RESPONSE BY 'NOKIA' TO THE TRAI CONSULTATION PAPER NO 11/ 2004 ON SPECTRUM RELATED ISSUES.

14 July, 04

Introduction :

1. Nokia is the world leader in mobile communications. Backed by its experience, innovation, user friendliness, secure and reliable solutions alongwith high quality of its products, the company has become the leading global manufacturer/ supplier of mobile phones, and one of the leading supplier of mobile, fixed and IP networks. By adding mobility to the Internet, Nokia is creating new opportunities, enriching the daily lives of the people worldwide. Nokia is currently the global leading supplier of IMT- 2000/ WCDMA (GSM/ 3GPP path to IMT – 2000) networks and has already supplied more than 15 such networks commercially.

2. It is gratifying that the Telecom Regulatory Authority of India has taken a futuristic approach and has invited 'Consultation' on spectrum related issues of public mobile networks. We are grateful to the 'Authority' for giving us this opportunity.

3. Spectrum is a limited natural resource and is vital for the mobile wireless services/ applications. We are confident that the Authority would like to bring in the environment and policies which would encourage rapid increase in tele-density and growth of high quality public mobile services. The Regulators in telecommunication market worldwide are facilitating the environment for level playing field and fair competition amongst the service providers, to maximize benefits to the consumers.

4. We wish to point out a few issues for consideration of the 'Authority', which somehow,are not reflected in the listed 'Issues for Consultation', at Chapter-7, although some of these had been mentioned in the text of the 'Consultation Paper'.

Additional Spectrum requirement and IMT- 2000 Spectrum deployment policy (para 2.3 & 2.6.2).

5. While discussing the current spectrum availability and requirement for mobile services in India, the possible use of PCS 1900 MHz has been mentioned.

6. We wish to invite the attention of TRAI that allocation of PCS 1900 (US) band, part or whole, would nullify the IMT- 2000/ 3G paired operations in the ITU-R globally harmonized WARC- 92 identified 2G Hz band, namely 1920- 1980 MHz/ paired with 2110- 2170 MHz, by severe harmful interference and thereby block the GSM/ 3GPP evolution path to IMT-2000 services/ applications for the end users in the country. The Authority has recognized prima-facie existence of such interference at para 2.6.2 of the Consultation Paper. We believe that it could not be the objective of the Authority to deny the benefits of IMT- 2000/ 3G applications from the reach of million of the consumers in the country.

Compatibility Assessment of mixed usage of PCS 1900 (US) band and WRC- 92 identified IMT- 2000 paired band

7. Compatibility assessment/ study has indicated serious harmful interference problems by mixed usage of the PCS 1900 band and IMT- 2000/ WARC – 92 identified paired band in

the same geographical area, because of the downlink (DL) of PCS band, '1930 – 1990' MHz, is adjacent (or, co-channel) to the uplink (UL) of IMT- 2000 paired band, 1920 - 1980 MHz that is, the duplex directions of the two bands are PCS 1900 and IMT- 2000 paired band are opposite and the PCS 1900 base station transmitter (BS Tx) gets co-channel to the IMT- 2000 base station receiver (BSRx), creating high level of interference in the base stations as well as in the terminals. The design specifications of PCS 1900 and IMT- 2000 network systems and handset/ terminals do not include the possible co-existence of such situations.

(i) The network interference cannot be mitigated by wasting spectrum in guard bands. No filtering in IMT- 2000/ WCDMA base stations can remove such 'In – band' interference and large guard band is required for interference free operations, without site coordination and without external filters.

- Any attempted solution for deploying mix of PCS 1900 and WARC – 92 bands for IMT – 2000 band would invite trade-off in terms of mitigation techniques, like, coordination, long physical separation distance between the sites, large guard bands, resulting in inefficient usage of spectrum as well as the need of external filters at all base stations both for IMT- 2000 and PCS 1900 networks, with associated issues of costs and filter complexities; even the external filters will require wastage of some spectrum as guard band. Further, such operations degrade the network performance, require more sites and have not been considered appropriate worldwide in the 2 GHz band for IMT- 2000

(ii) Inter - handset/ terminal interference is also severe, so much so that a single IMT- 2000/ WCDMA handset can block all PCS 1900 / CDMA handsets (receivers) within a proximity of 200 metres. The designed internal filters in the terminals cannot mitigate the high level interference.

(iii) This proposed 'mixed band plan' would ruin the evolution path to third generation mobile services for all GSM and CDMA operators in the country.

8. No country has opted for the 'mixed band plan' approach, i.e. PCS 1900 with WARC – 92 identified IMT- 2000 paired band in 2GHz in the same geographical area.

9. It may also be noted that almost all countries are adopting the principles of harmonized spectrum use and are allocating spectrum as per the ITU globally harmonized bands (WARC- 92 identified) for IMT- 2000 and in cases where even part of PCS 1900 (US) MHz band has been allocated for historical reasons, those countries are revising/ re-farming their frequency allocation plans so as to be in consonance with the ITU globally harmonized bands for IMT- 2000 for interference free operations for interference free operations.

10. It may be of interest that the preferred combinations / options by the ITU Working Party 8F (ITU WP 8F) Report on frequency arrangements for IMT- 2000, (ITU-R, M.1036) do not also include this 'mixed band plan' as a possibility. (extract from ITU report is available at para 2.3 of the Consultation Paper).

Suggested Solution

11. The IMT – 2000 spectrum was discussed for many years worldwide and WARC- 92 identified band (1920- 1980/ 2110- 2170 MHz) was the result of a consensus process. The process includes radio technologies that fulfill harmonized service listed in ITU- R, M.1457 which form the family of co-existent technologies recommended to be deployed in the IMT- 2000 bands.

12. The suggested solution for allocating more spectrum for the current infrastructures, if so justified and needed,after exhausting the existing provisions in the National Frequency Allocation Plan (NFAP- 2002), would be to take a strategic decision towards IMT- 2000/ 3G policy and allocation of new spectrum in the ITU- globally harmonized IMT- 2000 paired band; which enables the family of five radio access standards (ITU-R, M.1457) to co-exist interference free. Both WCDMA (GSM/3GPP path for IMT- 2000) and CDMA 2000 (CDMA/ 3GPP2 path for IMT- 2000) can thus co-exist in the WARC- 92 identified IMT- 2000 paired band, namely 1920- 1980 MHz/ 2110-2170 MHz without interference and wastage of spectrum by guard bands. Such networks are already operational (e.g. in Japan).

    - More than 40 countries have already chosen the IMT- 2000/WARC –92 identified band for early implementation of IMT- 2000/ 3G services (GSM/ 3GPP path) to include countries like Japan, Korea, China, Brazil (Latin America). 120 licenses have been awarded, 37 networks are commercial with almost 6 million subscribers; 60 networks expected commercial by 2004. The current IMT- 2000 (WCDMA) license holders (120) have over 500 million 2G subscribers.

13. India had already earmarked / allocated the ITU globally harmonized, WARC-92 identified band, namely 1920 – 1980/ paired with 2110- 2170 MHz for IMT – 2000 applications, in NFAP – 2000 as well as in the current NFAP – 2002.

14. It is to be noted that IMT- 2000 (FDD) mode / WCDMA has a carrier spacing of 5 MHz. There is the practical need for atleast two 3G carriers per network, to enable deployment of hierarchical networks. International practice, widely implemented, suggests 2 x 15 MHz for each operator so as to enable voice alongwith multimedia services in an integrated way. However, 2 x 10 MHz of IMT- 2000 spectrum (with some restrictions) could be regarded as the absolute minimum required initially to enable smooth evolution of GSM operations to IMT- 2000

Deployment of WRC – 2000 bands for IMT – 2000

15. It is noted that the bands 1710- 1785 MHz/ paired with 1805- 1880 MHz, 806-960 MHz (part or whole), 2500 – 2690 MHz were identified by WRC –2000 for IMT – 2000 usage. These are often referred as 'extension bands' and the transition to IMT – 2000/ 3G applications will take place later; as per the consensus in the industry and on the ITU side preferring a coordinated approach for mobile communications.

    - It may be pertinent to point out that equipment roll out based on WRC identified bands is a time consuming and involved process both at the levels of ITU study groups and investments/ equipment design and development by the global equipment manufacturers. If past experience is any guide, like the commercial availability of infrastructure equipment for IMT- 2000 / 3G operations and handset/ terminals, based on the WARC- 92 identified bands, could commence

only recently (2003/ 2004), i.e., a gap of more than 10 to 12 years. The time schedule for equipment availability based on WRC- 2000 identified bands is uncertain and not yet known, unlikely to emerge in the foreseeable future.

- Obviously, it would be quite out of context to consider implementation of WRC – 2000 identified bands (including whole or part of 1710 - 1785/ 1805 - 1880 MHz band) for IMT – 2000 / 3G services/ applications at this stage. This band cannot replace the current IMT-2000 band from the point of view of equipment availability and 'roaming'. However, the band can be in the meantime examined for interoperability solutions and for coordination for its timely availability to enable expansion of IMT- 2000 applications in future.

IMT – 2000/ 3G in India

16. The shift to third generation technologies by mobile operators is now happening globally and IMT- 2000/ 3G wave is ready to come to India. Some leading mobile operators (GSM) in the country are already rolling out EDGE networks. Perhaps, it may not be appropiate to deny / withhold the benefits of 3rd generation services to the Indian consumers at this stage.

?? IMT - 2000 provides combined voice and data services of high quality in more spectral efficient manner than any other wide area mobile cellular system has done before.

?? Improvements in network capacity to support a truly mass market for voice services, at low cost of delivery.

?? Faster data speeds and related performance improvements enabling delivery of exciting non-voice services such as rapid file transfers, internet access, audio/ video streaming etc.

?? Global roaming.

17. We recommend that the Government may make allocations for IMT- 2000/ 3G applications at the earliest according to the global band plan B1 in ITU- R, M.1036. i.e., the WARC-92 identified band, 1920- 1980/ 2110- 2170 MHz.

Quality of Service

18. We feel that the parameter of desired grade/ quality of telecom services to the end-user plays an important role and should be appropriately reflected in the spectrum solutions and related policy decisions. Thus, as an example, use of external filters, if deployed for mitigation of harmful interference by spurious signals normally tend to downgrade the network performance, typically on the slope segment of the filter design. Such aspects of efficiency in network performance need special consideration by the Authority to ensure interference free high quality service to the customers at affordable tariffs.

National Frequency Allocation Plan by Government

19. It may interest that the National Frequency Allocation Plan (NFAP- 2002), which is a policy document evolved by the Government within the framework of ITU, lays down the spectrum allocations for various wireless services/ applications in the country, taking into account spectrum requirements of government as well as private sector in a transparent manner, including those of new emerging technologies. NFAP- 2002 is currently under review/ revision by the Government with the participation of all stakeholders from government / private sector as well as the industry. The Consultation Paper No 11/ 2004 by the Authority on 'spectrum' under consideration has several spectrum issues, which are in common with the provisions in NFAP- 2002; somehow the Consultation Paper has not mentioned about the on-going NFAP – 2002 review by the Government. As the two exercises are running almost parallel, there could be possible conflicts in the recommendations on the same subject/ Issue. . The Authority may perhaps like to take this aspect into consideration while formulating its recommendations.

'Issues for Consultation' listed in Chapter - 7

20. Our response, views and suggestions to the 'Issues' listed in Chapter 7, of the Consultation Paper , chapter-wise and Issue-wise are indicated in the subsequent paragraphs.

Response by Nokia on the "Issues for Consultation"
(Chapter –7, TRAI Consultation Paper No. 11/ 2004 on 'Spectrum')

Chapter –2 : 'Current Spectrum availability and requirement'

Chapter – 2 (i) **:-- Should the 450 MHz or any other band be utilized particularly to meet the Spectrum requirement of service providers using CDMA technology.**

1. It is desirable that as per current trends spectrum allocations may maintain technology neutral with no reservations for one particular technology. Thus no new bands should be reserved using exclusively CDMA technology, rather all possible new bands should be open for any suitable technology.

2. The 450 MHz band offers wider coverage due to more beneficial propagation characteristics than in the higher frequency bands and is hence preferred for coverage in rural areas. However, deployment of this band for digital public cellular mobile systems has several limitations.

   (a) Amount of spectrum that could be made available from 450 MHz band (450.5 – 457.5/ paired with 460.5 – 467.5 MHz) is limited and not sufficient to effectively fulfill the operators capacity needs, atleast for one (or maximum two) operator (s).

   (b) It is not an ITU globally harmonized band for cellular mobile services, which adversely affects the benefits of economies of scale, wide competition and restricts the roaming aspect.

   (c) There are other potential demands, such as PMR/ PAMR and point to point microwave links in 400/ 450 MHz bands.

3. The countries where 450 MHz had been in vogue for mobile services had been few and largely analogue based for historical reasons. There is hardly any country where of late 450 MHz deployment had been widely resorted for digital public cellular mobile systems. Digital Mobile trunked radio systems (PMR's) are deploying 400/ 450 MHz bands.

4. Keeping in view the above position, it may perhaps be not appropriate to consider 450 MHz band for implementation in India for digital cellular mobile services. As regards utilization of 'any other band' is concerned, the provisions in the National Frequency allocation Plan be followed. In general, as far as possible, the ITU recommended/ identified globally harmonized bands for digital mobile cellular mobile systems should be considered, so as to avail the benefits of economy of scale, interference free operations and seamless roaming.

5. The additional needs of CDMA based cellular mobile services, if any so justified, could be better met by assigning part of the WARC- 92 identified band for IMT- 2000 applications, (1920- 1980/ 2110- 2170 MHz); the quantum of spectrum for individual operators could be based on regulatory guidelines.

Chapter –2 (ii) **:- The Consultation paper has discussed ITU method for assessment of spectrum requirement. Based upon the methodology submit your requirement of spectrum for next 5 years. While calculating the required spectrum, please give various assumptions and its basis.**

As rightly stated in the Consultation Paper, the ITU methodology was created for WRC- 2000 to estimate the total quantum of spectrum demand for IMT – 2000/ 3G networks. This methodology has been based on a good number of initial assumptions (general network planning principles) and suits such general type of calculations, like the requirements of spectrum for carrying assumed total estimated traffic for a place/ specified geographical area. It does not help and is not relevant to apply the same ITU methodology for calculation of the spectrum quantum for individual service provider/ operator, as the results would be largely dependent on the initial assumptions and the method does not give any guidance of, how the traffic is divided between different operators, which is the main question/ issue difficult to answer/ decide. The service providers/ operators can easily choose assumptions that fit to their purposes, thereby rendering misleading results. To the best of our knowledge, this methodology has not been normally applied by the Administrations worldwide to determine spectrum needs of individual operators/ service providers.

Keeping in view the emerging dominance of data, internet and MMS services alongwith the move for change from circuit switching to packet switching, it is being increasingly felt that current methodologies based on Erlang may not successfully meet today's spectrum demand calculations. A new ITU-R methodology is presently under discussion by the ITU Working Party (ITU WP 8F).

Although, there are no hard and fast agreed formulae on the quantum of spectrum for the operator, it could be largely based on the, "traffic handling capacity", within the assigned spectrum, network success, say in terms of busy hour Erlang traffic/ Sq km/ MHz, and the desired grade of service; study report by UMTS could be a good guide (Document # 5). The carried traffic on the Service Provider network, relative market share and design requirements of the deployed technology could play a role in determining the required quantum of spectrum.

The initial assignment of spectrum band for a new service provider could be largely based on the international practices in vogue and the design requirements of the technology deployed to facilitate optimal network design. Thus for allocations for IMT- 2000/ 3G applications, the international practice indicated is that a good start up for spectrum (FDD mode) is 2 x 15 MHz (+5 MHz, TDD mode), which would give an operator a firm basis for the optimal network design and its future development. India could fall in line with this approach for IMT – 2000/ 3G applications.

In so far, spectrum quantum allocations for 2/ 2.5G services in India are concerned, spectrum policy guidelines as laid down by the Government for the GSM and CDMA operators, based on detailed studies by high level Expert Committee could be followed. Consistency in policy and stability on adequate and timely spectrum allocations assignments would ensure flow of investments by the stakeholders.

Chapter-2 (iii) :- **Whether IMT- 2000 band should be expanded to cover whole or part of 1710- 1785 MHz/ paired with 1805 - 1880 MHz.**

It is to be noted that whole band 1710- 1785/ paired with 1805- 1880 MHz was identified as an IMT- 2000 band by WRC – 2000, alongwith 806- 960 MHz (part or whole) and 2500 – 2690 MHZ bands. These are often referred as 'extension bands'. As in many countries (as also in India), the band 1710- 1785/ 1805- 1880 MHz is currently occupied by a number of existing users including public mobile networks, the time schedule for its availability in a wide scale for IMT- 2000 applications is uncertain.

It may interest to note that (75 + 75) MHz in 1710- 1785/ paired with1805-1880 MHz is earmarked in NFAP – 2002 for 2G cellular mobile services and the rising demands in 2G in India would hardly spare spectrum in this band for other than 2G services.

It may be pertinent to point out that equipment roll out based on WRC identified bands is a time consuming and involved process both at the levels of ITU study groups and investments/ equipment design and development by the global equipment manufacturers. If past experience is any guide, like the commercial availability of infrastructure equipment for IMT- 2000 / 3G operations and handset/ terminals, based on the WARC- 92 identified bands, could commence only recently (2003/ 2004), i.e., a gap of more than 10 to 12 years. The time schedule for equipment availability based on WRC- 2000 identified bands is uncertain and not yet known, unlikely to emerge in the forseeable future.

Obviously, it would be quite out of context to consider implementation of WRC – 2000 identified bands (including whole or part of 1710 - 1785/ 1805 - 1880 MHz band) for IMT – 2000 / 3G services/ applications at this stage. This band cannot replace the current IMT-2000 band from the point of view of equipment availability and 'roaming'. However, the band can be in the meantime examined for interoperability solutions and for coordination for its timely availability to enable expansion of IMT- 2000 applications in future.

India had already earmarked / allocated the ITU globally harmonized, WARC-92 identified band, namely 1920 – 1980/ paired with 2110- 2170 MHz for IMT – 2000 applications, in NFAP – 2000 as well as in the current NFAP - 2002.

IMT- 2000 (FDD) mode / WCDMA has a carrier spacing of 5 MHz. There is the practical need for atleast two 3G carriers per network, to enable deployment of hierarchical networks. International practice, widely implemented, suggests 2 x 15 MHz for each operator so as to enable voice alongwith multimedia services in an integrated way. However, 2 x 10 MHz of IMT-2000 spectrum (with some restrictions) could be regarded as the absolute minimum required initially to enable smooth evolution of GSM operations to IMT- 2000.

What is important at this stage is the desirability of smooth evolution to IMT – 2000 operations. The IMT 2000 technologies are designed to co-exist and to not interfere with each other (GSM/ WCDMA and cdma 2000). A 2G CDMA network in the PCS 1900 band and IMT – 2000/ 3G network in IMT- 2000 paired band/ WCDMA cannot be operated in the same geographical area due to harmful interference. Further, IMT – 2000 (WCDMA) mobile handset and PCS 1900 (cdma) mobile handset would have inter handset/ terminal interference, the handsets cannot operate in proximity (within 200 metres) in the same geographical area. It is as such suggested that we (India) adhere to the existing spectrum allocations in NFAP- 2002 for IMT – 2000/ 3G applications, which would enable benefits of economy of scale, wide competition and large-scale global roaming; the end user would stand to gain in the form of lower tariffs.

It may not be out of place mention here that more than 40 countries have already chosen IMT- 2000/ FDD mode (WCDMA) and 120 licenses are issued. 37 networks are commercial with almost 6 million subscribers; 60 networks expected commercial by

2004 end. The current IMT-2000 / WCDMA license holders have over 500 million 2G subscribers.

Chapter –2 (iv) *:-* **Should IMT 2000 spectrum be considered as extension of 2G mobile services and be treated in the same manner as 2G or should it be considered separately and provided to operators only for providing IMT 2000 services?**

ITU had approved a family of five radio access standards (Recommendation M.1457) for the implementation of IMT- 2000 and had identified spectrum allocations for IMT – 2000 applications. (WARC - 92 and WRC – 2000).

It would be in fitness of things that IMT- 2000 spectrum should be considered independently from 2G networks. As per international practice, there is no precedent, to the best of our knowledge, where IMT- 2000 has been treated as an extension of '2G'. The IMT- 2000 frequency bands should not be misused as 2G extension bands. This is important for stability and continued capital investment in the mobile sector.

Regarding services, it would be difficult to separate between 2G and IMT – 2000 services, which would partly overlap and differ between operators depending on their business models/ packages in competition. However, it should be open to both 2G and non-2G operators to participate in the deployment of IMT – 2000 licensing in the country.

The IMT – 2000/ 3G is relevant for India, specially because of enhanced network capacity to support a truly mass market for voice services, at low cost of delivery. Besides, it offers benefits of multimedia capability (audio/ video streaming), higher spectral efficiency, higher data speeds, improved voice/ data quality as well as global roaming.

Chapter –2 (v) :- **Reorganization of spot frequencies allotted to various service providers so as to ensure the availability of contiguous frequency band is desirable feature for efficient utilization of spectrum. Please suggest the ways and means to achieve it.**

It had been well recognized that wider and contiguous frequency band allocations bring better network design/ planning, more flexibility in the network operations, and supports lower operational costs with increased spectral efficiency.

We appreciate that reorganization / review of current service providers spot frequencies had already been initiated by the Government with good results, e.g., at Delhi and that the process could continue to be followed. .

Chapter –2 (vi) **:- Whether the band 1880 – 1900 MHz be made technology neutral for all BSOs/ CMSPs/ UASLs and be made available with the pair 1970- 1990 MHz or should it be kept technology neutral but reserved for TDD operations only.**

Pairing 1880 – 1900 MHz band with 1970- 1990 MHz, would create a totally new band that is not in line with ITU- R,M.1036 and is not supported. This band could/ should not be paired with 1970- 1990 MHz because the later is part of IMT- 2000 paired band (uplink) and would be disrupting the operations in IMT – 2000 paired band. This would also be counter productive to the international effort that has gone into ensuring interference free compatibility between GSM 1800, DECT and IMT- 2000 allocations. The ITU-R recommended globally harmonized bands for IMT- 2000 TDD operation include 1885- 1920 MHz and studies have indicated that the TDD component may have a vital role, in providing capacity in hot spots.

The band 1880- 1900 MHz should be reserved for TDD (unpaired) technologies within IMT-2000 family members listed in ITU-R, M.1457, in line with the countries that have applied the IMT- 2000 paired, WARC- 92 identified band plan. Infact, it may interest that in Japan, where 1900-1920 MHz is functional for 2G (PHS), it has planned to move the PHS control channels as part of the refarming plan, keeping in view the likely interference/ co-location issues between PHS and IMT- 2000.

The band 1880- 1900 MHz stands allocated in NFAP-2002 for TDD access based micro-cellular indigenous technologies, (like Cor- DECT.) and is being extensively deployed by service providers including the BSNL for Cor-DECT applications. The band should be kept technology neutral but reserved for TDD operations only.

Chapter –3 : ' Technical Efficiency of Spectrum Utilization'

***Chapter – 3 (vii)* :- Please offer your comments on the methodology outlined in this Chapter for determining the efficient utilization of spectrum. Also, provide your comments, if any, on the assumption made.**

The close study on the methodology indicated in the Consultation paper by TRAI determining the efficient utilization of spectrum, indicates that clear conclusions cannot be drawn purely based on theoretical considerations. All the studied networks are built well and spectrally efficient. However, there can be differences and it would be difficult to say that a particular network has not been built spectrum efficient as the operators business model or status can be different. A new entrant may need to focus on coverage, and/ or grade quality of service where another operator may concentrate on capacity and / or lower tariffs in competition. All operators could resort to more micro and pico cells, which would increase their network capacity but would also add costs to the network build-up, which has its own implications related to customers tariffs etc.

This kind of theoretical consideration could be valid only when comparing carried traffic in networks using same technology in exactly the same geographical area during their busy hour. The resultant information emerged by the proposed theoretical exercise is the carried traffic, but it may not indicate how efficiently the network is built, as the gathered information does not record/ indicate whether any capacity is still left or the whole capacity is in use already.

On the other hand, when viewed in practical scenario, the operators business case contains several options. One option is additional spectrum and usually the most economic way to increase network capacity. Other option could be smaller cells but this increases network costs, specially if the network has not been planned for micro/ pico cells from the beginning, or, if there is not enough spectrum for micro/ pico cell layer. In any case, that when more cells are introduced, new sites would create additional costs.

In India, usage of micro/ pico cells has already been resorted by the GSM service provider/ operators, wherever so warranted due to inadequacy of spectrum. Besides, other advanced techniques for optimal utilization of spectrum and for increased network capacity/ efficiency are in vogue, such as, reduced antenna heights, lesser radiated power to cater to the short inter-site distances, frequency hopping, discontinuous transmission, dynamic power control etc. etc.

> The Authority may like to seek and incentivise equality in levels of infrastructure investment, in terms of 'equivalent base station density' for various cellular mobile networks in the country.

The Consultation paper has attempted a technical analysis and drawn general conclusions to suggest that CDMA is a more spectrally efficient available technology. We wish to point out that we do not agree with the conclusions on technical spectral efficiency, and certain observations in the consultation paper in favour of CDMA technology, as, these evalutions have tended to be based by the Authority on methodology, theoretical considerations, assumptions (some are subjective and flawed), and un- representative samples, which are discriminatory for GSM and do not reflect the correct position.

We wish to point out in this context that comparisons on radio technologies are generally difficult and complex. In this kind of comparisons, the efficiency of each technology depends on the basic assumptions (including radio planning parameters) and specific situation. In some cases GSM can be more efficient and in other cases CDMA. The theoretical calculations can be made to look in favour of one technology or the other, based on the assumptions. We feel

that it is rather difficult, if not impossible, to fairly judge as to which globally acclaimed radio technology was more efficient. The comparisons have to be apple- to – apple which is too difficult and complex to achieve for correct and fair conclusions. It could better be left to the market forces to determine which technology was more efficient and to choose for deployment.

A look at the global market scenario indicates GSM is spread across 207 countries and that almost 75 percent of cellular mobile users in the world (1.34 billion) are GSM based (1.1 billion). Even in the current rate of growth of mobile users worldwide, the new users based on GSM are in the range of 80 percent. 300 GSM operators are deploying GPRS, and 81 EDGE networks are commercial in 53 countries.

In the case of 25 top data operators, recent analysis by EMC has indicated,

22 use GSM/ GPRS/ EDGE/ WCDMA platform.
2 use PDC/ WCDMA platform.
1 uses CDMA platform.

More than 40 countries (120 licenses) have chosen (GSM/ 3GPP/ WCDMA path for IMT- 2000), 37 countries networks are commercial with almost 6 million subscribers; 60 networks are expected commercial by 2004 end. The current IMT- 2000/ WCDMA license holders have over 500 million 2G subscribers.

If CDMA were more spectrum efficient, why majority of world mobile users still prefer GSM??

Chapter – 3 (viii) **:- Please provide your perception of the likely use of data services on cellular mobile systems and its likely impact on the required spectrum including the time frame when such requirements would develop.**

While focus would continue on voice services, but global trends are towards increased data services. It may interest that the basic data features are already included in all cellular mobile equipments (GSM, CDMA etc.) and all networks would provide data services in some form or the other in the long term. The capacity requirements reflect the total needs i.e. both voice as well as data services.

As regards CDMA 2000 1X-EVDO mobile data system is concerned, global commitments are few, capacity enhancement relates to data services only, and voice service is not included. It may be relevant to note that lXEVDO mobile data system, based on data speed, is to be compared with other 3G radio access standards (RTT's) in the family of IMT- 2000 technologies, and as such spectrum considerations, in all fairness, should be in the IMT- 2000 bands (and not 2G bands).

It may interest that CDMA 2000 1X-EVDV shall be providing voice and data both and is expected in the market within a year or so. Significant hardware upgrades are involved in moving to 1XEVDV from cdma 2000 1x and 1XEVDO. Advanced 3G technology like IMT-2000 (FDD) / WCDMA, with high spectral efficiency provides multiple increase in network traffic capacity and reduces the spectrum demand significantly for such traffic (voice + data) as much as 5 to 8 times in contrast to the networks of to-day. Spectral efficiency figures go upto the highest values, by achieving bit rates upto 14.4 Mbps possible with WCDMA / HSDPA.

4. India is one of the fastest developing markets, which has seen its share of GSM increase from 15 million to 29.5 million in first 12 months alone. GSM is delivering huge benefits in

voice communications for India. As of today, the data traffic in India is 3% of total traffic but demand is rising, expected to grow to 5% by the year 2005 and 7 to 9% by the year 2007. New revenue growth from 3G data services enabled by GSM/ EDGE technology, followed by 3G/ WCDMA would soon arrive in India. Some leading mobile operators (GSM) in India are already rolling out EDGE networks.

Chapter – 4 : 'Spectrum Pricing'

***Chapter – 4 (para 4.0)* :- 'Objectives of pricing policy'**

A few comments on the seven basic objectives a) to g) stated in the 'Consultation paper' for spectrum pricing are given below; any spectrum pricing policy is primarily determined by the goals, it pursues.

As regards the goal of 'spectrum efficiency', since spectrum is a scarce resource for society, in a given situation, solution 'A' is more efficient than solution 'B', if solution 'A' leaves more spectrum to others than solution 'B'. Spectrum is "saved", in as much as it is usable by other users. Thus, pricing method as an incentive to spectrum efficiency may not make much sense, if spectrum is allocated by fixed amount, size of which in non-negotiable.

In cases, where spectrum supply is greater than demand (section 5.8.1, Chapter 5), there is no reason for a pricing method differing from recovering administrative costs. The concept of "technical efficiency" is not meaningful, which could justify any pricing other than administrative cost recovery.

Simplicity and transparency are vital to the policy on spectrum pricing.

'Cost recovery' means recovering administrative and regulation costs; this goal is universally recognized as justified (commercial and a majority of non - commercial spectrum).

The goals promoting 'competition' and 'increasing rural roll out' are important. The goal of 'Raising Govt. Revenue', is possible but can have negative impacts and calls for compromises, especially related to affordable services.

The overall objectives, such as achievement of national tele-density objectives, ensuring high quality and affordable mobile services should also be taken into account while finalizing pricing of spectrum.

The Regulator may like to maintain a "technology neutral" position, leaving it to the market forces to determine which technology was more efficient and better to deploy to meet the consumers needs. (cf, para 5 & 6 in our response to Issue (vii), Chapter –3)

The following criteria are recommended for consideration on spectrum pricing, in the background of simplicity, transparency and fairness.

A uniform spectrum pricing policy for all users including various government / public sector service providers and private users. (public welfare and non- commercial community services such as police, fire services, municipal services, could pay a nominal charge to ensure efficient usage of spectrum).

Spectrum pricing should not be aimed at raising revenue.

Spectrum price should provide sufficient resource to meet/ recover the cost of spectrum administration and regulation.

Spectrum pricing could be used as one of the tools to encourage efficient usage.

All users of spectrum including government/ public sector both commercial and non commercial should pay for the spectrum at the same rates, on the same policy as they are presently paying for other services such as telephones and electricity in the country.

Chapter – 4 (ix) **:- Is there a necessity to change from the existing revenue share method for determining the annual spectrum charge?**

1. The current pricing regime 'AGR' is roughly a measure of the operators economical efficiency and may not look to be most adequate but seems to have been working well in India.

   It is held in the Consultation Paper that the low fees in the early stages of the network roll out ' does not provide any significant financial incentive to use spectrum more efficiently'. We wish to point out that low levy is not the cause of low incentive, but the real reason is that any attempt by the operator to be spectrum efficient does not modify the levy, since spectrum efficiency has a cost (more base stations), trying to be spectrum efficient would be counter - productive in this case. However, the current increasing percentage system becomes an incentive, when the service provider/ operator reaches the saturation point, may not be when it just received the spectrum, or, in early stages of the network roll out.

2. Inefficient use of spectrum if any, seems to be presently controlled by the Government policy/ system to assign additional spectrum after satisfying that the assigned spectrum has been justifiably used. Thus, the control system is in some way ensuring spectrum efficiency and incentivising the operator for the same.

3. As the levy increase restricts the infrastructure and tariff reduction, it is suggested that the overall bars of 'AGR' could be considered to be lowered, the incremental charges could be modest and cap provided on the maximum spectrum usage charge, based on the spectrum administration and regulation charges.

Chapter – 4 (x) **:- If yes, what methodology should be used to determine spectrum pricing for existing and new operators?**

1. Auction seems to be the least adequate method for existing operators or new entrants. In the case of auctions, bidders raise their bid, so long as they still see a benefit. The winner(s) are who meet value the benefit they can draw from the auctioned spectrum, but,

   - all this estimated added value is automatically taken away from them and given to Government and neither they nor the users would benefit form this added value.

   - the past experiences show that in many cases, players overestimate the benefits and the auction goes to levels which hampers the players subsequent development, or bring them to bankruptcy.

   - those prone to over-estimation are the least experienced, i.e. new entrants and their bankruptcy will leave incumbents alone, to the detriment of competition.

2. Auctions do not create incentive to save spectrum. The operator is not spurred to spend more than necessary as efficient network is more expansive than a non-efficient one and the operator is not allowed to surrender its spectrum regardless of any efforts on its part to become more efficient.

3. Regulators are becoming more aware of the downside of high pricing spectrum. The trend is to make spectrum available to the entrepreneurs at the lowest possible cost.

4. The concept of 'technical efficiency' for spectrum pricing is not considered appropriate, as the technical analysis for a particular technology is normally based on a number of assumptions and planning parameters which are largely subjective leading to misleading conclusions. . Among the proposed formulae, cost recovery and/ or AIP are preferable.

5. AIP has been widely discussed in the Consultation paper and implemented in some overseas markets. AIP needs to be based on an assumed 'efficient technology' and is normally linked to the spectrum efficiency, which has a cost (more infrastructure, like more base stations, as rightly mentioned in first paragraph of section 4.1.1.1 of the Consultation Paper); and thereby the rates of spectrum levy/ charge may tend to subjective/ arbitrary and on higher side. Further, the assumed 'efficient technology' could be controversial and tend to be discriminatory, as explained above (para 4). AIP may thus be not conducive in the present stage of Indian market conditions. AIP would imply increased operating costs for mobile operators leading to increase in tariffs. If AIP is considered to be introduced, the pricing would need to be capped to the spectrum management (administration + regulation) cost recovery only.

6. Amongst the proposed formulae, 'cost recovery' is considered to be the justified and suited mode in the present Indian environment to promote high tele- density and rapid growth of affordable high quality mobile services.

Chapter – 4 (xi) **:- In the event AIP is adopted as a means to price spectrum, would it be fair to choose GSM as a reference for determining the spectrum price?**

We do not subscribe to the views in the 'Consultation paper' on technology comparisons for 2G network operations, like 'CDMA is the most efficient available technology' etc. Kindly see our comments on Issue (vii), Chapter –3. These are globally controversial subject, and it may be difficult for us to sit in judgement. We feel that technical calculations for a particular technology (CDMA & GSM) need to be based on correct and valid assumptions and methodology and comparisons need to be apple to apple which is difficult and complex to achieve for correct and fair conclusions. As earlier stated, the concept of 'technical efficiency' as the parameter for spectrum pricing is not supported

Chapter – 4 (xii) **:- Comments on the assumptions used in A.I. P.**

Please refer to our response to the previous question, Issue (xi), Chapter-4. Placement of different technologies on an equal footing by different AIP calculations based on assumptions (often subjective) is debatable for fair play and may lead to discriminations.

Chapter – 4 (xiii) **:- In case Auction methodology is used for pricing the spectrum, please give suggestions to ensure that spectrum pricing does not become very high and spectrum is available to those who need it.**

1. Please see detailed comments on the Auction mode in our response to Issue (x), Chapter –4, above.

2. Auctions do not create incentive to save spectrum and ensure spectrum efficiency. On the contrary, they are usually an incentive to use spectrum loosely, specially so when the spectrum price deprives the operator of the means of investing in a more spectrum efficient network (efficient networks are more expansive than a non- efficient one).

3. We do not recommend auctions. However, in case the Authority desires to consider the Auction mode inspite of the problems they represent, auctions need to be organized for new entrants only. The reserve price could be based on 'cost recovery'. The statement that the reserve price should be "at a level that ensures that spectrum cannot be won cheaply" makes little sense; one should accept the verdict of market forces (unless the goal is to maximise government revenue). A good selection procedure would be one which maximised service provision and there could be rebates for service provision.

Chapter – 4 (xiv) **:- Should the new pricing methodology, if adopted, be applicable for the entire spectrum or should we continue with revenue share mechanism till 10 + 10 MHz, and apply the new method only for spectrum beyond this?**

The spectrum usage charges should be kept as low as possible to ensure affordable services and increased tele-density. The suggested charges should be 'cost recovery' for spectrum administration and regulation, say, not more than 2 to 3 percent of the revenue upto spectrum allocations 2 x 15 MHz per operator.

Chapter – 4 (xv) **:- What incentives be introduces through pricing to encourage rural coverage and / or using alternative frequency bands like 450 MHz.**

1. Rural coverage by whatever bands, if deemed non profitable, can be better ensured by universal service funding rather than simply adapting spectrum pricing, or even bringing this price to zero. Universal service funding would be a financial contribution to an operator which covers an area with mobile service, to be made by those operators which do not cover the said rural area. The net cost of providing mobile service at an affordable customer price, incurred by the universal provider, would thus be shared between all telecommunication providers which benefit from this coverage when they handle calls terminating in, or originating from, such areas. The universal provider can also be compensated by public funds. Such a mechanism is already in place in the European Union

for the fixed service (EU directive 2002/22) and the possibility to have the same framework dealing with mobile service will be examined in 2005.

2. Incentives, if any should be made available non-discriminately to all operators in India - GSM or CDMA.

3. As earlier stated in Chapter- 2 (i), 450 MHz could be preferred for rural coverage due to its beneficial propagation characteristics. The mobile operators in India may like to exploit the 450 MHz band in a technology neutral way, in preference to the proposed assignments in the PCS 1900 MHz band, which would totally jeopardize the efficient operations of the IMT-2000/ (WARC-92) band, namely, 1800- 2100 MHz band.

Chapter –4 (xvi) **:- Does M x C x W formulae for fixed wireless spectrum pricing need a revision? If so, suggest the values for M, C, W?**

The formulae does not appear to be relevant for the mobile operators, after they have moved over to a revenue shared based formulae since August 1999 ??

Chapter – 4 (xvii) **:- Should there be different pricing levels for shared spectrum versus spectrum that is allocated with protection? How should this be determined?**

If there is variation between the costs for shared versus protected spectrum, differential pricing is justified. For shared spectrum, lower pricing seems logical.

Chapter –5 : 'Spectrum Allocation'

***Chapter – 5 (xviii)* :- How much minimum spectrum should each existing operator be provided?**

1. We feel that neither Approach –1 nor, Approach – II are appropriate to fulfill the desired objectives of rapid growth of the cellular mobile services in the country, nor would lead to spectrum efficiency. Infact, the Government has already laid down policy on the subject of spectrum assignments for GSM service providers, based on a study report by high level Expert Committee and the same is being implemented. A similar exercise is on-going for CDMA based service providers and the Government decision could be implemented.

2. There is no agreed value worldwide for the minimum amount of spectrum for each operator, but if so required for guidelines, it can be viewed in the context of design requirements of the technology deployed, optimal network plan, the carried traffic and an assured quality of service. Usually, the spectrum assignment is being determined by the amount of spectrum available and number of wanted operators; often international practices act as guidelines. It is believed that the concept of minimum spectrum does not improve spectrum efficiency, rather could lead to inefficient use of spectrum in the case of big number of operators.

3. One suggested way for guidelines on spectrum assignments, could be to compile the amount of total spectrum allocation needed for a place/ geographical area based on the carried traffic by the ITU- R methodology, and subsequentally distribute this pool of spectrum amongst the wanted service providers/ operators.

    - Consequently, the service providers/ operators could get additional spectrum based on the success of their network. The success of a network can be measured eg, by Erlg/ sq Km/ MHz. The number of subscribers could be only one indication of the success but cannot be taken as the only basis for additional spectrum. The considerations to ensure prescribed grade/ quality of service is also of importance. The objective could be to ensure that successful operators have enough spectrum.

4. Regarding IMT- 200/ 3G applications, worldwide deployment for initial spectrum is generally 2 x 15 MHz (paired) and 5 MHz (unpaired). (cf., our response on Issue (iii), Chapter 2, para 6).

***Chapter – 5 (xix)* :- At what stage the amount of spectrum allocation to new entrants be considered in the 800 MHz/ 900 MHz/ 1800 MHz frequency bands?**

1. The Regulator may seek a balance between the number of operators that are allowed to enter the market and the amount of spectrum that each can be assigned (most mobile markets in the world have between 3 to 4 competing operators). It is unlikely that in the current Indian scenario, eventuality of new entrants may occur.

2. In cases, where the total allocated spectrum is made known but not made available to the service provider / operator from the beginning, and the assignments are done by the Government in stages (may be due to certain compulsions), then the assignments should be ensured to be done timely, say when 70 to 80 percent of the assigned spectrum has been used up. However, in such cases, the roadmap of part spectrum assignments should be indicated to the service provider in the beginning itself to enable optimal network planning.

3. Priority should be in giving additional spectrum for existing operators.

Chapter – 5 (xx) :- **Should spectrum be allocated in a service and technology neutral manner?**

1. Yes, the spectrum allocation should be for a particular service and technology neutral; the licensees should be free to choose technology for deployment, so long it co-exists with the other adjacent users, free of interference.

2. The spectrum allocations should normally follow the identifications by ITU – R to avail the benefits of global harmonization, economies of scale, roaming and ensure future network development.

3. From a standards point of view, the IMT – 2000 bands are technology neutral and allow ITU approved technologies listed in ITU- R, M.1457 to co-exist efficiently and operate interference free. These include upgrade path both for GSM/ 3GPP and CDMA/ 3GPP2 technologies to IMT – 2000. This would give flexibility for operators, benefits of harmonization and ensure the future development and evolution of the current 2G networks towards IMT- 2000/ 3G applications. Allocation of PCS 1900 MHz for CDMA operations should not be permitted as it is impairs the IMT- 2000 paired band plan operations by severe harmful interference and would be a retrograde step. No country in the world has deployed 2G systems at 1900 MHz (PCS US band) alongside IMT- 2000/ 3G paired band systems.

Chapter – 5 (xxi) :- **What should be the amount of cap on the spectrum assigned to each operator?**

1. There should be no capping on the amount of spectrum per operator, so long as efficient usage of spectrum, principle of level playing field and fair competition are ensured. Most regulators are moving away from spectrum caps.

2. The IMT – 2000 band(s) should be made available in blocks of 10-15 MHz.

3. There is no need for a 'generic cap', neither within 2 G spectrum, nor IMT – 2000 spectrum, nor in combination.

***Chapter – 5 (xxii*) :-** **What procedure for spectrum allocation be adopted for areas where there is no scarcity and in areas where there is scarcity?**

1. We feel that Indian mobile market has intense competition and it is very unlikely that there will be any further entrants into this sector.

2. The same procedure for spectrum allocation can be used for both areas, keeping in view the alignment with international practices, efficient usage, fair justification, level playing field, fair competition etc.

Chapter – 5 (xxiii) :- **Which competitive spectrum allocation procedure (Auction/ Beauty Contest) be adopted in cases where there are scarcity.**

1. We do not support auction mode for a country like India. While the spectrum scarcity may occur in certain areas in the practical scenario, priority should be to assign at the earliest, adequate spectrum to the existing service providers/ operators in the interest of rapid growth of cellular mobile services in the country.

Chapter – 5 (xxiv) **:- Should we consider giving some spectrum in 900 MHz band to fourth CMSPs**?

1. It may be more beneficial to assign more spectrum for the existing operators, as larger number of operators may lead to unhealthy competition, resulting in smaller number of operators in the end.

2. In India, assignment of 900 MHz would help the fourth cellular mobile operator to minimise coverage costs in rural areas.

Chapter – 5 (xxv) : **The minimum blocks such as 2 X 2.5 MHz/ 2 X 5 MHz of additional spectrum to be allocated to existing service providers in situation where IMT 2000 band is opened as well as in situations where IMT 2000 band is opened as well as in situation in situation where it is not opened.**

1. It would be appropriate to safeguard the WARC-92 identified band for IMT- 2000 applications in the country and not tampered with by allocations outside the five radio access standards approved applications in the country by ITU for IMT – 2000 (ITU-R, M.1457)

2. A minimum block size for IMT- 2000 network is 2 x 5 MHz to be technology neutral and to facilitate all ITU/ IMT – 2000 technologies (Recommendation M . 1457 of ITU refers) to enable voice and multimedia services in an integrated way. Indian operators are likely to fall in line with the majority of global mobile markets and implement IMT- 2000 (FDD) / WCDMA (also referred as 3GSM). This technology operates on a 5 MHz carrier basis.

3. Regarding IMT- 2000, initial spectrum as per international practice, is 2 x 15 MHz (paired/ FDD) and 5 MHz (unpaired / TDD). The minimum spectrum applies for both existing operators and new entrants. The absolute minimum initial requirement to enable smooth evolution of GSM/ 2G operations to IMT- 2000 could be 2 x 10 MHz (with some restrictions).

Chapter – 5 (xxvi) :- **In the event that IMT 2000 spectrum is treated as continuum to 2G, should existing operators using spectrum below the specified benchmark be treated as those eligible for IMT 2000 spectrum?**

1. As already stated, the IMT- 2000 spectrum should be considered separately from 2G networks, (cf., our response on Issue iv, Chapter-2). However, it may be interest that in the practical scenario worldwide, bulk of the IMT – 2000 spectrum has been assigned to the existing 2G operators. For incumbent operators, the benefit is that they can continue the evolution of the networks.

   The assignment of IMT- 2000 spectrum would enhance the capability of existing mobile operators to increase traffic capacity (voice + data) to support a truly mass market for voice services at low cost of delivery, offer high speed data services, multimedia services (audio/

video streaming) etc. Some of the leading mobile operators (GSM) are already rolling out EDGE networks.

Chapter 6 : 'Re-farming, spectrum trading, M & A and Surrender

Re- farming of spectrum;

Chapter – 6 (xxvii) **:- What approach should be adopted to expedite the re-farming of 1800 MHz and IMT- 2000 spectrum from existing users?**

The existing users of these bands should be encouraged for early vacation by migration to other bands and they could be appropriately compensated by the Government.

Chapter – 6 (xxviii) **:- What approach should be adopted for re-farming of spectrum after expiry of license?**

This depends on the circumstances at the expiry of license. With the recent rapid growth in public wireless services in the country, it may be prudent that the spectrum assignments are carefully reviewed. Keeping in view, this background, the spectrum assignee should normally be not given extension and related spectrum can be re-assigned as per spectrum policy, prevailing needs of spectrum and new technology evolutions. However, if the holder applies for extension several years before, the request could be considered on merit, on case- to- case basis in the background of prevailing spectrum requirements for current & futuristic users, like mobile services.

Surrender of spectrum;

Chapter – 6 (xxix) **:- Should there be any refund for spectrum surrender in principle?**

It is not clear whether 'refund' is with reference to service license or spectrum. However, users should be given refund when they have been asked by the Government/ Licensor to surrender spectrum in advance of the expiry of their licenses, to make it available for usage by a public mobile operator. No refund may be considered where licensee has chosen to exit business.

Chapter – 6 (xxx) **:- Should there be refund for spectrum surrender consequent to Unified Access license policy? If yes, what should be the basis?**

Refunds should be provided where redundancy has been created by the Government policy, like introduction of a unified access license; operators holding both fixed and mobile licenses (CDMA/ GSM spectrum) find that one of their licenses has become redundant. The refund could be pro-rata to unexpired period of license.

Chapter – 6 (xxxi) **:- How should the amount of refund be estimated ?**

1. Refund should be provided pro-rata on the unexpired period of license.

2. In case of voluntary surrender, no refunds should be considered.

Spectrum trading;

Chapter –6 (xxxii) **:- Should we open up the spectrum market for spectrum trading? If yes, what should be the time frame for doing so?**

1. It appears pre-mature for India, as spectrum is not yet sold to, or owned by the operators. However, as and when so considered applicable or feasible, we feel that spectrum trading could be opened and right of trading considered after certain number of years of license, because this is certainly a way to improve spectrum efficiency and adapt supply and demand precisely and quickly, in terms of time, space and frequencies. In particular, real market forces are preferable to regulated allocation, especially, when it comes to the typical Indian situation.

2. The complex mathematical regulations proposed in the 'Consultation' paper for a spectrum pricing system attempting to capture fairly the various economical and technical situations of the various operators, technologies, environments etc. have their limitations. The proposed complicated regulations would not be practicable and quick enough to implement and direct the commercial negotiations between the interested parties. The regulations need to be made much simpler.

Chapter –6 (xxxiii) **:- What are the pre-requisites to adopting spectrum trading?**

1. The first spectrum trading experiments in the world show that the transition from regulated spectrum to traded spectrum should be carefully prepared and be implemented gradually within an adequate legal framework. For instance, the flexibility provided by spectrum trading may have to be the subject of compromise in situations where it can erase the benefits of standardization.

    - Sufficient definition would need to apply to ensure interference free operations in the adjacent spectrum, both uplink and downlink as well as inter – handsets.

    - Care may also need to be taken to prevent spectrum hoarding.

    - Trades should be subject to ex-ante scrutiny, as used in the control of mergers, to prevent a reduction in competition. The needs of existing end-users also should be taken in to account, in cases of loss of their service.

2. It may interest that everyone the world over is experiencing a learning curve in this field.

Mergers & Acquisitions;

Chapter –6 (xxxiv) **:- Whether we should specify a cap higher than 2 X 15 MHz for Metros and Category "A" service area and 2 X 12.4 MHz for Category "B" and "C" service are in case of M & As or should it be retained?**

1. The 'Consultation paper' evokes a likely type of mergers, which could create unbalanced and unfair situations where the merged entity would have access to more spectrum than needed. However, pervasive mergers can certainly create near monopolies or lead to strategies akin to spectrum hoarding and the Regulator may need to keep this type of situation under control, whether it builds up through mergers or spectrum trading.

2. The merged entity should be required to return the surplus spectrum beyond the specified amount in accordance with the prevailing Government policy on spectrum allocations (already prescribed for GSM operators, and under finalization for CDMA operators by the Government in India).

Chapter – 6 (xxxv) **:- In case, IMT 2000 is considered as continuum of 2G services, is there a need to have a cap higher than that without IMT 2000 services ? Should there be individual caps on 2G and 3G spectrum or a combined cap?**

1. As earlier stated in our response to Issue (xxvi), Chapter -5 and to Issue (iv), Chapter-2, the IMT- 2000 spectrum should be considered separately from 2G spectrum. There is no need for a generic cap neither within 2G spectrum, nor IMT- 2000 nor in combination. (It has happened in Korea and elsewhere that CDMA 2G operators have opted for IMT – 2000/ WCDMA operations).

2. We wish to re-iterate that allocations for spectrum for 2G should not impair the ITU globally harmonized frequency band plans (WARC-92) identified for IMT- 2000 applications.

3. Most Regulators are moving away from spectrum caps and there should be no caping on the spectrum quantum per operator either in 2G or in 3G spectrum so long as efficient usage, principle of level playing field and fair competition are maintained.

Chapter –6 (xxxvi) **:- In case of M & As where the merged entity gets spectrum exceeding the spectrum cap, what should be the time frame in which the service provider be required to surrender the additional spectrum?**

This seems to be a decision to be taken on a case- per- case basis by the Regulators or competent authorities; 12 months could be considered as the reasonable period for completion of the transfer.
