policies and practices are fair and equitable to GSM operators.

51. The representatives of COAI further stated that as per the licensing conditions GSM operators signed the licence starting with 4.4 MHz of spectrum, CDMA started with 2.5 MHz. It is a well established fact that the spectral characteristic of CDMA gave it a five times higher subscriber (Erlang) capacity *vis-a-vis* GSM (Erlang is a unit of voice traffic that is generated by mobile networks using the raw material of spectrum. The higher the Erlangs generated, the greater is the number of subscribers that can be served). 5 MHz spectrum allotted to CDMA is equivalent to 25 MHz of GSM spectrum. They submitted that in India GSM operators are given inadequate spectrum *vis-a-vis* CDMA. It is because when GSM operators sign the licence, they start with 4.4 MHz whereas CDMA operators start with 2.5 Mhz, which is equal to 12.5 MHz of GSM equivalent spectrum.

52. The Committee enquired, why should not the system support only CDMA technology given the fact that CDMA technology is utilized better. In reply, the representative of COAI submitted:

"That is a fair question. In fact, that is the prerogative of the people of India or the Parliament to decide that if we want only

CDMA technology, then yes, so be it. But when we have two technologies, I would submit that the world is going the GSM way. GSM is the only one which goes everywhere and America is, therefore, completely isolated from the rest of the world as far as this is concerned."

53. On the issue of allocation of spectrum the representative Association of Unified Service Providers of India (AUSPI) had the following views:

".....CDMA has really brought the mobile revolution in the last few years when we were given the Unified Access Licence. Before that from 1996 to 2003, the growth was only 11 million customers whereas the entry of CDMA changed the scenario with 18 million mobile subscribers added in one year."

54. The Committee then specifically desired to know whether CDMA was more efficient than GSM in terms of spectrum management and utilization. In reply, the representative of AUSPI stated that undoubtedly CDMA was an efficient technology, but such efficiency had to be measured with economic, functional and technical aspects. Asked to elaborate, the representative of AUSPI submitted:

"As regards the economic efficiency, we are slightly at a disadvantage as compared to the GSM operators world over because they have a large infrastructure and handset vendors which give advantage in terms of prices and certain other commercial aspects. In addition, innovations like a single-chip handset are available in GSM, but we are yet to have it. They have a low priced handset because of the large availability of handsets from secondary market and they have widespread sales and distribution. The GSM operators have a formidable alliance among them for a common cause. They also have superior financial performance and high profitability.

.....Unfortunately, CDMA today does not have a widest choice of handsets, and the price segments vary from very low to very high. On the other hand, easy subscription process is there for them because of the SIM card available in the handsets, but CDMA today does not have SIM card availability in India. They have a seamless interoperability which makes them much more popular and they have seamless international roaming. If one takes all these points into account, then we would find that they have a preferential economic and financial advantage over CDMA.

As regards technical efficiency, we are spectrally more efficient if we are given at least 10 MHz, which is possible to be allotted to us.....”

55. The representative of AUSPI further stated:

“.....If you give us 10 MHz, we are more efficient than GSM of 10 MHz. You cannot call for 2.5 MHz and stop it and say that since you are more efficient, it is enough..... If a technology is spectrally efficient, you cannot punish it.”

56. Citing GSM operators argument that 2.5 MHz of spectrum allocated to the CDMA operators was equivalent to 12.5 MHz of spectrum allotted to GSM operators and that CDMA would not become competitive at 10 MHz spectrum, the Committee desired to know the authenticity of the statement made by the GSM lobby. In reply, the representative of the AUSPI stated:

“Sir, there is no basis for this statement and this statement is only made to kill competition..... There is no theoretical, practical and technical aspect to say that 2.5 MHz is equivalent to something much more given to GSM..... On the other hand, a technical document is available to support our spectral efficiency at 10 MHz. We have also given an affidavit in this respect in the court in one of the cases where we have tried to show the efficiency of CDMA at 10+10 MHz.”

57. On the question of discrimination of allocation of spectrum, the CDMA operators stated:

“.....It is because we pay the same licence fee, the same entry fee, the same spectrum charge and the same roll out obligations. Now, the spectrum allocation is not the same. When in all other areas we are same and not equitable, why the spectrum allocation should also not be the same and equal?”

58. The Committee were informed by the operators that not even a single spectrum practice discriminated against the GSM operators. Rather, the CDMA operators were discriminated so far as licensing condition was concerned because licence mandated 4.4 MHz to GSM and 5 MHz to CDMA whereas actual allocation has been 2.5 MHz to CDMA and 4.4 MHz to GSM. It was further stated that for GSM there was no roll out obligations for additional allocation, no mention of effective or efficient utilization and no subscriber base or any criteria for additional allocation. Still, spectrum beyond 4 + 4 MHz and up to

10 + 10 MHz was allocated to them and no question was asked to them about effective/efficient utilization of spectrum or installation of BTS sites and number of subscribers served.

59. On the same issue, the Department of Telecommunications stated:

“The problem is that over a period of time we have allocated spectrum in different bands depending on the needs of the situation and perhaps one did not realize that one would require the spectrum in a very cogent manner. Naturally, like any other resource, this was treated as if it were available and now we are having a situation where different band shave been occupied by different people and so that is not at one place. We need that spectrum in a comprehensive manner..... We can say that the planning has not been good..... We have given away spectrum as and when anybody asked at different placed in different bands whereas in case of other developed countries, be it USA or European countries, they have developed their standards in such a way that it did not interfere with their defence needs. With the result, they had a spectrum available to them in a block as compared to our country.”

Mobile Telephony by 2007

60. In order to achieve a target of 200 million mobile customers, by 2007, the Department of Telecommunications, in a note to the Committee have stated that the share of GSM mobile subscriber and CDMA mobile subscriber is estimated to be in the ratio of 65% and 35%. The number of GSM subscribers will be to the tune of 130 million and those of CDMA will be around 70 million. The Department has further informed that for the GSM systems in 900/1800 MHz band the estimated spectrum requirement in the Metros and other cities will be as under:

Area/State	Total estimated spectrum	Additional estimated spectrum
Metro Cities	40-55 MHz	10-25 MHz each
Other Cities	40-65 MHz	15-40 MHz each

61. According to the Department and as per the National Frequency Allocation Plan NFAP-2002, CDMA based operators have been permitted to operate in the frequency band of 824-844 MHz/869-889 MHz. A total of fourteen CDMA carries each of 1.23 MHz bandwidth are possible in this band. However, due to other existing operators at Kolkata Metro area, Gujarat, Rajasthan and West Bengal Telecom Circle, all possible 14 CDMA carries are not available.

62. Telecom Regulatory Authority of India (TRAI) in its recommendation to the spectrum requirement in the four Metropolitan cities has given the following figures for additional requirement of spectrum by GSM services to achieve the target of 200 million by 2007.

Projected Subscriber Base and Total Spectrum Requirement in Four Metropolitan Cities for GSM services

Sl. No.	Circle	Spectrum Allotted (in MHz)	Subscriber Base as on 28.2.05 (In lakhs)	Subscriber Base as on Dec. 2007 (In lakhs)	Additional Spectrum Req.		Total Spectrum Req.	
					(In MHz) Max.*	(In MHz) Min.**	(In MHz) Max.	(In MHz) Min.
1.	Delhi	32.40	40.25	104.90	64.60	28.12	97.00	60.52
2.	Mumbai	34.20	38.46	87.02	45.80	20.20	80.00	54.76
3.	Chennai	24.80	15.15	33.62	8.40	7.76	33.20	32.63
4.	Kolkata	28.40	13.26	59.56	26.60	15.72	55.00	44.12

*2x1 MHz for every one lakh additional subscriber

**2x0.36 MHz for every one lakh additional subscriber.

63. The projected subscriber base and the total spectrum requirement in the four Metropolitan cities for CDMA services as given by TRAI is as under:

Projected Subscriber Base and Total Spectrum Requirement in Four Metropolitan Cities for CDMA services

Sl. No.	Circle	Spectrum Allotted (In MHz)	Subscriber Base as on 28.2.05 CDMA (In Lakhs)	Subscriber Base as on Dec. 2007 (In Lakhs)	CDMA Additional Spectrum Req. (In MHz)		Total Spectrum Req. (In MHz)	
					Max.	Min.	Max.	Min.
1.	Delhi	12.50	15.95	41.57	17.50	3.75	30.00	16.25
2.	Mumbai	15.00	12.18	27.55	10.00	1.25	25.00	16.25
3.	Chennai	11.25	5.31	11.79	5.00	1.25	16.25	12.50
4.	Kolkata	10.00	5.27	22.66	12.50	1.25	22.50	12.50

PS: The present spectrum allocation criteria is different for CDMA and GSM operators. However, we are of the opinion that efforts should be

made to gradually move in the direction wherein the spectrum allocation criterion is technology neutral. It is, therefore, recommended that the present spectrum allocation criterion may be reviewed such that while retaining the subscriber base approach, the quantum and steps for additional spectrum allocation are technology neutral. If the GSM spectrum allocation criterion is applied to the projected CDMA subscriber base then the maximum and minimum additional spectrum requirement in Delhi would be in the range of 2x9 MHz and 2x26 MHz.

Merger of operators

64. The Committee were informed that in China there are only two operators who are providing service to a subscriber base of over 300 million with a spectrum of approximately 65 MHz. In India there are 18 mobile service providers and there is a tendency to rise. India has consumed 55 MHz of bandwidth and are still far from the vision of 200 million subscribers. The statistics given was to suggest to the Committee to encourage the merger of operators.

65. The Committee while going through the recommendations of TRAI on the 'level of competition and entry to new mobile service Providers' found that TRAI had conducted an HHI (Herfindhal-Hrischman Index) analysis to show the level of competition in different service areas, because in India licenses are given circle-wise. HHI=1 represents monopoly and HHI=0 represents perfect competition.

66. It was noted from this analysis that maximum spectrum requirement is in Metro, Category 'A' and 'B' circles wherein the competition level is very high because HHI in these service areas is below 0.24. This factor discourages the further entry of new service providers. New operators can come if there are mergers.

67. Mergers and acquisitions can currently happen between operators in the same geographic service area subject to Government guidelines on merger of licences in a service dated 21st February, 2004. As per the guidelines:

"Consequent upon the merger of licences, the merged entity shall be entitled to the total amount of spectrum held by the merging entities, subject to the condition that after merger, the amount of spectrum shall not exceed 15 MHz per operator per service area for Metros and category 'A' Service Areas, and 12.4 MHz per operator per service area in category 'B' and category 'C' Service Areas. Subject to these limits, the merged spectrum will remain

with the merged entity and would be treated as a starting point for further allocation and revision, as per the detailed Spectrum Guidelines to be issued separately. The guidelines on efficient utilization of spectrum and its pricing shall be applicable.”

Spectrum Pricing

68. During evidence on 9.2.2005 the Committee were informed by the representatives of DoT:

“At that time the GSM was the main technology as I said earlier. It was in fact evolving the world over. Europe had started the GSM. We were not sure whether people will be taking mobile. Immediately after 1991 liberalisation, the first tender was issued on 31st December 1991 and it was opened in 1991. There were litigations and it took almost two years. Only in 1994 the licences could be given. The initial trial was only for the four metros, Delhi, Mumbai, Kolkata and Chennai. Circles were not opened at that time. It was thought that mobile is going to be very costly. Calculations were made. It was expected that about Rs. 30,000 will be revenue per mobile per annum. The Government thought that about one-sixth of that should come as revenue to the Government. So, Rs. 5,000 was fixed as licence fee per customer. That is how the licence fee became very high. By 1994 when licences were given for these metros, a lot of developments took place in Europe. That was the time mobiles were becoming very popular. Immediately, thereafter the circles were opened. At that time, it was thought that two operators will be enough for competition. People will have the choice and if it is considered necessary at a later point of time, the Government will also start the service. So, three operators will be there. So, customers will get the choice. The spectrum is also limited. Not many takers may be there. That was the scheme of things at that time. Subsequently, we saw there were problems. Licence fee was very high. Then the Government thought about fee competition, unrestricted entry and revenue sharing regime. That is how things came about.”

69. In the existing provisions of licensing the spectrum charge has two components:

- (a) an entry fee which includes one time spectrum charge; and
- (b) an annual spectrum charge in terms of percentage of AGR (Annual Gross Revenue).

As per this policy the annual spectrum charges for GSM services is as under:

2% of AGR for spectrum usage upto 2x4.4 MHz

3% of AGR for spectrum usage upto 2x6.2 MHz

4% of AGR for spectrum usage upto 2x10 MHz

5% of AGR for spectrum usage upto 2x12.5 MHz

6% of AGR for spectrum usage upto 2x15 MHz

70. In addition, charges have to be paid separately in respect of spectrum used for point to point and point to multi-point radio links.

71. For CDMA operators upto 2x5 MHz annual spectrum charges are 2% of AGR.

72. On 24.10.2005 during evidence the GSM operators claimed that they were disadvantaged in the matter of spectrum usage charges as they have to pay double the usage charges *vis-a-vis* CDMA operators for the same subscriber base. They furnished the following information to prove their point before the Committee:

	Spectrum Assignment		Subscriber Base (in lakhs)		Usage Charges in %	
	GSM	CDMA	GSM	CDMA	GSM	CDMA
Entry Level	2x4.4 MHz	2x2.5 MHz	xx	xx	2%	2%
Current Level	2x10 MHz	2x5 MHz	10	10	4%	2%

73. The representatives explained that for the same subscriber base of 10 lakh subscribers GSM operators pay double the usage charges compared to CDMA. They further stated that in 2005-06 alone, GSM operators would pay additional spectrum usage charges of approximately Rs. 300 crores.

74. The CDMA operators claimed that they were requested to pay 2% of AGR for 2x5 MHz. However, the actual allocation varies from 2x2.5 MHz to 2x5 MHz. They pay 2% of AGR even in those areas where the allocation is not 2x5 MHz. They said that they wanted a level playing field in terms of capacity utilization.

3G Services Controversy

75. The Committee have been informed that 3G services is the 3rd generation services in telecommunication. The 3rd generation deals with advanced services that can be made available to the consumer through the same wireless connection. Presently in the 2G service a consumer can get voice and video on his wireless connection. In the 3G service he will be getting voice, video and data transmission through the same connection but not without a cost.

76. They have been further informed that currently in India both the technologies *i.e.* GSM and CDMA which are primarily working in the 900 MHz and the 800 MHz spectrum bandwidth respectively are providing services through the EDGE and the EVDO platforms which have internationally been recognized and identified by ITU as 3G services.

77. During the course of discussions, the Committee learnt that 3G services need additional bandwidth which is more than that normally required by 2G services. In case GSM and CDMA are already providing such services they are utilizing some of the bandwidth available to them in the 900 and 800 MHz bands respectively. The operators admitted the fact that they are providing services through the EDGE and the EVDO platforms. On requirement of additional spectrum by CDMA operators in the 800 MHz band the Committee, during the discussion with the operators, have been repeatedly informed that the spectrum available to them is only 2x20 MHz in the 800 MHz band whereas GSM operators have around 2x100 MHz in the 900 MHz and the 1800 MHz bands.

78. The CDMA operators, in their written submission have stated that in the 800 MHz band they have been provided 20+20 MHz and taking into account the need for guard band, the actual spectrum available for allocation is only about 17 + 17 or 18 + 18 MHz for 3 to 4 operators in each circle. Even the licence mandated 5+5 MHz cannot be given to all the operators where 4 operators have been operating. Whenever, there are 3 operators, after allocation of 5+5 MHz to each operator, the only additional spectrum available is 2 to 3 MHz. This is the additional spectrum that the CDMA desire to be given to them in the 800 MHz band and which the GSM operators claim to be a backdoor entry for CDMA operators.

79. In the above connection the GSM operators stated on 24.10.2005 as under:

"Just to conclude and summarize, we would wish to say that this was to repeat the US method of 1900 MHz which is completely out of line with the rest of the world. We would not recommend that for India. It gives severe interference that will become a very big problem of customers. Equipment is available in 2.1 GHz..... They are trying to get back door entry into 3G which is obviously not fair. So, what is clearly important is migration to 3G must be equitable and concurrent for both. You cannot allow one a backdoor entry. That way, it is a disregard to the dominant operators.

80. Replying to a query on the allotment of 2.1 GHz band for 3G services, the CDMA operators stated:

"If we are talking about the service, the advantage is that in the 2.1 GHz band GSM equipment is available, but CDMA equipment is not available today in the band."

81. Explaining the point on 3G Services the representative of CDMA further stated:

"Coming back to the 3G question, as far as the 3G part is concerned, it is true that though we provide 3G services in 800 MHz band, we can provide the services in 1900 MHz band. Similarly, the GSM operators can provide 3G services in 900 MHz band: they can provide in 1800 MHz band; they can provide in 2.1 GHz band also. TRAI recommended that spectrum for 3G should be only in 2.1 GHz band."

82. The DoT was asked to give their clarification on the 3G controversy. The representatives of DoT explained during evidence:

"The spectrum band in which technology development has taken place in case of GSM 900 is 890 MHz to 915 MHz which is 25 MHz of spectrum. Thus, in the case of GSM, 100 MHz of spectrum is available. On the other hand, in the case of CDMA it is 824 MHz to 844 MHz, which is only 20 MHz. The problem is arising because the technology development that has taken place and the equipment that are available for GSM are available for about 100 MHz. On the contrary, generally speaking the CDMA equipment is available for about 20 MHz only. Therefore, the problem is of satisfying four GSM operators with 100 MHz of spectrum and satisfying three CDMA operators with much lesser band width i.e. only 20 MHz of spectrum."

83. Asked to specify the measure taken by the Department to satisfy both the operators in terms of spectrum allocation, the representative, DoT submitted:

“.....Spectrum is being allocated depending on what is available and also on all that is laid down in the license.”

International Mobile Telecommunication (IMT)-2000

84. TRAI in their recommendations on spectrum related issues has stated:

“ITU has identified various frequency bands for IMT-2000 services. WARC-92 identified the bands:

-
- 1882-2025 MHz
 - 2110-2200 MHz

And WRC-2000 identified the bands:

- 806-960 MHz**
 - 1710-1885 MHz
 - 2500-2690 MHz
-

**The whole band 806-960 MHz is not identified on a global basis for IMT-2000 due to variation in the primary mobile service allocation and uses across the three ITU Regions.

One of the key objectives of IMT 2000 services was inter-operability of various mobile systems. While selecting the frequency band for IMT-2000 services it is to be ensured that the frequency bands should be such that it helps in achieving the international roaming objective and also inter-operability among various systems.

Since vacation of spectrum in existing bands (GSM-900 and GSM-1800) may take some time, the new frequency bands which are immediately available and in which the equipment is also available in the market are to be identified. Allocation of spectrum in IMT-2000 bands is being considered not only for 3G services but also because there is a problem of additional spectrum availability to existing mobile operators.

For additional allocation of spectrum while considering the availability of new frequency band and also availability of

equipment, one has to look into the spectrum identified for 3G services. While considering additional allocation of spectrum, Authority has to consider whether for 3G services spectrum allocation is to be considered an extension of 2G services or it is to be dealt separately.”

85. TRAI has further stated that:

“The necessity of allocation of additional spectrum in which IMT-2000 equipment is available may arise in the following situation:

- (1) It is expected there shall be a need of high-speed data services in the market which cannot be fulfilled by existing service available through EDGE. (As per an article in financial times dated 7th April 2005, the mobile phone will replace TV as most important medium for advertisers to reach technology-savvy consumers. The article mentioned that the spread of digital video recorders are giving consumers the ability to avoid TV commercials and therefore the way forward for advertisers to reach consumers would be to use wireless devices).
- (2) The voice traffic increases to a limit that the existing 2G spectrum may not cater to this requirement and since the IMT 2000 technology is more spectrally efficient for voice services, therefore, operator may feel the need of allocation of IMT-2000 spectrum even for voice traffic.
- (3) Where 2G spectrum is not available in the time frame in which it is required and the possibility of getting additional spectrum in IMT-2000 band are better in the same time frame.”

86. The Committee were informed that in accordance with the national Frequency Allocation Plan (NFAP) 2002, the core IMT 2000 (3G) band 1920-1980 MHz paired with 2110-2170 MHz was earmarked for Frequency Division Duplex (FDD) Mode and 2010-2025 MHz for Time Division Duplex (TDD) mode.

87. Giving his views on IMT-2000, the Member (Technology) DoT submitted on 9th February, 2005:

“.....As regards the 3G IMT 2000 band, we definitely feel that in the next three years, 3G is going to come in a very big way and internationally this is the band reserved where we have a lot of dispute between CDMA and GSM..... This is the disputed band,

that is 1920 to 1980 MHz. It means 60 MHz is available there. If more requirement is there, definitely internationally we have to meet and try to get vacated other frequencies available and manufacturers will have to produce equipment. It is not only that. Those equipment should be able to work within those frequencies now."

Spread of Mobile Services in Cities and Rural Areas

88. Regarding the requirement of additional spectrum in the Metro cities particularly Delhi and Mumbai, the representatives of DoT stated in evidence:

"It is true that in urban areas, in metropolitan areas, particularly Mumbai and Delhi, these are the two places where we need to give more and notwithstanding a very high teledensity today, still the teledensity will increase and all of us do experience a certain degree of call droppings and things like that. Now, here is a case where the issue is in terms of making additional spectrum available, as making the operators actually put in more towers and use that spectrum much more efficiently than what they are using. So, this is the issue in the metropolitan areas."

The private operators have also accepted the fact during evidence that more spectrum must be allotted especially in the big cities as early as possible.

89. Discussing about the scanty and erratic mobile services in rural areas the Committee queries the mobile operators on their insensitivity towards the rural population and desired to know their future plans on this point. The representative of the CDMA Association informed:

"The CDMA technology people are presently available in 3,900 locations. We are planning to go to 5,700 locations. While going to these 5,700 locations we are the people who are going to cover the semi-rural and rural areas. When we expand the networks on the Highways, the network expansion will cover up the villages which will come on both sides of the Highways."

90. In the same context, CMD, Bharati Cellular stated:

"Just our company alone, installed about 10,000 base stations this year and by the end of this financial year, that is, March 2006, we would cover all the census towns, which is 5,200 and at least 100,000 villages and almost all the National and State Highways."

ANNEXURE I

SPECTRUM ALLOTTED TO OPERATORS USING GSM BASED
SYSTEMS IN DIFFERENT SERVICE AREA

(As on 31.7.2005)

Sl.No.	Service Area	Operator	Frequency allotted
1	2	3	4
1.	Delhi-Metro	Bharati Cellular Ltd.	10+10 MHz
		Hutchison Essar Mobile Services Ltd.	10+10 MHz
		MTNL	6.2+6.2 MHz
		Idea Cellular Ltd.	6.2+6.2 MHz
2.	Mumbai Metro	BPL Mobile Commn.	10+10 MHz
		Hutchison Max	10+10 MHz
		MTNL	8+8 MHz
		Bharti Cellular Ltd.	8+8 MHz
3.	Kolkata Metro	Bharti Mobitel Ltd.	8+8 MHz
		Hutchison Essar	8+8 MHz
		BSNL	6.2+6.2 MHz
		Reliable Internet	6.2+6.2 MHz
4.	Chennai Metro	Aircel Ltd.	6.2+6.2 MHz
		Bharti Mobinet Ltd.	6.2+6.2 MHz
		BSNL	6.2+6.2 MHz
		Hutch Essar South	6.2+6.2 MHz
5.	Andhra Pradesh	Idea Cellular Ltd.	8+8 MHz
		Bharti Mobile Ltd.	8+8 MHz
		BSNL	8+8 MHz
		Hutch Essar South	6.2+6.2 MHz

1	2	3	4
6.	Assam	Dishnet DSL (UASL)	4.4+4.4 MHz
		Reliance Telecom	6.2+6.2 MHz
		BSNL	6.2+6.2 MHz
		Bharti-Televenture	4.4+4.4 MHz
7.	Bihar	Reliance Telecom	6.2+6.2 MHz
		BSNL	6.2+6.2 MHz
		Bharti Cellular (UASL)	6.2+6.2 MHz
		Dishnet DSL (UASL)	Yet to be allotted
8.	Gujarat	Fascel Ltd.	9.8+9.8 MHz
		Idea Cellular Ltd.	6.2+6.2 MHz
		BSNL	7.4+7.4 MHz
		Bharti Cellular Ltd.	6.2+6.2 MHz
9.	Haryana	IDEA Mobile	6.2+6.2 MHz
		Aircel Digilink	6.2+6.2 MHz
		BSNL	6.2+6.2 MHz
		Bharti Cellular Ltd.	6.2+6.2 MHz
10.	Himachal Pradesh	Bharti Telenet Ltd.	6.2+6.2 MHz
		Reliance Telecom	4.4+4.4 MHz
		BSNL	6.2+6.2 MHz
		Escorts Telecom.	4.4+4.4 MHz
		Dishnet DSL (UASL)	Yet to be allotted
11.	Jammu & Kashmir	Bharti Cellular (UASL)	4.4+4.4 MHz
		BSNL	6.2+6.2 MHz
		Dishnet DSL (UASL)	4.4+4.4 MHz
12.	Karnataka	Spice Commn.	6.2+6.2 MHz
		Bharti Mobiles Ltd.	10+10 MHz
		BSNL	8+8 MHz
		Hutch Essar	8+8 MHz

1	2	3	4
13.	Kerala	BPL Mobile	6.2+6.2 MHz
		IDEA	8+8 MHz
		BSNL	8+8 MHz
		Bharti Cellular Ltd.	6.2+6.2 MHz
14.	Maharashtra	BPL Mobile Cellular	6.2+6.2 MHz
		Idea Cellular Ltd.	10+10 MHz
		BSNL	8+8 MHz
		Bharti Cellular Ltd.	6.2+6.2 MHz
15.	Madhya Pradesh	BTA Celcom.	6.2+6.2 MHz
		Reliance Telecom.	6.2+6.2 MHz
		BSNL	6.2+6.2 MHz
		Bharti Cellular Ltd.	6.2+6.2 MHz
16.	North East	Reliance Telecom.	4.4+4.4 MHz
		BSNL	6.2+6.2 MHz
		Dishnet DSL (UASL)	4.4+4.4 MHz
		Bharti	4.4+4.4 MHz
17.	Orissa	Reliance Telecom.	6.2+6.2 MHz
		BSNL	6.2+6.2 MHz
		Bharti Cellular (UASL)	6.2+6.2 MHz
		Dishnet DSL (UASL)	4.4+4.4 MHz
18.	Punjab	Spice Commn.	8+8 MHz
		Bharti Mobile Ltd.	8+8 MHz
		BSNL	6.2+6.2 MHz
		Hutch Telecom.	6.2+6.2 MHz
19.	Rajasthan	Aircel Digilink	6.2+6.2 MHz
		Hexacom India Ltd.	6.2+6.2 MHz
		BSNL	6.2+6.2 MHz
		Escorts Telecomm.	4.4+4.4 MHz

1	2	3	4
20.	Tamil Nadu	BPL Mobile Cellular	6.2+6.2 MHz
		Aircel Ltd.	10+10 MHz
		BSNL	8+8 MHz
		Bharti Cellular Ltd.	6.2+6.2 MHz
21.	Uttar Pradesh (W)	IDEA	6.2+6.2 MHz
		BSNL	6.2+6.2 MHz
		Hutchison Essar (UASL)	6.2+6.2 MHz
		Bharti Cellular Ltd.	6.2+6.2 MHz
22.	Uttar Pradesh (E)	Aircel Digilink	6.2+6.2 MHz
		Bharti Cellular (UASL)	6.2+6.2 MHz
		BSNL	6.2+6.2 MHz
		Escorts Telecom.	4.4+4.4 MHz
23.	West Bengal	Reliance Telecom.	6.2+6.2 MHz
		Bharti Cellular (UASL)	4.4+4.4 MHz
		Hutchison Essar (UASL)	4.4+4.4 MHz
		BSNL	6.2+6.2 MHz
		Dishnet DSL (UASL)	4.4+4.4 MHz

Spectrum beyond 6.2+6.2 MHz is allotted for specific cities in the service area, except Metro service area.

ANNEXURE II

SPECTRUM ALLOTTED TO OPERATORS USING CDMA
BASED SYSTEMS IN DIFFERENT SERVICE AREAS

(As on 31.7.2005)

Sl.No.	Service Area	Name of the Operator	Amount of Spectrum Allocated in CDMA Band*
1	2	3	4
1.	Delhi	Mahanagar Telephone Nigam Ltd.	3.75+3.75 MHz
		Reliance Infocomm. Ltd.	5+5 MHz (Delhi SDCA)
		Tata Teleservices Ltd.	5+5 MHz (Delhi SDCA) 3.75+3.75 Mhz (Delhi NCR)
2.	Mumbai	Mahanagar Telephone Nigam Ltd.	5+5 MHz
		Reliance Infocomm. Ltd.	5+5 MHz
		Hughes Telecom(I) Ltd./Tata Teleservices (Mah.) Ltd.	5+5 MHz, out of which 2.5+2.5 MHz are earmarked for CDMA based system in Mumbai & 5 + 5 MHz for DAMP-TDMA based technology.
3.	Kolkata	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
		Reliance Infocomm. Ltd.	5+5 MHz (Kolkata SDCA)
		Tata Teleservices Ltd.	2.5+2.5 MHz
4.	Chennai	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
		Reliance Infocomm. Ltd.	5+5 MHz
		Tata Teleservices Ltd.	3.75+3.75 MHz
5.	A.P.	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz

1	2	3	4
		Reliance Infocomm. Ltd.	5+5 MHz in Hyderabad SDCA 3.75+3.75 MHz for rest of circle
		Tata Teleservices Ltd.	5+5 MHz in Guntur, Hyderabad, Vijayawada & Vishakhapatnam SDCAs 2.5 + 2.5 MHz in rest of circle
6.	Bihar	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
		Reliance infocomm. Ltd.	3.75+3.75 Mhz
		Tata Teleservices Ltd.	2.5+2.5 MHz
7.	Gujarat	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
		Reliance Infocomm. Ltd.	3.75 + 3.75 in Baroda & Surat SDCAS 2.5+2.5 MHz in other SDCAs
		Tata Teleservices ltd.	2.5+2.5 MHz
8.	Haryana	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
		Reliance Infocomm. Ltd.	2.5+2.5 MHz
		Tata Teleservices Ltd.	2.5+2.5 MHz
9.	H.P.	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
		Reliance Infocomm. Ltd.	2.5+2.5 MHz
		Tata Teleservices Ltd.	2.5+2.5 MHz
10.	J&K	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
11.	Kerala	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
		Reliance Infocomm. Ltd.	3.75+3.75 MHz
		Tata Teleservices Ltd.	2.5+2.5 MHz

1	2	3	4
12.	Karnataka	Bharat Sanchar Nigam Ltd. Reliance Infocomm. Ltd. Tata Teleservices Ltd.	2.5+2.5 MHz 5+5 MHz in Bangalore SDCA 3.75+3.75 MHz in rest of the circle 3.75+3.75 MHz in Bangalore SDCA & 2.5+2.5 MHz rest of the circle
13.	Maharashtra	Bharat Sanchar Nigam Ltd. Reliance Infocomm. Ltd. Hughes Telecom (I) Ltd./Tata Teleservices (Mah.) Ltd.	2.5+2.5 MHz 3.75+3.75 MHz 5+5 MHz in Pune for DAMP—TDMA based technology, out of which 2.5+2.5 MHz for CDMA based system in circle including Pune.
14.	M.P.	Bharat Sanchar Nigam Ltd. Reliance Infocomm. Ltd. Tata Teleservices Ltd. Bharti Telenet Ltd. (Surender Licence <i>w.e.f.</i> 1.10.04) allowed to retain two CDMA carriers (2.5+2.5 MHz) for one year (<i>i.e.</i> up to 30.9.2005) in the name M/s Bharati Cellular Limited)	2.5+2.5 MHz 3.75+3.75 MHz 2.5+2.5 MHz 2.5+2.5 MHz
15.	Orissa	Bharat Sanchar Nigam Ltd. Reliance Infocomm. Ltd. Tata Teleservices Ltd.	2.5+2.5 MHz 3.75+3.75 MHz 2.5+2.5 MHz

1	2	3	4
16.	Punjab	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
		Reliance Infocomm. Ltd.	3.75+3.75 MHz
		Himachal Futurastic Co. Ltd.	5+5 MHz in Ludhiana SDCAs 3.75+3.75 MHz in Jalandhar & Chandigarh SDCAs. 2.5+2.5 MHz in other SDCAs
		Tata Teleservices Ltd.	2.5+2.5 MHz
17.	Rajasthan	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
		Reliance Infocomm. Ltd.	3.75+3.75 MHz
		Shyam Telelink Ltd.	5+5 MHz in Jaipur, Jodhpur and Udaipur SDCAs 3.75+3.75 MHz at Kota 2.5+2.5 MHz in other SDCAs
		Tata Teleservices Ltd.	2.5+2.5 MHz
18.	Tamil Nadu	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
		Reliance Infocomm. Ltd.	3.75+3.75 MHz
		Tata Teleservices Ltd.	2.5+2.5 MHz
19.	U.P. (East)	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
		Reliance Infocomm. Ltd.	3.75+3.75 MHz
		Tata Teleservices Ltd.	2.5+2.5 MHz
20.	U.P. (West)	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
		Reliance Infocomm. Ltd.	3.75+3.75 MHz
		Tata Teleservices Ltd.	2.5+2.5 MHz
21.	West Bengal	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz
		Reliance Infocomm. Ltd.	2.5+2.5 MHz
		Tata Teleservices Ltd.	2.5+2.5 MHz
22.	Assam & N.E.	Bharat Sanchar Nigam Ltd.	2.5+2.5 MHz

*CorDECT system are also used by various service providers at different locations in their service areas.

RECOMMENDATIONS/OBSERVATIONS

The Committee observe that the growth of telecom services is synonymous with the growth of wireless services. In wireless communication, the signal is transmitted from one point to another without any wire and it requires use of Radio Frequency Spectrum. This Radio Frequency Spectrum is a limited natural resource available in one form only and it can only be shared amongst various countries, services, users, technologies, etc. In India, Spectrum is shared amongst Defence, Railways, ONGC, etc. and the two streams of Cellular Mobile Service Providers i.e. Global System of Mobile (GSM) and Code Vision Multiple Access (CDMA). Another technology, namely, Digital Enhanced Cordless Telecommunications (CorDECT) also shares spectrum, but as its reach is less, it is basically not substitutable for GSM & CDMA technologies. Amongst all the users of spectrum in India, Defence occupies a large portion because initially it was the sole major user. Assignment of Spectrum in India is governed by the National Frequency Allocation Plan (NFAP), 2002 and the international radio regulations of the International Telecommunications Union (ITU). The Committee find that in India, historically, apart from Defence, spectrum was allocated on need base, in bits, mostly to Government Organisations. However, due to the unprecedented growth of the telecommunication sector, especially mobile services in the non-Defence areas, requirement of spectrum by the telecom sector has increased manifold making spectrum management a critical issue. The position is no better with the Defence either, whose requirement has also grown enormously due to a substantial increase in the number of radio users all along the international border, hopping and network centric operations. There was basically no policy envisaging a higher requirement and use of the scarce commodity for the future. The Committee feel that the lack of foresighted planning on the part of the Department has led to ad hoc and injudicious allocation of spectrum which in turn has caused non-availability of this scarce resource to the telecom operators when they need it the most for faster expansion of telecom services throughout the country. Needless to say, lack of anticipated demand for spectrum and haphazard planning over a period of time has given birth to a horde of problems. The Committee feel that it is very important to move ahead, in a coordinated and planned manner, rather than in an adhoc way, and there is a dire need to have a clear cut road map for the country in order to cater to the short term

spectrum requirements upto 2007 to meet the Government objectives in addition to the long term requirements beyond 2007. It is, therefore imperative that the Department come out with a comprehensive and transparent spectrum policy, dispensing with all earlier loopholes and keeping in mind the requirement of both Defence and non-Defence sectors.

2. The Committee note that Defence has always been amongst the largest users of spectrum in India and all Defence requirements of spectrum go through the process of vetting and technical analysis by the Wireless Planning and Coordination (WPC) Wing of the Department of Telecommunications (DoT) before assignment. But the Committee are deeply concerned to hear the statement of the Defence Ministry that in the process of the assignment of spectrum to the Defence, WPC takes almost two to three years to give its clearance which obviously results in a lot of inconvenience for the Defence forces. While the responsibility of defending the nation is bestowed upon the Defence, the Committee feel that any delay in assigning the spectrum to them will certainly have numerous adverse implications. In order to avoid that, the Committee impress upon the Department to ensure timely release of spectrum to Defence to counter the adversary and there should not be slightest scope for any aberrations in this regard.

3. The Committee find that the Defence at present is holding 4.8+4.8 Mhz spectrum in 890-915/935-960 MHz band, 60+60 MHz in Metros and 65+65 Mhz in other areas in 1710-1785/1805-1880 MHz band and 60+60 Mhz in 1920-1980/2110-2170 Mhz band. So far, 20+20 MHz in 800 MHz band for the CDMA operators and 25+25 MHz in 900 MHz band for the GSM operators have already been coordinated by the Defence. Similarly, 25+25 MHz in the 1800 MHz band has been partly coordinated in favour of the GSM operators. The Committee also find that for coordination of IMT-2000 band for 3G services consultations are going on between Defence and the Ministry of Communications and Information Technology. The Defence has advocated optimal utilization of spectrum and deployment of spectrum efficient technology to improve quality of service and availability of spectrum in India where the spectrum efficiency, according to them, is one of the lowest in the world. The Committee agree with the views/suggestions of the Defence, but would simultaneously emphasize that optimal utilization of spectrum and deployment of spectrum efficient equipment is applicable to Defence also.

4. It is true that commercial norms to measure spectrum efficiency cannot be applied to Defence forces as they look for thousand hops on different frequencies on the same band, the electro magnetic interference and compatibility as well at the time of planning. It is also true that today, Defence possess generations of Soviet equipment in their inventory which are not spectrally as efficient as equipment on NATO pattern and the migration to that pattern, as explained by Defence is a 15 year Plan. The Committee were further informed that the Defence always tried to look into more spectrum efficient technology at the time it is inducted. However, because of the financial limitations, Defence was looking forward to using equipment till it becomes functionally obsolete and not technologically obsolete. Keeping in view the need for Defence preparedness of the nation, the Committee consider it important for the Defence to keep pace with the State-of-the-art technology and hence, those old technologies should be phased out. In doing so, not only will the country be better prepared for any eventuality but it would also have a lot of spectrum in its hands for utilization for other non-Defence purposes. The Committee, therefore, desire that a detailed study be carried out by the Defence to evaluate the exact requirement of funds to phase out the technologically obsolete equipments within a reasonable time frame. The Committee would like to be apprised of the findings of the study.

5. So far as vacation of spectrum by Defence is concerned, the Committee find that in 2003, the Group of Ministers were of the opinion that Defence should be given full freedom to map their changeover and wherever they find that their equipment have become obsolete or inefficient they should replace it immediately and vacate spectrum. Pursuant to that, the DoT, as reported by them in February 2005, meet and interact every month with the Defence Ministry. However, the Committee note that even after 10 months the Department has not arrived at any final view on the requirement of Defence and the vacation of spectrum including IMT-2000 band. Not only that, several recommendations of TRAI related to the spectrum issues are still under consideration of the Department. The Committee agree that decisions on spectrum related issues, being very critical and sensitive in nature are to be handled very carefully and decision taken judiciously, but they feel that such issues cannot be kept pending for ever. The Committee, therefore, would urge DoT to make their decision making process quicker and in keeping with the technological developments and the immediate requirement of the industry.

6. The Committee note that as per the recommendations made by the Spectrum Management Committee, the Defence were promised reframing for the portion of spectrum that they would coordinate. They were also promised a financial compensation estimated at Rs. 345 crore in 1998-1999 for migration. Till date, neither has the reframing been carried out nor have they been paid any amount as compensation for migration. The Committee further note that an amount of Rs. 900 crore has been earmarked for Defence to enable them to switch over to new and spectrum efficient equipment which has not yet been disbursed to them. The Committee appreciate the views of the Defence that they are prepared to share and vacate additional spectrum with the telecom service providers, if the compensation promised is awarded to them. The Committee feel that without a major reworking of the Defence networks and applications involving major spectral and financial compensation and alternate spectrum, it may be very difficult on the part of Defence to release additional spectrum. The Committee, therefore, urge the DoT to take up the matter at the appropriate level with a sense of utmost urgency for giving financial and spectral compensation to Defence.

7. The Committee observe that prior to 1999, Defence had exclusive rights over its spectrum since the allocated spectrum was categorized as the 'Defence Band'. In the year 1999, the telecom industry was allowed to establish its communication infrastructure in the country in a big way and in order to achieve that, a need was felt to reallocate the entire spectrum from the concept of major and general users to the concept of 'types of services' which resulted in sharing a common band by both the Defence and the Telecom Industry and necessitated the requirement of shedding certain spectrum from the erstwhile Defence Band for the Industry. As this arrangement has resulted in some operational inconvenience for the Defence, they have suggested that a 'Defence Band', as was in vogue prior to 1999, should be formed on the pattern of USA, UK, France, Germany etc. According to them, the formation of such a band will enable provision of adequate spectrum for the service providers and for the Defence as well besides having additional benefits of better planning for procurement and development of equipment by both Defence and the Industry. The representatives of the Industry in their deposition before the Committee have welcomed the formation of a Defence Band and the Secretary, DoT has also assured the Committee to look into the matter in consultation with the Defence Authorities. Since there is unanimity of opinion, Government should create conditions for the formulation of a Defence Band. The

Committee are of the opinion that once such a band is formed, besides other benefits, the waiting period for assignment of frequencies will reduce considerably as there will be no need for continuous coordination, vacation and migration which is obviously time consuming. The Committee would also like the Department to act upon the suggestion of the Defence and the recommendation of the Spectrum Management Committee by taking up the issue of formalization of a Defence Interest Zone (DIZ).

8. The Committee observe that at present wireless telecommunication services in India are mainly provided through Global System of Mobile (GSM) and Code Division Multiple Access (CDMA) technologies, the former coming from Europe and the latter from America and both of them competing in India. GSM operates in India in 900 & 1800 MHz band and CDMA in 800 MHz band. The frequency bands that are available to be allocated to GSM 900 & 1800 are 890-915 MHz paired with 935-960 MHz and 1710-1785 paired with 1805-1880 MHz. Similarly, 824-844 MHz paired with 869-889 MHz has been allocated to CDMA operators in the 800 MHz band. Thus, in the case of GSM, 100 MHz of spectrum is available whereas in the case of CDMA it is only 20 MHz. The task before the Government is, therefore, to satisfy four GSM operators with 100 MHz of spectrum and three CDMA operators with 20 MHz. The Committee find that against the availability, the Indian GSM operators have been allotted only 2x4.4 to 2x10 MHz and CDMA operators only 2x2.5 to 2x5 MHz whereas the international averages for GSM & CDMA spectrum allocation are 2x20 MHz and 2x14 MHz respectively, as revealed by TRAI in their Recommendations on Spectrum related issues. In other words, India's highest allocation of spectrum for GSM operators is 2x10 MHz and for CDMA operators it is 2x5 MHz against an international average of 2x20 MHz and 2x14 MHz respectively. Keeping in view the immediate and short term requirements, which will provide relief to the operators in meeting the Government objectives set for them, the Committee recommend that whatever spectrum is currently available or which will become available after vacation by Defence, may be provided in a time bound manner to the GSM and CDMA operators. The Committee desire that this exercise should be completed within a definite time frame. All efforts should be made to allot as much spectrum as the Government can in the 800/1900 MHz for the CDMA operators and the 900/1800 MHz for the GSM operators for the expansion of the telecom services.

9. The Committee find that one issue that is a cause of concern to the operators, irrespective of the usage of any particular technology,

is the methodology of allocation of spectrum to them. The Committee recommend that subject to availability of adequate spectrum, efforts should be made to address the concern with respect to the quantum of spectrum allocation in such a manner that the interest of the consumers, operators and the overall national interest is subserved keeping in view the imperatives of technological choices. The Government may consider incorporating suitable clauses in the licence agreement and the relevant legislation to ensure the optimal utilization and prevention of hoarding of spectrum.

10. The Committee note that under the Unified Access Services Licence (UASL), there is benchmarking for the allocation of additional spectrum to CDMA operators who require spectrum beyond 2.5 MHz. This benchmarking refers to ensuring optimal and efficient utilization of the already allocated spectrum taking into account all types of traffic and guidelines/criteria prescribed from time to time. However, additional spectrum beyond 4.4 MHz upto 10 MHz is allocated to the GSM operators on fulfilling the subscriber criteria. The Committee also observe that there are competing claims regarding the efficiency of utilization of spectrum by GSM and CDMA operators. Each in its anxiety for getting more spectrum has put up various contentions to establish their claim to additional spectrum. By way of illustration, the GSM operators maintain that the efficiency of CDMA operators is five times that of GSM for the same allocated spectrum. On the other hand, the CDMA operators feel that the GSM operators have a larger infrastructure and handset vendors which give advantage in terms of prices and certain other commercial aspects. The Committee are informed that the exact scope of efficiency factor of one technology over the other in relation to the number of subscribers for an allotted spectrum is yet to be worked out finally by DoT. The Committee, therefore, recommend that in the light of the DoTs comprehensive evaluation of the above, Spectrum may be released keeping in view the need for eventual harmonization of the spectrum allocation policy in accordance with the international norms.

11. The Committee are particular about the achievement of the target of 200 million mobile customers by 2007, especially in these trying situations when spectrum is so scarce that each and every MHz has to be eked out of a finite resource. The Committee observe that the DoT has estimated a requirement of an allocation of 10-25 MHz to each operator in the Metro cities and 15-40 MHz to each operator in the other cities. On the other hand, TRAI in their recommendations have estimated a minimum requirement of

28.1 MHz to 64.60 MHz in Delhi circle, 20.2 MHz to 45.80 MHz in Mumbai, 7.76 MHz to 8.40 MHz in Chennai and 15.7 MHz, to 26.6 MHz in Kolkata for the GSM services and 3.75 to 17.5 MHz, 1.25 to 10 MHz, 1.25 to 5.00 MHz and 1.25 to 12.50 MHz respectively in the CDMA services. However, according to the operators, additional spectrum of over 20 MHz in the major cities would essentially be required in the GSM services and around 10 MHz in the CDMA services. Thus, the Committee find that there is a substantial variation in the estimate of requirement of additional spectrum in urban areas. The Committee, therefore, desire that the DoT alongwith the Defence take immediate steps to identify the available spectrum towards a coordinated release thereof to the operators to meet the growing demand in urban areas, particularly the Metros. The Committee also desire that while releasing the spectrum adequate opportunity should be given to both the technologies to expand in a balanced manner.

12. As pointed out by the Defence, the Committee also recognize that the optimum utilization of spectrum is hampered due to a higher number of operators as a buffer band has to be made available between the allocation of spectrum to each of these operators. This, however, should not be a factor for restricting the entry of new operators. Eventually, consolidation of operators may happen depending on the market forces. While accepting the principle and the logic of encouraging competition and thereby offering multiple choices to the consumer, the Committee recommend that Government should take into consideration the legitimate spectrum needs of the existing operators.

13. The Committee have been informed that the existing provisions contain the payment of an entry fee which includes a one time spectrum charge and an annual spectrum charge in terms of percentage of the annual Gross Revenue (AGR) by operators who get and operate a licence for mobile operations. Recognizing the scarce and invaluable nature of spectrum, the Committee feel that the Government should be able to realize adequate revenue from the allocation of spectrum. The Government should also consider creating suitable conditions for entry of small and local players.

14. In the course of the discussions on spectrum management and the detailed study, the Committee have come to learn that whereas efforts are being made for the coordination of the 2.1 GHz band to enable the introduction of 3G services i.e. voice, data and data transmission by the GSM and the CDMA operators in India, the 3G services are already available through the EDGE and the EVDO platforms of the GSM and the CDMA operators respectively.

The Committee also learn that the EDGE and the EVDO platforms have been internationally recognized and identified by the International Telecommunication Union (ITU) as 3G services. Until such time the 2.1 GHz band is coordinated and spectrum and equipment made available in that band, the Committee feel that the nation and the users should not be denied access to the 3G and emerging services. In view of the fact that 3G and other emerging services can be provided in the 800 MHz and the 900 MHz/1800 MHz bands, the Committee desire that the Government should create conditions and provide simultaneous opportunities to both GSM and CDMA operators for roll out of 3G services.

15. The Committee learn that one of the key objectives of selecting the IMT-2000 band was inter-operability of various mobile systems through use of such frequency bands that help in achieving international roaming and inter-operability. The Committee have been informed that in the next three years 3G services will be widely available. The Committee feel that DoT should take all necessary steps to allocate the spectrum in this band fairly, judiciously and in a planned framework so that the experiences of the 2G allocation are not repeated. The Committee desire that they may be kept informed of the road map to the allocation of IMT-2000 band.

16. The Committee are pained to observe that whereas there has been no constraint of spectrum for the operators in rural areas, the mobile coverage in such areas is very small and almost incidental. This fact has been admitted by the operators themselves and the Secretary, DoT also. However, the Committee are comforted by the assurance given by the GSM operators that they will establish 5000 cell sites this year in the rural areas. The CDMA Association also has promised to cover the semi urban and rural areas when they expand their network on the Highways by setting up cell sites at 5700 locations. The Committee would like to see the fruits of such efforts in the very near future. They also desire that in the long run much more will be done in such areas to boost the teledensity in the country. The Committee feel that the Department on its part should structure their policies in such a way that noticeable penetration of mobile services in rural and remote areas is facilitated and operators penalized for deliberately neglecting such areas on flimsy grounds.

17. The Committee's attention has been drawn to a report about a new technology being developed whereby telephone exchanges could be set up for interconnecting mobile telephone operations.

Under this technology an operator could route calls from and to mobile networks within a building to a fixed network. It has been reported that since about that 60 per cent of mobile calls originate and terminate within a building and if, for the "last mile" the call could travel on fixed line, it would relieve a lot of scarce spectrum. The Committee feel that the Department of Telecommunications should examine this issue in detail and formulate a long term policy keeping in view the above mentioned developments. The Committee may be kept informed.

18. To sum up, the Committee find that spectrum requirement for both GSM and CDMA operators is urgent especially in urban areas and Metros; portions of spectrum is to be vacated from Defence without compromising the national security and by compensating them adequately; Defence Band and Defence Interest Zone (DIZ) need to be formalised; spectrum efficient equipment need to be deployed by Defence as well as the operators; rural areas require to be given due attention; penal provision for inefficient utilization of spectrum as well as for neglecting rural areas; best returns for spectrum allocation to be ensured; early allocation of spectrum to be made for commencement of 3G services, spectrum should not be kept idle and has to be used in an efficient, optimum and rational manner, both GSM and CDMA technologies have to co-exist, and a long term planning to identify new cellular bands (2500 MHz/2600 MHz) that are aligned to global developments needs to be framed. Taking all the above factors into account, the Department of Telecommunications (DoT) should come out with a comprehensive and transparent spectrum policy at the earliest catering to the requirement of both Defence and non-Defence sectors.

NEW DELHI;
21 December, 2005
30 Agraayana, 1927 (Saka)

M.M. PALLAM RAJU,
Chairman,
Standing Committee on
Information Technology.

ANNEXURE III

MINUTES OF THE TWENTY-FIRST SITTING OF THE STANDING
COMMITTEE ON INFORMATION TECHNOLOGY (2004-2005)

The Committee sat on Wednesday, 9 February, 2005 from 1100 hours to 1320 hours in Committee Room 'G074', K-Block, Parliament Library Building, New Delhi.

PRESENT

Shri M.M. Pallam Raju — *Chairman*

MEMBERS

Lok Sabha

2. Dr. P.P. Koya
3. Shri G. Nizamuddin
4. Shri Tathagata Satpathy
5. Shri K.V. Thangka Balu

Rajya Sabha

6. Shri Ashwani Kumar
7. Shri Dara Singh
8. Shri N.R. Govindarajar
9. Shri Sanjay Nirupam

SECRETARIAT

1. Shri P.D.T. Achary — *Secretary*
2. Shri Raj Shekhar Sharma — *Deputy Secretary*
3. Shri K.L. Arora — *Under Secretary*

WITNESSES

Representatives of the Department of Telecommunications

1. Shri Nripendra Misra — Chairman, Telecom Commission and Secretary, DoT

- | | | |
|-------------------------|---|---------------------------|
| 2. Shri K.L. Jain | — | Member (Technology) |
| 3. Shri Yashwant Bhawe | — | Additional Secretary |
| 4. Shri P.K. Garg | — | Wireless Advisor |
| 5. Shri J.R. Gupta | — | Sr. DDG (TEC) |
| 6. Shri Ashok Kumar | — | Jt. Wireless Advisor |
| 7. Shri R.J.S. Kushwaha | — | Jt. Wireless Advisor (NT) |
| 8. Dr. Ashok Chandra | — | Project Director |

2. At the outset, the Chairman welcomed the representatives of the Department of Telecommunications to the sitting of the Committee.

3. Thereafter, the Member (Technology), DoT, gave a brief presentation on the subject 'Spectrum Management'. The Members also sought certain clarifications on the issues relating to Spectrum Management. The representatives of the Department responded to the same. A brief presentation was also made on 'Provision of Virtual Private Network (VPN) by Internet Service Providers (ISPs)'.

4. The Chairman, then, thanked the witnesses for appearing before the Committee and furnishing valuable information that the Committee desired in connection with the examination of the subject.

A verbatim record of the sitting has been kept.

The Committee, then adjourned.

ANNEXURE IV

MINUTES OF THE SEVENTH SITTING OF THE STANDING
COMMITTEE ON INFORMATION TECHNOLOGY (2005-06)

The Committee sat on Monday, the 24th October, 2005 from 1100 hours to 1530 hours in Committee Room 'D', Parliament House Annexe, New Delhi.

PRESENT

Shri M.M. Pallam Raju — *Chairman*

MEMBERS

Lok Sabha

2. Shri Mani Cherennamei
3. Shri Sanjay Shamrao Dhotre
4. Kunwar Jitin Prasad
5. Shri P. Karunakaran
6. Dr. P.P. Koya
7. Shri Ajay Maken
8. Smt. Nivedita Sambhajirao Mane
9. Smt. P. Jayaprada
10. Shri G. Nizamuddin
11. Shri Chandra Shekhar Sahu
12. Shri P.C. Thomas

Rajya Sabha

13. Shri Vijay J. Darda
14. Shri Ashwani Kumar
15. Shri Balbir K. Punj
16. Shri Dara Singh
17. Shri N.R. Govindrajar
18. Shri Eknath K. Thakur

SECRETARIAT

1. Shri P. Sreedharan — *Joint Secretary*
2. Shri Raj Shekhar Sharma — *Director*
3. Shri K.L. Arora — *Under Secretary*

WITNESSES

Representatives of the Ministry of Defence

1. Vice Admiral Raman Puri, — ADC, CISC
PVSM, AVSM, VSM
2. Shri Bimal Julka — Joint Secretary (9G/Air)
3. Maj. Gen. AJS Lamba, VSM — ADGTC
4. Cmde. A.R. Vardhan — NM Bar, Principal
Director Naval Signals
5. Air Cmde. P. Basu — Principal Director (Signals
Air)
6. Lt. Col. Pankaj Narayan — GSO-1, JCES
7. Col. Dinesh Kumar — JCES

**Representatives of Cellular Operators
Association of India (COAI)**

1. Mr. Anil Nayar — Chairman
2. Mr. T.V. Ramachandran — Director General

**Representatives of Association of Unified Telecom Service
Providers of India (AUSPI)**

1. Shri S.C. Khanna — Secretary
2. Shri Dilip Sahay — Advisor
3. Shri Arun K. Sur — Member
4. Shri B.B. Anand — Member
5. Dr. Rakesh Mehrotra — Member
6. Shri Greg Young — Member
7. Shri Rajesh Ballal — Member

2. At the outset, the Committee noted that the Defence Secretary had sought leave of absence from the sitting due to some pressing engagements and the Additional Secretary was to represent the Ministry. However, on being informed that the Additional Secretary, Defence was busy with some discussions and thus was not present, the Committee expressed their displeasure over his absence in the Committee meeting.

3. Thereafter, the Chairman welcoming the representatives of the Ministry stated that the Committee are aware that spectrum is a primary requirement for the operations of Defence but with the unprecedented growth of telecom usage in the civil side there was a need to strike a fair balance between the national security concerns and the telecom requirements. The Committee, therefore, wanted to hear the valuable views and suggestions of the representatives of the Defence in this context.

4. The representatives of the Defence Ministry made a presentation before the Committee covering important spectrum related issues like spectral efficiency, forming of a Defence band, restricting the number of mobile players, difference between the Civil Communication and Military Communication, delay in allotment of spectrum, striking a fair balance between the national security and economic development etc. They also attended to the specific queries of the Members on different aspects of spectrum. However, the representatives were not able to clarify the members on the efficient usage of spectrum by the defence services.

5. The Chairman thanked the representatives of the Defence Ministry for appearing before the Committee.

The witnesses, then, withdrew.

The Committee, adjourned for a tea-break.

6. The Committee reassembled after the tea-break. The Chairman, then, welcomed the representatives of the Cellular Operators Association of India (COAI) and apprised them that an understanding of spectrum related issues directly from the mobile service providers and their Associations would be of great help to the Committee in coming to meaningful conclusions and to give fruitful recommendations.

7. The representatives of COAI made a presentation before the Committee advocating the causes of the GSM service providers, their requirement of spectrum, constraints etc. They also responded to the queries of the Members on various issues relating to Spectrum Management.

8. The Chairman thanked the representatives of COAI for appearing before the Committee and expressing their views in a very free and frank manner.

The witnesses, then withdrew.

9. Thereafter, the Chairman welcomed the representatives of the Association of Unified Telecom Service Providers of India (AUSPI) to the sitting of the Committee and apprised them that the views of the body representing the CDMA Operators on Spectrum related issues would be as useful as that of the GSM Operators and therefore the Committee were keen to get their views.

10. The representatives of AUSPI made a presentation before the Committee covering various aspects of spectrum like requirement of additional spectrum for CDMA Operators to facilitate easy roll out, boost competition, increase tele-density, provide more value added services etc. They also responded to the queries of the Members on various issues relating to Spectrum Management.

11. The Chairman thanked the representatives of the AUSPI for appearing and providing valuable inputs on Spectrum Management.

A verbatim record of the proceedings of the sitting was kept.

The witness withdrew.

The Committee, then, adjourned.

ANNEXURE V

MINUTES OF THE EIGHTH SITTING OF THE STANDING
COMMITTEE ON INFORMATION TECHNOLOGY (2005-06)

The Committee sat on Monday, the 24th October, 2005 from 1540 hours to 1740 hours in Committee Room 'D', Parliament House Annexe, New Delhi.

PRESENT

Shri M.M. Pallam Raju — *Chairman*

MEMBERS

Lok Sabha

2. Shri Mani Cherenamie
3. Kanwar Jitin Prasad
4. Shri P. Karunakaran
5. Dr. P.P. Koya
6. Shri Ajay Maken
7. Smt. P. Jayaprada
8. Shri G. Nizamuddin
9. Shri Chandra Shekhar Sahu
10. Shri P.C. Thomas

Rajya Sabha

11. Shri Vijay J. Dadra
12. Shri Ashwani Kumar
13. Shri Dara Singh
14. Shri N.R. Govindrajar
15. Shri Ekanath K. Thakur

SECRETARIAT

1. Shri P. Sreedharan — *Joint Secretary*
2. Shri Raj Shekhar Sharma — *Director*
3. Shri K.L. Arora — *Under Secretary*

WITNESSES

Representative of Bharti Cellular

1. Shri Sunil Bharti Mittal — CMD

Representative of Hutchison Essar

1. Mr. Asim Ghosh — Managing Director

Representative of Idea Cellular

1. Shri Vikram Mehmi — CEO

Representative of Bharat Sanchar Nigam Limited (BSNL)

1. Shri A.K. Sinha — CMD

Representatives of Reliance Infocomm

1. Mr. B.B. Anand — President
2. Mr. B.D. Khurana — Group President

Representatives of Tata Teleservices

1. Shri K.A. Chaukar — Director
2. Mr. Greg Young — Chief Technical Officer

2. At the outset, the Chairman welcomed the representatives of Bharti Cellular, Hutchison Essar, Idea Cellular and Bharat Sanchar Nigam Ltd. to the sitting of the Committee.

3. The representatives of these GSM service providers made a presentation on Spectrum requirement and management. They also attended to the queries of the Members of the subject.

4. The Chairman thanked the representatives of the GSM service providers for appearing before the Committee as well as for furnishing valuable information.

The witnesses, then, withdrew.

The Committee adjourned for a tea-break.

5. Thereafter, the Chairman, welcomed the representatives of Reliance Infocomm and Tata Teleservices to the sitting of the Committee and requested them to give their individual suggestions/opinions on spectrum requirement and management.

6. The representatives of these CDMA service providers made a presentation before the Committee and attended to the queries of the members on various aspects of Spectrum Management.

7. As some points still remained to be clarified the meeting remained inconclusive and the Chairman, therefore, requested the CDMA service providers to attend a sitting next day for further clarification.

A verbatim record of the proceedings of the sitting was kept.

The witnesses, then, withdrew.

The Committee, then, adjourned.

ANNEXURE VI

MINUTES OF THE NINTH SITTING OF THE STANDING
COMMITTEE ON INFORMATION TECHNOLOGY (2005-06)

The Committee sat on Tuesday, the 25th October, 2005 from 1100 hours to 1430 hours in Committee Room 'D', Parliament House Annexe, New Delhi.

PRESENT

Shri M.M. Pallam Raju — *Chairman*

MEMBERS

Lok Sabha

2. Shri Mani Cherennamei
3. Shri P. Karunakaran
4. Smt. Nivedita Sambhajirao Mane
5. Smt. P. Jayaprada
6. Shri G. Nizamuddin
7. Shri Chandra Shekhar Sahu
8. Shri K.V. Thangka Balu

Rajya Sabha

9. Shri Vijay J. Dadra
10. Shri Balbir K. Punj
11. Shri Dara Singh
12. Shri Ekanath K. Thakur

SECRETARIAT

1. Shri P. Sreedharan — *Joint Secretary*
2. Shri Raj Shekhar Sharma — *Director*
3. Shri K.L. Arora — *Under Secretary*

WITNESSES

Representatives of Department of Telecommunications

1. Dr. J.S. Sarma, Secretary, DOT
2. Shri B. Svaramakrishnan, Member (T)
3. Shri A.K. Sawhney, Member (F)
4. Shri Y.S. Bhave, Additional Secretary (T)
5. Shri P.K. Garg, Wireless Adviser to GOI
6. Shri J.R. Gupta, Senior DDG, TEC
7. Shri A.C. Padhi, DDG (WPF)

Representatives of the CDMA Service Providers

1. Shri K.A. Chaukar, Director, Tata Teleservices
2. Mr. Greg Young, Member, A USP
3. Shri B.B. Anand, President, Reliance Infocom
4. Shri B.D. Khurana, Group President, Reliance Infocom

2. At the outset, the Chairman welcomed the representatives of the Department of Telecommunications (DoT) to the sitting of the Committee and apprised them that the previous day the Committee heard the views of the Ministry of Defence, Cellular Operators Association of India (COAI), Association of Unified Telecom Service Providers of India (AUSPI) and individual GSM and CDMA service providers, on Spectrum requirement and management. The Chairman further stated that the Committee thought it prudent to get the views of the Department of Telecom, it being the nodal Ministry, before arriving at any conclusion/recommendation.

3. The representatives of the Department of Telecom made a presentation before the Committee and attended to various queries of the Members on the subject.

4. The Chairman thanked the representatives of the Department of Telecommunications for appearing before the Committee and for furnishing valuable information as well.

The witnesses, then, withdrew.

The Committee adjourned for a tea-break.

5. The Committee reassembled after tea-break. The Chairman welcomed the representatives of the CMDA service providers to the sitting of the Committee and requested them to attend to further queries of the Members on Spectrum Management.

6. The representatives of the CDMA service providers made another presentation before the Committee besides attending to further queries of the Members.

7. The Chairman thanked the witnesses for appearing before the Committee and providing valuable inputs on various aspects of Spectrum Management.

The witness then, withdrew.

A verbatim record of the proceedings of the sitting was kept.

The Committee, then, adjourned.

ANNEXURE VII

MINUTES OF THE FOURTEENTH SITTING OF THE STANDING
COMMITTEE ON INFORMATION TECHNOLOGY (2005-06)

The Committee sat on Tuesday, the 20th December, 2005 from 1600 hours to 1730 hours in Committee Room 'D', Parliament House Annexe, New Delhi.

PRESENT

Shri M.M. Pallam Raju — *Chairman*

MEMBERS

Lok Sabha

2. Shri Nikhil Kumar Chaudhary
3. Shri Mani Cherennamei
4. Shri Sanjay Shamrao Dhotre
5. Shri Kailash Joshi
6. Shri P.S. Gadhavi
7. Shri Chander Shekhar Sahu
8. Shri K.V. Thangka Balu

Rajya Sabha

9. Shri Vijay J. Darda
10. Shri Ashwani Kumar
11. Shri Dara Singh
12. Shri K. Rama Mohana Rao
13. Shri Motiur Rahman

SECRETARIAT

1. Shri P. Sreedharan — *Joint Secretary*
2. Shri Raj Shekhar Sharma — *Director*
3. Shri K.L. Arora — *Under Secretary*

2. At the outset, the Chairman welcomed the Members to the sitting of the Committee. The Committee, then, took up the following Draft Reports for consideration:

- (i) *** *** ***
- (ii) *** *** ***
- (iii) *** *** ***
- (iv) Draft Report on “Spectrum Management” relating to the Ministry of Communications and Information Technology (Department of Telecommunications).
- (v) The Committee, then, adopted the Draft Action Taken Reports at Serial No. (i), (ii) and (iii). Draft Report on “Spectrum Management” relating to Department of Telecommunications was partially discussed. As some Members requested the Chairman to give them some more time to go through the Draft Report, the Committee deferred further consideration of the Draft Report on “Spectrum Management” to 21 December, 2005.

3. The Committee, then, authorized the Chairman to finalize and present the above mentioned Reports adopted by the Committee to the House on a date and time convenient to him.

The Committee, then, adjourned.

ANNEXURE VIII

MINUTES OF THE FIFTEENTH SITTING OF THE STANDING
COMMITTEE ON INFORMATION TECHNOLOGY (2005-06)

The Committee sat on Wednesday, the 21st December, 2005 from 1500 hours to 1840 hours in Committee Room 'B', Parliament House Annexe, New Delhi.

PRESENT

Shri M.M. Pallam Raju — *Chairman*

MEMBERS

Lok Sabha

2. Shri Mani Cherennamei
3. Shri Sanjay Shamrao Dhotre
4. Dr. P.P. Koya
5. Shri P.S. Gadhavi
6. Shri Sohan Patel
7. Shri Chandra Shekhar Sahu
8. Shri Vishnu Sai
9. Shri Tathagata Satpathy

Rajya Sabha

10. Shri Vijay Darda
11. Shri Ashwani Kumar

SECRETARIAT

1. Shri P. Sreedharan — *Joint Secretary*
2. Shri Raj Shekhar Sharma — *Director*
3. Shri K.L. Arora — *Under Secretary*

2. At the outset, the Chairman welcomed the Members to the sitting of the Committee. Thereafter, the Committee considered the Draft Report on 'Spectrum Management' and adopted the same with some modifications/amendments as indicated in the Appendix.

3. The Committee, then, authorised the Chairman to finalise and present the above-mentioned Report to the House on a date and time convenient to him.

The Committee, then, adjourned.

APPENDIX

MODIFICATIONS/AMENDMENTS AS CARRIED OUT BY THE COMMITTEE IN THE DRAFT REPORT ON 'SPECTRUM MANAGEMENT'

Sl. No.	Page No.	Para No.	Line No.	Amendments/Modifications	
				For	Read
1	2	3	4	5	6
1.	40	01	08	"factions"	"streams"
2.	41	01	02	"an improper planning lacking in foresight"	"the lack of foresighted planning"
3.	41	01	07	"such"	"lack of anticipated demand for spectrum and"
4.	43	04	10 & 11	<i>Delete:</i> "and at the same time Defence could acquire funds by releasing those bands no more required by them"	
5.	43	04	16-18	<i>Delete:</i> "Defence may also take into consideration the funds that they could receive from the civil side for the release of spectrum while calculating the requirement of funds"	
6.	44	05	Last	<i>Add at the end</i> "and the immediate requirement of the Industry"	
7.	45	07	17-23	"The Committee feel that when there is no reservation whatsoever amongst the stake holders in the creation of an exclusive Defence Band, the Department, taking into consideration the particular band to	"Since there is unanimity of opinion, the Government should create conditions for the formulation of the Defence Band".

1	2	3	4	5	6
				which Defence wishes to migrate, the time they will take to migrate and the cost involved therein, should initiate consultation with the Defence Authorities forthwith to chalk out the modalities for the creation of a Defence Band."	
8.	46	08	Last	<i>Add at the end:</i> "All efforts should be made to allot as much spectrum as the Government can in the 800/1900 MHz for the CDMA operators and the 900/1800 MHz for the GSM operators for the expansion of the telecom services."	
9.	47	09	01	"principle"	"issue"
10.	47	09	1&2	"causing great inconvenience"	"is a cause of concern"
11.	47	09	02	"affiliation to"	"the usage of"
12.	47	09	03	"piecemeal"	"methodology of"
13.	47	09	4-17	"Whereas such droplet allocation of spectrum causes inconvenience to the operators in advance network planning and infrastructure set up, it ensures that the operators harness the allotted spectrum to the fullest capacity before additional spectrum is granted to them. While appreciating the	"The Committee recommend that subject to availability of adequate spectrum, efforts should be made to address the concern with respect to the quantum of spectrum allocation in such a manner that the interest of the consumers, operators and the overall national interest is subserved keeping in

Department 's management of spectrum, the Committee, however, feel that allocation of spectrum to the operators in bigger chunks will certainly result in a better planning and coordinated growth of telecom services. However, suitable legal provision needs to be contemplated for penal action against those operators who fail to optimally utilise the scarce resource. The Committee, therefore, desire that the Department examine the issue and if they find it plausible to allocate spectrum in one go to each of the operators, they should ensure that the operators who do not use the spectrum optimally and do not have the demonstrative ability or plan to use spectrum, should not be allowed to hold that spectrum and prevent other capable operators from moving forward and deploying innovative services for the benefit of the consumers."

view the imperatives of technological choices. The Government may consider incorporating suitable clauses in the licence agreement and the relevant legislation to ensure the optimal utilization and prevention of hoarding of spectrum."

1	2	3	4	5	6
14.	48	10	03	"is a great controversy arising"	"are competing claims regarding"
15.	48	10	4-6	"Each in their anxiety for getting more spectrum has put up some alibi or the other to prove that he is the rightful claimant for additional spectrum e.g.,"	"Each in its anxiety for getting more spectrum has put up various contentions to establish their claim to additional spectrum. By way of illustration".
16.	48	10	11 to last	"whereas CDMA is devoid of such advantages. The Committee had the opportunity to discuss the matter of efficiency in utilization of spectrum with the Defence. The Committee learnt that the needs of spectrum in the Defence were so varied that efficiency could not be measure through any scale/formula. TRAI in their report has also opined that benchmarking at this stage may not be appropriate because the allocations to both the major technologies are below the international standards. The Department of Telecommunications also do not accept the concept of efficient	"The Committee are informed that the exact scope of efficiency factor of one technology over the other in relation to the number of subscribers for an allotted spectrum is yet to be worked out finally by DoT. The Committee, therefore, recommend that in the light of DoTs comprehensive evaluation of the above, Spectrum may be released keeping in view the need for eventual harmonization of the spectrum allocation policy in accordance with the international norms."

utilization in direct terms but mince words to say that it is not practicable. The operators would be too glad to have no restrictions. In spite of all these opinions every organization/entity feels that there should be some method to check misuse and idling of precious spectrum. In the light of all these factors, the Committee are of the opinion that, in the present circumstances, spectrum may be released to operators as and when they demand, subject to availability and that this should not debar the Department from imposing any conditions in the course of operations."

17. 49 11 Full *Delete:* "During interactions with various Organisations/Associations, the Committee were given to understand that there is a lot of controversy with regard to the 'equal' and 'equitable' allocation of spectrum. While the CDMA lobby is advocating 'equal' allocation of spectrum on the ground of same entry fee, spectrum charges and roll out obligations, the GSM operators are in favour of 'equitable' allocation on the plea of level playing field in terms of capacity utilization, revenue share etc. The Department in their papers

1	2	3	4	5	6
				submitted to the Committee have used the word 'equitable' whereas TRAI has used the word at par, namely equal. The Committee recognize that such kind of dichotomy of views is difficult to reconcile. Owing to the constraint in spectrum availability and the ever growing demand for it, the Committee feel, as has already been expressed earlier, that it will be the interest of all if spectrum is allocated to the operators based on their needs. However, the Committee intricately understand the issues concerning the desire of CDMA operators of getting equal amount of spectrum as allocated to the GSM operators and also the higher subscriber base that the CDMA operators can achieve out of 2.5 MHz as compared to the GSM's 5 MHz. The Committee are of the opinion that if CDMA operators are able to make use of spectrum allocated to them to the fullest capacity and get the subscriber base which makes them eligible for an allocation equal to that of the GSM operators, they should not be denied such allocation."	
18.	49	12	01	"very anxious"	"particular"
19.	50	12	10	"great"	"substantial"
20.	50	12	12	"that can be coordinated and released"	"towards a coordinated release thereof"
21.	50	12	15 & 16	"equal and ample opportunities."	"adequate opportunity"
22.	50	13	Full	"The Committee are not inclined to buy the Defence suggestion that the number of mobile operators should be restricted to enhance efficient utilization of spectrum. As pointed out by the Secretary DoT, the	"As pointed out by the Defence, the Committee also recognize that the optimum utilization of spectrum is hampered due to a higher number of operators as a buffer band has to be made available

operators may not meet the spectrum norms in terms of demand, subscriber limit, etc. once the merger is effected. The Committee also feel that restricting the number of operators will be a retrograde step and will prove detrimental to consumer interest as it will kill competition. However, as per the guidelines, there is no restriction on mergers and hence the Committee would like to leave it to the market forces to decide on mergers. The Committee would like to suggest that before any new player is allowed into the arena, the existing players should be assured of adequate spectrum for their roll out plan. The Committee desire that such adequacy of spectrum has to be seen in the context of short term requirements upto 2007 to meet the Government objectives, the spectrum

between the allocation of spectrum to each of these operators. This, however, should not be a factor for restricting the entry of new operators. Eventually, consolidation of operators may happen depending on the market forces. While accepting the principle and the logic of encouraging competition and thereby offering multiple choices to the consumer, the Committee recommend that Government should take into consideration the legitimate spectrum needs of the existing operators."

1	2	3	4	5	6
				requirements beyond 2007 and the existing spectrum allocation criterion."	
23.	51	14	5 to last	<p>"The licence to operate within the allocated spectrum is thereafter a permanent asset of the licence holder for all times to come. The Committee are of the opinion that whereas an entry fee is a source of income to the Government, its high value may not be affordable to many serious but small players who may like to enter the field. On the other had, the Committee feel that since the operation of this business is wide-spread and would require continuity and high levels of investment, it may not be proper to allow entry to individual operators who do not have that kind of resources. The heavy entry fee therefore, acts as an automatic deterrent for small business. The Committee are of the opinion that</p>	<p>"Recognizing the scarce and invaluable nature of spectrum, the Committee feel that the Government should be able to realize adequate revenue from the allocation of spectrum. The Government should also consider creating suitable conditions for entry of small and local players."</p>

through the payment of an entry fee and the annual spectrum charge, the entrepreneur should not become a permanent holder of such spectrum usage and therefore they suggest that there could be a provision for leasing out the spectrum through an agreement. The agreement may have a clause of heavy penalty through attachment or otherwise and the withdrawal of licence. The Committee also feel that in view of the latest upsurge in mobile technology and its usage the percentage of AGR may be reconsidered."

24. 52 15 7 to end

"The Committee are, however, pained to know that even though the CDMA and the GSM operators are providing such services in the 800 MHz and the 900 MHz bands respectively, they have been accusing each other of backdoor entry. The

"Until such time the 2.1 GHz band is coordinated and spectrum and equipment made available in that band, the Committee feel that the nation and the users should not be denied access to the 3G and emerging services. In view of

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very fact that these services are provided in the 800 MHz and the 900 MHz/1800 MHz bands establish the fact that enough spectrum is available with the operators to afford the luxury. On the contrary, the Committee are bound to accept that this is being done at the cost of providing efficient 2G services to the users. The Committee are aware that the clamour for additional spectrum is the backbone of such controversy. However, the Committee feel that, till such time the 2GHz band is coordinated and spectrum made available the Department should release available spectrum on need base and as such there should be no hesitation to release the 2-3 MHz spectrum to the CDMA operators in the 800 MHz band."

the fact that 3G and other emerging services can be provided in the 800 MHz and the 900 MHz /1800 MHz bands, the Committee desire that the Government should create conditions and provide simultaneous opportunities to both GSM and CDMA operators for roll out of 3G services."

25. 52 16 5 to end

"are going to come in a big way alongwith a lot of dispute. The Committee feel that

"will be widely available. The Committee feel that DoT should take all

1	2	3	4	5	6
				DoT will take all necessary steps to allocate the spectrum in this band judiciously and in a planned framework so that the experiences of the 2G allocation are not repeated. The Committee desire that they may be kept informed of the road map to the allocation of IMT-2000 band."	necessary steps to allocate the spectrum in this band fairly, judiciously and in a planned framework so that the experiences of the 2G allocation are not repeated. The Committee desire that they may be kept informed of the road map to the allocation of IMT-2000 band."
26.	53	17	Full	<i>Add a new paragraph:</i> "The Committee's attention has been drawn to a report about a new technology being developed whereby telephone exchanges could be set up for interconnecting mobile telephone operations. Under this technology an operator could route calls from and to mobile networks within a building to a fixed network. It has been reported that since about that 60 per cent of mobile calls originate and terminate within a building and if, for the "last mile" the call could travel on fixed line, it would relieve a lot of scarce spectrum. The Committee feel that the Department of Telecommunications should examine this issue in detail and formulate a long term policy keeping in view the above mentioned developments. The Committee may be kept informed."	
27.	54	18	02	<i>Add after "co-exist":</i> "and a long term planning to identify new cellular bands (2500 MHz/2600 MHz) that are aligned to global developments needs to be framed."	