

TVR/VIL/105 14 August 2013

#### Shri Arvind Kumar Advisor – Network, Spectrum and Licensing The Telecom Regulatory Authority of India Mahanagar Door Sanchar Bhawan Jawahar Lal Nehru Marg (Old Minto Road) New Delhi-110002

Dear Sir,

#### VIL Response to TRAI Consultation Paper on Valuation and Reserve Price of Spectrum

Vodafone India is happy to respond to the TRAI's Consultation Paper on 'Valuation and Reserve Price of Spectrums' and offers its inputs and comments to the various important questions posed in the Authority's Paper dated 23<sup>rd</sup> July 2013.

Affordable telecommunication being the foremost telecom policy objective, we respectfully submit that this should underpin the Authority's examination of the subject of spectrum- the lifeblood of a mobile service- in the present Consultation. We believe that this policy objective needs to be addressed while formulating conditions for the desired market discovery of spectrum price through a successful, open and transparent auction that also provides fair revenues to the Government. We submit that the maximization of the total socio-economic benefits and not merely of auction revenue should be the objective.

Against the above backdrop, we submit, in the Annexure to this letter, our detailed response to all the questions posed by the Authority and give below the key highlights in a summarized form:-

- 1. We most respectfully submit that the entire spectrum quashed by the Hon'ble Supreme Court's Order of 2<sup>nd</sup> February 2012 is not being put up for auction. There seems to be a discrepancy and we request that this be addressed on priority.
- The reserve prices recommended should encourage purchase of ALL the spectrum as unsold/idle spectrum is a valuable socio-economic opportunity irretrievably lost to the nation forever.

There are GDP data derived estimates that suggest that, from the quantum of Spectrum lying unsold/ idle, the nation could be losing benefits worth over hundred thousand crores per annum, - something this country can ill afford.

- 3. The reserve price, the auction process and the spectrum-related policy features should be such as to overcome fragmentation and facilitate consolidation of spectrum. Fragmentation of spectrum destroys valuable overall traffic-carrying capacity of networks thereby inflicting huge losses to the economy, the society and its citizens.
- 4. VIL supports spectrum trading since it is an important tool to ensure that spectrum is used productively and efficiently and to facilitate consolidation. It has been successfully introduced in a number of countries. We ask TRAI to recommend its introduction and to consult on the

modalities of spectrum trading. More liberal M&A norms and spectrum sharing norms in line with global practices, would also be very beneficial for all stakeholders.

- 5. The various cost approaches to value spectrum, as tabled by the Authority in the Consultation Paper all depend on a number of factors that are extremely sensitive to the assumptions. Hence they produce widely varying results and are not stable enough to give confidence in the end result.
- 6. Indexing historic market prices, whether from 2001 (1800MHz) or 2010 (2100MHz), to estimate current market prices is also not appropriate because the expectations about the future, on which those historic prices are based, change over time. As the Authority rightly notes, there has been a significant downswing in the market since 2010.
- 7. Our approach to setting reserve prices has been a pragmatic one. We have chosen, *a priori*, a 'reasonable' set of prices—the 3G reserve prices in 2010—and asked whether these are likely to result in a successful auction. Using a variety of tests and benchmarks we find this to be the case and we firmly believe that, if adopted, our proposal will produce an auction outcome that will be in the long-term interests of the country.
- 8. The block size of 1.25 MHz is extremely unsuitable, with inbuilt inefficiency leading to a situation where there is wastage of the precious and scarce spectrum by operators and spectrum left unintentionally idle by the Government. This goes against NTP objectives. The wastage is further magnified in case the allocations are not as per the GSM ARFCN (Absolute Radio Frequency Channel Number) Table. A 200 KHz block is the ideal size for an auction for GSM and its evolved technologies.
- 9. The term 'refarming' of 900MHz as used by DoT, is itself a misnomer and completely untenable. Refarming has very different connotations as accepted in the global telecom fraternity. It is not applicable in the current Indian context of technology neutrality as well as license extension and where there is no 900 MHz available for 'refarming'. Thus any auction of 900MHz is not only untenable under the existing policy and licensing regime but is also not pursuant to the directions of the Hon'ble Supreme Court, which has amply clarified that 900 MHz is not covered under its Order of 2<sup>nd</sup> February, 12.
- 10. Auction of 900 MHz may be possible when the E-GSM band becomes available, which proposal we heartily support. We urge TRAI and the Government to immediately start an exercise to free up all the EGSM, by reconfiguring the 800MHz band plan and accommodating CDMA users in the lower end of the CDMA 800MHz band. Any overlap into the E-GSM spectrum could be addressed through negotiations and discussions with the CDMA users, including the option to compensate them for giving up the spectrum. Some 900 MHz could also be possibly arranged through negotiation and discussions with other sources /users.
- 11. The current escalating Spectrum Usage Charges (SUC) regime is a legacy from bilateral settlement between Industry and Government in 2002 and, that too, in a scenario of administrative allocation of spectrum. However, today the escalating SUC regime is an anomaly and in dire need of urgent reform. As rightly noted by the Authority, it creates a non-level playing

field amongst different players; penalizes larger operators who penetrate deeper into the market to connect the unconnected; discourages mergers and represents a significant burden on the industry. In addition to these disadvantages we believe that the current policy of escalating charges, which is unique to India, discourages the purchase of spectrum, perpetuates the inefficient use of spectrum, distorts spectrum auctions, skews technology choices and ultimately may result in lower revenues for the government. We suggest that a fixed SUC per MHz per annum would be the appropriate way to go as this would resolve all the anomalies and would also be more desirable and advantageous for the growth of the sector. At the very least, we recommend that we move to a flat / uniform percentage SUC.

We request that the above submissions may kindly be treated as an integral part of our detailed submissions which are attached as Annexure -1.

We look forward to the kind consideration of the Authority for the above.

Kind regards,

Sincerely yours,

T. V. Ramachandran Resident Director Regulatory Affairs and Government Relations

Copy to

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## RESPONSE OF VODAFONE INDIA LIMITED TO TRAI CONSULTATION ON VALUATION AND RESERVE PRICE OF SPECTRUM

#### 14 August'2013

#### Summary

Vodafone is pleased to respond to the TRAI's consultation on the Valuation and Reserve price of spectrum. The issues raised by the Authority are vital to the long-term health of the industry: the cost of spectrum, the future supply of spectrum, the trading of spectrum and the ongoing charges applied to the holders of spectrum.

The objective of the forthcoming auction should be to sell *all* of the spectrum at a price discovered by the auction, not set by the seller. Too high reserve prices have left much spectrum unsold and sitting idle, rather than in productive use. Unused spectrum is an opportunity lost forever by the Nation; it can never be made up by producing more minutes or megabytes later. The spectrum that will continue to be held by the Department of Telecommunications (DoT) *after* the next auction will further exacerbate this lost opportunity.

Indexing historic market prices, whether from 2001 (1800MHz) or 2010 (2100MHz), to estimate current market prices is not appropriate because the expectations about the future, on which those historic prices are based, change over time. As the Authority rightly notes, there has been a significant downswing in the telecommunications market since 2010. The recent unsuccessful auctions of November 2012 and March 2013 provide ample evidence that using past market prices to set current reserve prices does not work. Also, approximating the market price of all India spectrum and distributing this across LSAs in proportion to a *single* factor is very likely to produce anomalies and inaccuracies because market prices vary between LSAs as a consequence of *many* factors.

We find that the avoided cost approaches outlined by the Authority produce widely differing results depending on the assumptions made about future demand, technological change and the future supply of spectrum. We suggest that these types of models are too unstable to give us confidence that reserve prices based on their output will lead to a successful auction.

Instead, we advocate a pragmatic approach. We propose using, with minor modifications, the reserve prices from the successful 2010 2100MHz auction in the forthcoming 1800MHz auction. On average, this means a 58% reduction from the combined reserve prices in the November 2012 and March 2013 auctions with these drops concentrated in the LSAs where most of the spectrum went unsold. We benchmark our proposal against auctions of 1800MHz held in other countries, our econometric analysis of the November auction, Vodafone's recent offer to the DoT and our assessment of what a 'marginal' operator would be prepared to pay for spectrum. All of these comparators give us comfort that our suggestion will result in a successful auction.



We maintain that our existing licenses provide for their extension—with the allocated spectrum and that our 900MHz spectrum cannot be put to auction. We have stated that we are willing to pay a market-related price for the extension of our licenses. In this regard, we have made an offer to the DoT of INR 4,000 crores to extend our licenses for 20 years in Delhi, Mumbai and Kolkata with a flat rate Spectrum Usage Charges (SUC) of 3% AGR. We have also indicated our willingness to discuss the issue further with the Government to arrive at mutually agreed terms and conditions.

We urge the TRAI to recommend that the E-GSM spectrum is cleared and auctioned. This will require some reshuffling of the existing users of the band (at a low cost and with no disruption to their customers) and the co-operation of the PSUs and the Defense Ministry. We calculate that over 190MHz of spectrum can be released within a period of a few years, with 10MHz available in eleven LSAs. If necessary, we would support payments to the current holders of spectrum to compensate for any reasonable costs incurred in clearing spectrum. Some 900 MHz could also possibly be arranged through discussions and negotiations with other sources/users.

The spectrum usage charge regime resulted from a bilateral settlement between the industry and the Government in 2002. However, it is now in desperate need of reform. We see <u>no</u> advantages with the current system. On top of the shortcomings that the Authority notes, we believe that it: retards the development of the sector, unfairly advantages some operators, fails to encourage the efficient use of spectrum and can distort the outcome of spectrum auctions. We advocate moving to charging for using spectrum as a fixed fee per MHz of spectrum held, based on the market value of spectrum, for all future allocations of spectrum in *every* band. This approach will address all of the shortcomings of the current regime and is likely to earn the Government more revenues over time. At the very least, we urge moving to a fixed percentage spectrum charge which addresses some, but not all, of the disadvantages with the current regime. If the latter is adopted, we concur with the TRAI that 3% AGR is an appropriate figure. The industry should migrate to the new regime as licenses came up for extension, with operators also being given the choice to migrate their existing holdings of spectrum to the new regime on payment of market determined fee.

Spectrum trading is an important tool to ensure that spectrum is used productively and efficiently. It has been successfully introduced in a number of countries. We urge TRAI to recommend its introduction and to consult forthwith on the modalities of trading.

We take the opportunity of this consultation to raise some other issues:

- The block size of 1.25MHz used in the recent auctions results in a waste of spectrum. The wastage is further exacerbated if the allocations of spectrum are not consistent with the GSM ARFCN (Absolute Radio Frequency Channeling Plan) table. This is untenable when, as the TRAI notes, operators have so little spectrum compared with those in other countries. The problem can be addressed by auctioning spectrum in 200KHz blocks;
- We are also concerned that operators may be able to abuse the auction by opting out of paying for spectrum if their purchase is non-contiguous—we ask that the auction rules be framed to prevent such possibilities;



- The rules for Mergers and Acquisitions and spectrum sharing should encourage rather than deter both;
- Spectrum that is only partially available within an LSA should not be auctioned;
- We believe that more 2100MHz can, and should be, released over the next year by using the 1900MHz band to accommodate the needs of the Defense Ministry.

We believe that this is an important opportunity to shape the prospects of the sector for the benefit of all stakeholders. We earnestly request the Authority to make recommendations that are aimed at enhancing the socio-economic benefits for the Nation, rather maximising revenue for Government.

Vodafone August 2013



Q.1. What method should be adopted for refarming of the 900 MHz band so that the TSPs whose licences are expiring in 2014 onwards get adequate spectrum in 900/1800 MHz band for continuity of services provided by them?

Q.2. In case spectrum is to be "reserved" for such TSPs, should it be restricted to licences expiring in 2014 (metros) or include licences expiring afterwards (LSAs other than metros)?

We maintain that our existing licenses provide for their extension and that our 900MHz spectrum cannot be put to auction. The extension of our license is expedient and should be done on mutually agreed terms. The issue of re-farming therefore does not arise. We have stated that we are willing to pay a market-related price for the extension of our license. In this regard, we have made an offer to the DoT of INR 4,000 crores to extend our licenses for 20 years (along with their existing allocations of spectrum) in Delhi (Rs. 1,700 crores), Mumbai (Rs. 1,700 crores) and Kolkata (Rs. 600 crores) with a flat rate SUC of 3% AGR. Vodafone has also indicated its willingness to discuss the issue further with Government to arrive at mutually agreed terms and conditions. A copy of our offer letter is attached as <u>Annexure-1A</u>.

The Authority is also aware that the Hon'ble Supreme Court has directed that the entire spectrum quashed by it must be auctioned. Accordingly, no spectrum can be reserved.

Notwithstanding our rights under our license, we are concerned that the potential implications of 're-farming' have not been appreciated. The loss of 900MHz spectrum could have serious implications for the quality of service that we are able to offer and the continuity of service for some customers, particularly in semi-urban, rural and remote areas. A report by Analysys Mason in 2012 concluded that the 're-farming' as proposed by TRAI will have a substantial cost to industry, lead to an increase in retail tariffs and cause significant inconvenience to consumers. A copy of the Report has already been sent to the Authority and is enclosed once again as <u>Annexure-1B</u>.

There are some statements made in the consultation that we would like to clarify:

- The total spectrum stated as quashed by DoT/TRAI and the quantum being put up for auction is not as per the Orders of the Supreme Court;
- There is no 'contracted' spectrum of 6.2MHz (paragraph 1.12 of the consultation paper). This statement contradicts the DoT's position on affidavit in TDSAT, the statements of the Ministry on the floor of Parliament and the judgment of the Hon'ble TDSAT (dated 16 December 2010 in Petition 319 of 2007), an appeal against which has been dismissed by the Hon'ble Supreme Court;
- Paragraph 2.9 of the Consultation Paper erroneously notes that "[i]n view of the direction of Hon'ble Supreme Court dated 15th February 2013, the DoT has decided to conduct another round of auction in 1800 MHz, 900 MHz and 800 MHz bands". The Supreme Court stated in its Order dated 15 February 2013 that its judgment did not cover 900MHz. Thus, any auction of 900MHz cannot be attributed to the Hon'ble Supreme Court's Direction.



### Q.3. Is any restriction required to be imposed on the eligibility for participation in the proposed auction?

The auction should be open to all participants who meet the requisite licensing requirements i.e.,

Any licensee that holds a UAS/ CMTS/ UL(AS) license; or

Any licensee that fulfils the eligibility criteria to obtain a Unified License (Access Services) or gives an undertaking to obtain a UL(AS) through a New Entrant Nominee as per the DoT's stipulations.

We recommend that participants should continue to be subject to the spectrum cap stipulated the Notice Inviting Applications for the 2012 and 2013 auctions: "25% of the 'total spectrum assigned' in all bands put together and 50% within a given band in each service area" with the spectrum put to auction included in the computation of 'total spectrum assigned'.

Q.4. Should India adopt E-GSM band, in view of the diminishing interest in the CDMA services? If yes,

a) How much spectrum in the 800 MHz band should be retained for CDMA technology?b) What are the issues that need to be addressed in the process?c) What process should be adopted for migration considering the various issues involved?

We believe that given: the declining numbers of CDMA users (28% year-on-year), the shrinking minutes of use (an average decline of 10% year-on-year over the past three years), the lack of interest in acquiring CDMA spectrum (nearly 70% unsold), the apparent desire by one operator to surrender spectrum and the greater interest in 900MHz, there is a strong case to reconfigure the 800MHz band plan, auction the released spectrum as E-GSM, and harmonise India with the majority of Europe, the Middle East and Africa and the Asia Pacific region.

Making this band available through an auction would bring considerable benefits for:

- *Operators*: A greater number of operators could potentially acquire 900MHz spectrum. They could choose to deploy it either:
  - o for voice or data or broadband.
  - for reducing their costs of network coverage and improving the quality of their service (vs. 1800MHz or vs 2100 MHz).
- *Users*: A larger number of users will benefit from the improved quality of voice/data/broadband services.
- *Government:* Since many operators have evinced an interest in acquiring 900MHz spectrum and only one has acquired CDMA 800 MHz spectrum, it is reasonable to assume that the market price for the former will be higher.



The longer that this spectrum is dedicated to CDMA use, the longer it is that these benefits will go unrealised—there is a cost associated with inaction.

We believe that the E-GSM band can be cleared. We calculate that 3MHz of this band can be released in sixteen circles, at a low cost, and with no disruption to the customers of the CDMA operators, *simply by reshuffling some of the existing occupants* within the band. Freeing up the remainder of the band will require the co-operation of the PSUs and the Defense Ministry and that TTSL/TTML relinquishes spectrum in excess of 3.75MHz in the metros and 2.5MHz elsewhere (as reported in the media). We estimate that, in total, just over 190MHz of E-GSM spectrum can be cleared, including 10MHz in eleven circles (detailed in the table below); we see no reason why this cannot be achieved within a period of a few years. If necessary, we would support payments to the current holders of spectrum to compensate for any reasonable costs incurred in clearing spectrum.

	800MHz Spectrum Allocated (including PSUs & TTSL/TTML)		Amount of 800MHz spectrum that can released E-GSM			
Circle	# carriers assigned	Amount of Spectrum Assigned (MHz)	Spectrum Available	Reshuffling of existing users (in 200KHz blocks assuming Defence occupies 7MHz)	Clearance by Defence, PSUs & return by TTSL/TTML in excess of 2.5/3.75MHz)	Total (Phase 1 + Phase 2)
Delhi	14	20.00	0.00	0.00	5.40	5.40
Mumbai	10	14.48	5.52	3.00	6.80	9.80
Kolkata	12	17.54	2.46	2.40	4.20	6.60
Maharashtra	10	14.48	5.52	3.00	7.00	10.00
Gujarat	11	16.31	3.69	3.00	4.80	7.80
AP	10	14.48	5.52	3.00	7.00	10.00
Karnataka	12	17.54	2.46	2.40	4.20	6.60
Tamil Nadu	11	16.31	3.69	3.00	4.80	7.80
Kerala	13	18.77	1.23	1.20	5.40	6.60
Punjab	10	15.08	4.92	3.00	6.20	9.20
Haryana	8	12.02	7.98	3.00	7.00	10.00
UP - West	12	17.54	2.46	2.40	4.20	6.60
UP - East	9	13.25	6.75	3.00	7.00	10.00
Rajasthan	12	17.54	2.46	2.40	4.20	6.60
M.P.	8	12.02	7.98	3.00	7.00	10.00
West Bengal	10	15.08	4.92	3.00	4.80	7.80
H.P.	6	9.56	10.44	3.00	7.00	10.00
Bihar	9	13.25	6.75	3.00	7.00	10.00
Orissa	7	10.79	9.21	3.00	7.00	10.00
Assam	6	9.56	10.44	3.00	7.00	10.00
North East	6	9.56	10.44	3.00	7.00	10.00
J&K	6	10.16	9.84	3.00	7.00	10.00
All India		315.32	124.68	58.80	132.00	190.80

We urge the Government to play a role in facilitating the availability of the E-GSM band; in particular because it will require the co-operation of the existing users of the band. As we say above, we believe that payments to CDMA operators from the proceeds of the auction of E-GSM spectrum to compensate them for the cost of any network modifications and migrating customers to alternative technologies can expedite this process. In the UK, the users of radio microphones for public performances were recompensed for the costs of moving out of the 800MHz band (the 'digital dividend').



#### Q.5. Should roll out obligations for new/existing/renewal/quashed licenses be different? Please give justification in support of your answer.

We are of the firm view that the rollout obligations should be the same for all licensees. There can be no justification to prescribe different obligations for operators who are operating under the same license, in the same service area. Such an approach would be discriminatory and result in a non-level playing field.

There should be no variation in the rollout obligations stipulated in the recent spectrum auctions of November 2012 (for 1800MHz) and March 2013 (for 800MHz). Any change could give rise to disputes and challenges. These provisions allow existing Licensees to count the coverage of Block Headquarters already achieved as a part of the compliance towards their rollout obligation. This is desirable. There can be no sense in requiring operators to replicate infrastructure in uneconomic areas simply because they have acquired more spectrum which they will use to provide the same service using the same technology.

To increase penetration beyond the requirements in the licenses, TRAI may like to consider an incentive based approach. For example, operators could get a waiver of a proportion of their license fees if they cover specified uneconomic areas. This was recommended by TRAI in May 2010 and was also earlier considered by the DoT. We believe that such an incentive-based approach would provider a far greater impetus to deeper rural rollout.

It is worth recording that the test procedures stipulated for meeting rollout obligations are complex, impractical, ambiguous, impossible to comply with, and are prescribed many years after the award of spectrum (three years in the case of 2100MHz). The test procedure for meeting the rollout obligations should be reasonable and practical and should be known to operators at the time of the auction of the spectrum. In fact, we would like to recommend that the procedure for rollout coverage testing is revisited and that operators should be allowed to submit self-certification compliance certificates, which could then be audited by TERM Cells on a sample basis.

Q.6. Is there a need to prescribe additional roll-out obligations for a TSP who acquires spectrum in the auction even if it has already fulfilled the prescribed roll-out obligations earlier?

No. Such an approach would lead to the duplication of infrastructure for no benefit of the consumer. It would also be complex to monitor and enforce.

Q.7. What should be the framework for conversion of existing spectrum holdings into liberalised spectrum?

Vodafone continues to maintain that its licenses and spectrum are both technology neutral and liberalised.

The policy of technology neutrality has been in place since 1999; this has been repeatedly confirmed by both the DoT and the TRAI on several occasions. This policy has also been noted



and upheld by the Hon'ble TDSAT in its Order dated 31 March 2009 in Petition 286 of 2007. Vodafone has have made detailed submissions to the DoT (through the COAI) on this matter (please see the letter RSM/COAI/123 dated 15<sup>th</sup> June 2012 included in <u>Annexure-1C</u>) and it has challenged the incorrect interpretation of spectrum liberalisation in the TDSAT (Petition No. 154 of 2013).

The Authority in paragraph 2.43 of the current consultation defines spectrum liberalisation to mean "spectrum in any band can be used for deploying any service in any technology". This is same as the permissions given under NTP-1999 read with the DoT circular dated 9 April 2001, where it is stated that operators are permitted to operate any Cellular Mobile Telephony Service in any digital technology in the designated band.

There is no need to have a framework which converts existing spectrum into liberalised spectrum because the existing spectrum is already liberalised.

Q.8. Is it right time to permit spectrum trading in India? If yes, what should be the legal, regulatory and technical framework required for trading?

Vodafone believes that the time is right to introduce spectrum trading in India; we are yet to see a convincing case *against* its introduction.

Spectrum trading between operators facilitates the efficient use of spectrum because it ensures that spectrum is put into the hands of those that can use it most productively. It can also result in better utilisation of spectrum if operators can aggregate their holdings into contiguous lots. The absence of trading has meant that large amounts of spectrum in India are underutilised and, as a result, the customers of the 'spectrum-starved' potential buyers suffer a poorer quality of service.

Government may be concerned that spectrum trading will result in windfall gains for licensees who have been allocated spectrum administratively. This concern can be addressed through the imposition of a spectrum transfer fee. However, it is important that the transfer fees imposed for such trades be kept at a reasonable level that actually encourages, rather than deters, such market based re-allocations. There would be no point in permitting spectrum trading and making the conditions associated with trading so onerous that no operator wishes to buy spectrum from another. Accordingly, any fee should be charged only the first time that administratively allocated spectrum is traded in the market and only when a gain will be made on the trade. Subsequent trades should not attract any transfer fees.

#### Spectrum Trading in the UK

Ofcom permits spectrum trading, it believes: "...the ability to trade spectrum, as well as to change its use, is critical to securing maximum benefit for society." As it explains "...it is less and less likely that any spectrum regulator can have sufficient information or foresight to predict which technology or application will generate the greatest benefits for society or will be able to react fast enough to the pace of change. This is likely to lead to regulatory failure in which sub-optimal regulatory decisions impose greater costs than benefits. For this reason....we have pursued a



policy of making progressively greater use of market mechanisms to allow spectrum to migrate dynamically to the users, services and technologies that will benefit society most."<sup>1</sup>

In the UK, spectrum licenses are distinct from 'operating' licenses. In fact, no telecommunications company requires a license to operate. Instead, providers of telecommunications services must comply with a set of General Conditions<sup>2</sup>. The UK introduced spectrum trading for mobile operators in 2011 and all bands (800, 900, 1800, 2100MHz and 2.6GHz) are now tradeable. This enables licence holders to transfer some, or all, of the rights and associated obligations that they hold under a licence under the Wireless Telegraphy Act to third parties. Trading involves agreement between an existing holder (the 'transferor') and another person (the 'transferee') to transfer the transferor's rights under its licence and is put into effect by surrender of the original licence and the grant of a new licence by Ofcom.

The trading framework permits various different types of transaction or 'modes of trading'<sup>3</sup>:

- Outright total transfers all the rights and obligations under a licence are transferred to a third party (A);
- Outright partial transfers only some of the rights or obligations are transferred to a third party and the rest remain with the original owner **(B)**;
- Concurrent total transfers all the licence rights and obligations are transferred to a third party while continuing at the same time to apply also to the original holder **(C)**; and
- Concurrent partial trades some of the licence rights and obligations are transferred to a third party while continuing at the same time to apply to the original holder and the rest of the rights and obligations remain with the original holder (**D**).

These options are pictured in the diagram below:



In 2012, Everything Everywhere sold 15MHz of 1800MHz spectrum (out of a total holding of 60MHz) to Hutchison Whampoa (which operates under the brand name '3' in the UK). The ongoing spectrum usage charges, which are currently charged as a fixed fee per 200KHz channel

<sup>&</sup>lt;sup>1</sup> Ofcom: Simplifying spectrum trading - Regulatory reform of the spectrum trading process and introduction of spectrum leasing; September 2009 - see page 9.

<sup>&</sup>lt;sup>2</sup> http://stakeholders.ofcom.org.uk/telecoms/ga-scheme/general-conditions/

<sup>&</sup>lt;sup>3</sup> Ofcom: Simplifying spectrum trading - Regulatory reform of the spectrum trading process and introduction of spectrum leasing; September 2009



on 900MHz and 1800MHz spectrum, pass to the acquirer in proportion to the amount of spectrum acquired. There are currently no ongoing fees for 800MHz, 2100MHz and 2.6GHz spectrum.

There are number of issues that will need to be resolved before trading is allowed in India:

*Scope:* should all of the variants of trading be available in India? Should spectrum leasing be permitted? The more flexibility allowed, the greater the prospective benefits from trading.

*Approvals*: Should trading require approval? Who should approve a trade? What should be the reasons for not permitting a trade? How long should the approval process take? Can the refusal to allow a trade be challenged? If the approval process is too lengthy, or uncertain, then operators' benefits from trading will be reduced.

Interference: Who bears the responsibility if trading leads to interference?

*Proceeds from trading*. To what extent should the proceeds from trading be subject to a charge if the spectrum has been awarded administratively? Should license fees be paid on the gains from trading? What SUC charge applies if an operator purchases additional 2100MHz spectrum? Obviously, the more trading is 'taxed', the lower the incentive to trade and the less likely that trading will lead to a more efficient allocation of spectrum.

*Transparency.* What information, if any, should be made public about a spectrum trade? Will potential buyers of spectrum have access to details of who is using what spectrum? Better market information can facilitate trading.

*Spectrum Usage Charges* – How will trading be made compatible with the current regime? We detail in our answer to Question 18 how the current SUC regime deters some operators from acquiring spectrum.

Spectrum trading can bring significant benefits to Indian consumers of mobile telephony. There are complex matters associated with its introduction; and we urge the Authority to consult on the modalities of its introduction.

Q.9. Would it be appropriate to use prices obtained in the auction of 3G spectrum as the basis for the valuation in 2013? In case the prices obtained in the auction of 3G spectrum are to be used as the basis, what qualifications would be necessary?

The final 3G prices should not be used as a basis to set reserve prices for the forthcoming auctions for all the reasons that the TRAI cites. The table below compares the mobile industry in 2010 and 2013 across a number of dimensions.



	March 2010	March 2013	% Change
Growth in Customer Numbers over previous year (in millions)	193	(51)	
Growth in both-way minutes of usage over previous year (in billions)	450*	255	(40%)
ARPU (in Rs)	131	105	(20%)
GSM Revenue per minute (in Rs)	0.57	0.48	(16%)
HHI	0.1512	0.1434	(5%)
Industry debt (Rs. Crores)	123,700	250,000*	102%
Total PAT (listed companies in Rs. Crores)\$	~11939	~800	(93%)
FDI Investment (Rs. Crores)	12,270	507#	(96%)

\* Estimated from TRAI's quarterly wireless MoUs, subscribers

# April 2012 – January 2013;\*\* as indicated in the media reports; \$ Idea, Airtel, RCOM, MTNL and TTML

These data suggest that the expectation of bidders about the incremental value of spectrum will be lower in 2013 compared with 2010 (as evidenced by the unwillingness of FDI investors to put money into the sector) and therefore the market prices achieved in 2010 should no longer form a basis for setting the level of reserve prices. To do so again would risk another failed auction. As the TRAI notes: "[t]he reduced demand for spectrum has to be seen in at least two contexts namely, (a) the deteriorating financial performance and overall financial position of the sector, and, (b) the general slowdown in the economy over the last few years."

Q.10. Should the value of spectrum for individual LSA be derived in a top-down manner starting with pan-India valuation or should valuation of spectrum for each LSA be done individually?

It is important to be clear about what is meant by the 'value' of spectrum. The value of spectrum will differ between operators; it reflects how much each is willing to pay to acquire spectrum and will depend upon, amongst other things: existing holdings of spectrum, expectations about future demand and the price of infrastructure. As we understand it, TRAI wishes to estimate, for each LSA, the *market price* of spectrum i.e., the price at which the demand for, and supply of, spectrum are matched<sup>4</sup> and then apply a discount factor to set the reserve price in the auction (see Chapter IV of the consultation). In any auction, the market price is revealed when the marginal bidder either reduces its demand or leaves the auction. Put simply, in each LSA, there will be as many valuations <u>of</u> spectrum as there are operators, but there is only one market price <u>for</u> spectrum.

<sup>&</sup>lt;sup>4</sup> Section 3.8 of the consultation talks about 'reaching an equilibrium'



TRAI notes that in paragraph 22 that "each LSA is distinct from the point of view of telecom related parameters....LSAs differ in terms of population size, population density, economic growth, per capita income...". We agree that estimating the pan India market price of spectrum (the sum of the individual LSA market prices) and "working backwards" to distribute this across circles in proportion to (say) tele-density will be an inaccurate way of estimating a market price for spectrum in each LSA.

In our answers to questions 12-14 we detail our concerns with estimating the market price of spectrum *individually* for each LSA. We propose a solution in our answer to question 15.

## Q.11. Is indexation of 2001 prices of 1800 MHz spectrum an appropriate method for valuing spectrum in 2013? If yes, what is the indexation factor that should be used?

The indexation of historic market prices to set reserve prices should not be contemplated, particularly for market prices set long in the past, as indexation does not take into account the changes in the market environment; it simply assumes that the value of spectrum grows in a compound fashion over time. This method of setting reserve prices risks unsold spectrum when the market sentiment has changed for the worse. Please also see our answer to question 9.

Q.12. Should the value of spectrum in the areas where spectrum was not sold in the latest auctions of November 2012 and March 2013 be estimated by correlating the sale prices achieved in similar LSAs with known relevant variables? Can multiple regression analysis be used for this purpose?

Vodafone has reviewed the results of the Authority's multiple regression analysis and also run our own econometric models. Although there are shortcomings with this kind of approach, we find that our results support our view that the market price for spectrum in Delhi, Mumbai and Karnataka is *significantly* below the reserve prices set in the November and March auctions. We summarise our findings below.

#### Simple Correlations

There are severe limitations with using a simple correlation to predict a value per MHz for the four LSAs (Delhi, Mumbai, Karnataka and Rajasthan). By definition, simple correlations do not account for the effects of any other factors on the value per MHz. The Authority does partially compensate for this by narrowing the sample by the LSA category. However, doing this means that the results for Delhi, Mumbai and Karnataka are based on a sample of five, while that of Rajasthan is based on a sample of seven. With such small samples it is difficult to have any level of confidence in the results.

#### TRAI's econometric analysis

Unfortunately, the Authority has chosen not to make available the data that it has used for its econometric analysis, or to reveal details of the equations that it estimated. We have therefore compiled our own dataset and tried to duplicate TRAI's regression analysis. We have been unable



to replicate exactly the Authority's work, although our results are similar. A sample of our results, for one estimated equation, is shown in the table below.

Variables: AGR,		Reserve price per	
Population, Residual teledensity	TRAI	Vodafone	MHz (March 13)
Delhi	193	173	388.1
Mumbai	203	164	379.9
Karnataka	180	182	184.9
Rajasthan	100	96	37.6
Model R <sup>2</sup>	-	91%	-

Rs. in crores)

For each of the regression specifications that we have run, we find that the estimated market price for spectrum in Delhi and Mumbai is less half of the March 2013 reserve price.<sup>5</sup> However, we do have some concerns with the TRAI's econometrics. The Authority reports that the R<sup>2</sup> in their estimations is over 80% and that their coefficient estimates are statistically significant. But, these findings alone do not imply a model that makes intuitive sense or a model that is valid. For example, in some regressions, population has a negative sign – i.e., the model predicts that the greater the population, the lower the value per MHz. This is contrary to our *a priori* expectations and suggests that the model may not make intuitive sense (the negative sign is possibly a consequence of collinearity<sup>6</sup>). It would be helpful if the TRAI published the full results of their regressions (coefficients, t-statistics, and standard errors).

Generally, published studies of this kind also include variables relating to operators' existing spectrum holdings and to the auction itself. For example, we might expect a relationship between the amount of spectrum unsold in the auction and the reserve price—if spectrum is left unsold it implies that the value per MHz is lower than the auction's reserve price.

#### Vodafone's econometric analysis

To expand on the TRAI's econometric analysis we have run some of our own regressions on the dataset of the 1800MHz auction results. Our results are summarised in the table below. Our estimates are consistently much lower than both the reserve price and the TRAI's estimated value/MHz for Delhi, Mumbai and Karnataka.

<sup>&</sup>lt;sup>5</sup> We believe that the estimates for Rajasthan in the econometric analysis have been skewed by the fact that spectrum is unavailable in districts amounting to 39% of the population.

<sup>&</sup>lt;sup>6</sup> Multi-collinearity occurs when there are high levels of correlation among predictor variables. This can lead to unreliable estimates of regression coefficients – it might, for example, lead us to over-estimate the impact of a given factor on the value per MHz. We note that there are high levels of correlation among some of our data, for example between the population and the residual teledensity (which is to be expected as one is computed using the other).



Specification	Estimated value/MHz   (1) (2) (3) (4) (5)					Reserve price (March 2013)
Delhi	70.2	127.8	125.1	103.1	122.4	388.1
Mumbai	41.6	110.8	107.1	73.7	84.4	379.9
Karnataka	122.1	131.5	126.6	131.8	105.4	184.9
Rajasthan	49.8	51.9	54.4	50.1	17.1	37.6

(Rs. crores)

Note: Values for Rajasthan assume 39% of the population is not covered by the spectrum on offer.

For every specification, our dependent variable was price/MHz/population, in line with other econometric studies of this kind. All regressions were run on linear models—although similar results were obtained for log-linear specifications. The independent variables in each of the specifications are as follows:

- 1) Per capita GDP, number of unsold lots, existing spectrum holdings, AGR, a dummy variable for Kolkata<sup>7</sup>
- 2) Per capita GDP, number of unsold lots, existing spectrum holdings, AGR, urbanisation
- 3) Per capita GDP, number of unsold lots, existing spectrum holdings, ARPU, urbanisation
- 4) Per capita GDP, AGR, existing tele-density; Kolkata dropped from sample
- 5) Per capita GDP, number of sold lots, existing spectrum holdings, AGR, urbanisation; Kolkata dropped from sample

(Since Kolkata is a notable outlier in terms of price per MHz per population it was dropped from specifications 4 & 5)

Although we would recommend caution be taken when assessing the results of this analysis, we do note that they show a degree of consistency. There are certain limitations and issues with cross-sectional modelling of this kind. Nevertheless, it can provide indicative results. All of our regression models predict that the market price of spectrum in Delhi, Mumbai and Karnataka is significantly below the previous reserve prices. We believe that the results for Rajasthan are not reliable because a significant proportion of the population (39%) was not covered by the spectrum offered and this more than proportionately reduces the value of the spectrum.

 $<sup>^{7}</sup>$  A dummy variable is a 1/0 variable – in this case, the variable was 1 for Kolkata and 0 for all other LSAs.



Q.13. Should the value of spectrum be assessed on the basis of producer surplus on account of additional spectrum? Please support your response with justification. If you are in favour of this method, please furnish the calculation and relevant data along with results.

# Q.14. Should the value of spectrum in the 1800 MHz band be derived by estimating a production function on the assumption that spectrum and BTS are substitutable resources? Please support your response with justification. If you are in favour of this method, please furnish the calculation and relevant data along with results.

The TRAI has proposed using a producer surplus approach to value the 1800MHz spectrum. This approach involves calculating the network infrastructure costs avoided from having additional spectrum. The additional spectrum allows the operator to lower the number of sites needed to meet its anticipated growth in traffic. This approach implicitly assumes that it is profitable to serve the growth in traffic. Vodafone has explored the use of this approach to value the 1800MHz spectrum. Below we describe the modelling approach used, the data required to calibrate the model, and the nature of results obtained.

In summary, we find that the producer surplus estimates are sensitive to the many assumptions that need to be made about the evolution of the mobile market (including market shares and service use) and the timing of future spectrum releases in India over the next 20 years. We therefore do not consider that the producer surplus approach provides a robust basis for valuing spectrum and setting reserve prices in the Indian context.

#### Modelling Approach

Additional 1800MHz is expected to be used to supplement existing 2G voice and data capacity over the 20 year licence period. Calculation of avoided cost therefore focuses only on the avoided costs for the 2G service. The steps to computing this avoided cost in each circle are as follows:

- Divide each circle into four geo-types dense urban, urban, suburban and rural where geotypes are defined by population density.
- For each circle estimate the number of base station sites in 2013 for a "typical" operator in each geo-type and calculate the network and other costs per site.
- Estimate capacity per site based on service standard requirements (i.e. blocking rate) and on a current and future view of how channels are allocated between voice and data.
- Forecast 2G voice traffic in all geo-types of all circles for the entire licence period, including a view of subscriber growth, the technology migration path and future changes in voice minutes/user
- Divide total 2G traffic for each geo-type/circle in each year by site capacity to get the number of sites required for two scenarios – one with additional 1800 MHz spectrum and



one without this spectrum. These scenarios will include assumptions about additional spectrum that might be acquired in bands other than 1800MHz over the next 20 years.

- Calculate the producer surplus (or avoided cost) per year as the product of the difference in the number of sites between the two scenarios and the cost per site for each geo-type and circle. (If the number of sites required is below the operator's current site number in both spectrum scenarios, no new sites are required and avoided cost for that geo-type in that year is zero).
- Calculate the net present value of the annual producer surplus values by discounting the cost savings by the WACC for the mobile industry. This gives the lump sum value of the additional 1800MHz spectrum.

#### Input assumptions and information requirements

The tables below list the input assumptions that are required to derive the 3 key components of the model – voice traffic forecast, 2G voice capacity per site, cost per 2G site. As can be seen the model requires numerous market and operator specific assumptions for the next 20 years.

#### Input assumptions for voice traffic forecast

Input variable	Use of input variable
Operator's market characteristics: Number of 2G sites Current 2G voice traffic – minutes of use and number of subscribers	To establish the starting point for traffic and the number of sites at present for the operator
Urban/ rural population and their growth rates	To form a view of total for mobile service over time
Forecast of mobile penetration	
Number of subscribers using 2G, 3G and 4G technology over time	To project the number 2G subscribers split by urban and rural areas as well as the number of voice minutes per subscriber for
Evolution of 2G voice minutes of use/subscriber over time	the entire licence duration

Input assumptions for individual site capacity

Input variable	Use of input variable
Cell reuse factor	These network parameters are required for
Number of sectors per site	the entire licence duration to determine th
Spectrum assignment in all bands – current and future	Therefore, this requires the current values as well as how they will evolve over time.
RF resource reserved for 2G data service	
Mobile voice service standards	
Network inefficiencies	



Input assumptions for cost per site

Input variable	Use of input variable
Passive site infrastructure costs: Rentals Power Maintenance Backhaul Payroll contribution Others e.g. insurance, security, managed services	To determine the annual payment required for the passive component of each site. Therefore, this requires the current values as well as how they will evolve over time.
Active site component costs (CAPEX & OPEX): BTS Transceivers	To determine the annual payment required for the active component of each site. Therefore, this requires the current values as well as how they will evolve over time.
Useful life of assets	
Weighted average cost of capital	To convert value into annual value at current
Inflation on network infrastructure component costs	prices

#### Discussion of results

The producer surplus estimates obtained for Delhi and Mumbai are low and are significantly below the November 2012 and March 2013 reserve prices. We obtain disproportionately large values for rural areas in most circles, and in particular in Rajasthan because of the growing takeup and use of 2G services in rural areas. The results suggest that operators will not find it profitable to support service growth in these areas. However, this finding is dependent on the specific modelling assumptions.

In summary, the results are sensitive to the many assumptions that need to be made about the evolution of the mobile market (including market shares and service use) and the timing of future spectrum releases in India over the next 20 years. For example, changing the assumptions about the technology choice for future spectrum allocations in Rajasthan and Orissa reduces their avoided cost estimate by over 80%. We therefore do not consider that the producer surplus approach provides a robust basis for valuing spectrum and setting reserve prices in the Indian context.

The Cobb Douglas production function proposed by TRAI has no economic or engineering foundation in mobile networks and ignores important inputs such as backhaul. It assumes operators can continuously optimise their balance of base station and spectrum inputs which is clearly unrealistic. We are not aware of any other regulator having used this approach.

Q.15. Apart from the approaches discussed in the foregoing section, is there any alternate approach for valuation of spectrum that you would suggest? Please support your answer with detailed data and methodology.



Our answers to the above questions indicate the difficulties and risks of estimating the market price of spectrum for individual LSAs using: the indexation of previous market prices, top-down estimates distributed across LSAs and bottom-up methodologies. Instead, we propose a pragmatic approach to the setting of reserve prices for 1800MHz spectrum in the forthcoming auction.

Vodafone believes that the auctions in November and March failed for two reasons: the level of the reserve price and the escalating Spectrum Usage Charge regime; both elements comprise the cost of owning spectrum and, in *combination*, they were too high, and this restricted the demand for spectrum. As a consequence no market price for spectrum was discovered in any circle except Bihar. In all, only slightly over 43% of the spectrum put to auction was sold and more than 75% of this was a 'distressed' purchase by operators who had no choice but to acquire spectrum in order to continue their business.

TRAI states in Chapter that IV of the consultation paper that "...the reserve price should not be so high as to discourage the participation of bidders and leave the spectrum unsold". It also acknowledges that it has insufficient information to set an optimal reserve price (it does not know the distribution of bidders' valuations) and that, in practice, few bidders are expected and therefore the reserve price should be pegged at a low level.

These factors, together with the fact that such as large quantum of spectrum went unsold in the previous auctions, reinforce the need to set reserve prices in a <u>conservative</u> manner. We therefore propose a practical approach which builds on the success of the 3G auction, but where the reserve prices are set prudently to give the best opportunity for the auction process to determine the market price. This is the philosophy that Ofcom adopted in its recent auction of 800MHz and 2.6GHz spectrum in the UK. That auction was competitive—there were 50 rounds of bidding—the prices realised were higher than the reserve prices in <u>all</u> spectrum bands and the entire amount of available spectrum was sold.

## Our Proposal: The reserve prices in the next auction should be based on the reserve prices set in 2010 for 2100MHz spectrum.

In order to test the appropriateness of our recommendation, we compare our suggested reserve prices with a) the reserve prices in the November 2012 and March 2103 auctions; b) international comparisons of the market price of 1800MHz spectrum adjusted for India; c) Vodafone's recent offer for the extension of its licenses in Delhi, Mumbai and Kolkata d) the results of our econometric analysis for the circles in which no spectrum was sold and e) the price that a new entrant (the 'marginal' operator) would be prepared to pay for spectrum. Overall, our analysis shows that, with reserve prices similar to those charged in 2010, TRAI can be confident of a successful auction.

A reserve price based on the 3G reserve prices is also consistent with the Supreme Court Order of 2 February 2012 that directed that the TRAI "to make fresh recommendations for grant of licence and allocation of spectrum in 2G band in 22 Service Areas by auction, *as was done for allocation of spectrum in 3G band*". (our emphasis).



#### November 2012 and March 2013 Auctions

The table below compares the reserve prices in the November and March auctions with our recommendation (all amounts in Rs. crores).

Circle Name	Category	1800 MHz RP	2100 MHz RP	Vodafone Proposal	Vodafone Proposal	% Reduction in RP
		2x5MHz	2x5MHz	2x5MHz	2x1MHz	
Delhi	М	1,941	320	320	64	84%
Mumbai	М	1,900	320	320	64	83%
Kolkata	М	455	120	120	24	74%
Karnataka	А	924	320	320	64	65%
Gujarat	А	899	320	320	64	64%
TN	А	1,224	320	320	64	74%
Maharashtra	А	1,051	320	320	64	70%
AP	А	1,148	320	320	64	72%
UP West	В	430	120	120	24	72%
Punjab	В	269	120	120	24	55%
UP East	В	305	120	120	24	61%
West Bengal	В	103	120	20	4	81%
Rajasthan	В	188	120	120	24	36%
Kerala	В	261	120	120	24	54%
Haryana	В	186	120	120	24	36%
MP	В	216	120	120	24	44%
Assam	С	35	30	20	4	42%
Bihar	С	170	30	120	24	29%
HP	С	31	30	20	4	36%
J&K	С	25	30	20	4	21%
NE	С	35	30	20	4	43%
Orissa	С	81	30	20	4	75%
Total		11,878	3,500	3,440	688	58%

In all bar two circles—West Bengal and J&K—the 2100MHz reserve prices are below the realised / reserve prices in the November and March auctions (the third column in the table above). Some of the highest percentage reductions (80%+)<sup>8</sup> are in the circles where no spectrum was sold and the average percentage reduction is 58%. This is desirable, and consistent with our view that the major contributory factor behind the failure of the previous auctions was the high level of the reserve prices.

In order to increase further the possibility of a successful auction we recommend that the reserve price of the 'C' circles is reduced to Rs.20 crores, that West Bengal is re-classified as a 'C' circle and that Bihar is treated as a 'B' circle (given the success of the auction in that circle). The net effect of these changes is to reduce the pan India price by less than 2%; our revised recommendation is shown in the fifth column of the above table.

International Benchmarks

<sup>&</sup>lt;sup>8</sup> And, overall, there is a negative correlation between the amount sold in the November auction and the reduction in the reserve price that we propose.



In order to encourage a successful auction we require that the *sum* of the reserve prices is set well below the *sum* of the (unknown) market prices of spectrum across all circles. One way of assessing this is to look at international benchmarks on the sale of 1800MHz spectrum to estimate a pan India market price for spectrum and to compare this with the aggregate of our proposed reserve prices. Ofcom used consultants (DotEcon and Aetha) to perform just such a benchmarking exercise in preparing for its possible sale of 1800MHz spectrum in 2012.<sup>9</sup>

The average market price of 1800MHz spectrum in a sample of 28 auctions since 2000 investigated by the consultants was approximately  $\pm 0.29$  (INR 32.2)<sup>10</sup> per MHz per capita. The consultants also considered a number of sub-samples. These are summarised in the table below:

30				Benchmarking
Table 5: 1800MHz sample benchmarks				
Samples without outliers	N*2	Mean	Standard deviation	95% confidence Interval®
All auctions since 2000	28	60.212	0.189	60.138 - 60.285
European auctions since 2000	12	60.161	0.147	10.0675 - 10.254
All auctions in the last five years	18	60.190	0.174	60.103 - 60.276
All auctions since 2010 - all awards in this sample are of liberalised	7	60.175	0.204	((0.0134) - (0.363

Overall, Ofcom were advised that the range of £0.146 to £0.219 per MHz per population (INR 16.2 to INR 24.3) is an appropriate benchmark for the value of 1800MHz spectrum. The midpoint of the range recommended by the consultants is £0.1825 (INR 20.8); this is slightly above the mean value achieved in the most recent auctions of 1800MHz spectrum evaluated by Ofcom's advisors.

In the table below we adjust this market benchmark for ARPU and PPP differences between the sample used and India (explained in the second table); we then multiply this number by the India population and compare this estimated pan India market price with our all India reserve prices. The data show that our recommended reserve prices sum to an amount that is around 60% of what the international benchmarks indicate is a 'reasonable' market price for all India spectrum; it is also broadly consistent with the data presented in Table 4.1 of the consultation. Again, this should give the TRAI confidence that these levels of reserve prices will result in a successful

<sup>&</sup>lt;sup>9</sup> See <u>http://stakeholders.ofcom.org.uk/binaries/consultations/award-800mhz/statement/spectrum-value.pdf</u> (section 3.4)

<sup>&</sup>lt;sup>10</sup> We use an exchange rate of £1=INR 90 throughout this response/



auction11

Ofcom Benchmarking Data	Market Price
Price/MHz/Pop (UK pence)*	18.25
Adjustment for ARPU	2.0
Adjustment for PPP	5.1
Adjusted Price/MHz/Pop (INR)	4.63
Price per 1MHz (INR crores) - pan India	576
Price per 2x1MHz (INR crores) - pan India	1,152
Price for 2x5 MHz of 1800 (INR crores)**	5,762
Ratio of Vodafone RP to Market Price	60%

Country	Auction Observations #	ARPU US\$
Brazil	2	10.5
Singapore	4	38.7
NZ	1	30.2
Austria	2	21.4
Greece	2	17.4
Norway	1	49.2
Canada	2	60.1
Israel	1	22.4
US	2	51.4
Poland	1	11.0
НК	1	21.6
China	1	10.3
Italy	1	20.3
Portugal	1	15.2
Germany	1	18.9
Denmark	1	26.6
Average		26.56
Weighted Average		29.25
India ARPU		3.04
Avg ARPU Adj Factor		8.74
Wtd Avg ARPU Adj Factor		9.62
Avg Adj Factor (rounded)		9.00

India GDP (PPP) US\$bn	4,711
India GDP (nominal) US\$ per capita	1,492
India Pop (m)	1,245
India GDP (nominal) US\$bn	1,858
Nominal PPP Adjustment Factor	2.5

#### Source:

ARPU: BoFA ML Global Wireless Matrix Q1 2013 # See "Spectrum Value of 800MHz,1800MHz and 2.6GHz - A DotEcon & Aetha Report

for Ofcom July 2012"

GDP: Wikipedia

\* UK price is for 1MHz (Simplex) of 1800MHz spectrum

\*\* Indian price converted to 2x5MHz (duplex) equivalent

<sup>&</sup>lt;sup>11</sup> The data show that the combination of the reserve prices for the March and November auctions (Rs. 11,878 crores) is around double what we would expect the sum of the LSA market prices to be, based on international benchmark comparisons.



#### Vodafone's Offer for Delhi, Mumbai and Kolkata

In Vodafone's recent letter to the DoT offering a price at which we are prepared to extend our spectrum, the implied value of 5MHz of 1800MHz in both Delhi and Mumbai is Rs. 685 crores (or Rs. 137 crores per MHz). Clearly, this represents a fair price to Vodafone. However, we do not know others' valuations of 1800MHz spectrum (or the distribution of those valuations) and therefore whether our offer would be above the market price of spectrum.<sup>12</sup> Consequently, given the level at which 1800MHz spectrum has sold internationally, it is prudent to set the reserve price *below* Vodafone's offer. Simply transposing Vodafone's offer into the reserve price risks leaving spectrum unsold.

#### Econometric Analysis

Our econometric analysis supports our approach. Our estimates of the market value of spectrum in the 'failed' circles (see below) are significantly below the previous reserve prices.<sup>13</sup> Our estimated market values as a percentage of the previous reserve prices are: 69% in Karnataka, 30% in Delhi and 24% in Mumbai. This is consistent with the auction failing in those circles. Our recommended reserve price in these circles (Rs. 64 crores) as a percentage of the estimated market price is, on average, 58%; this gives sufficient headroom to permit the auction to determine the market price of spectrum and is broadly in line with the mean and median of reserve price/final price ratios that TRAI lists in table 4.2 of the consultation.

			Estim	nated val	ue/MHz				
Specificati on	(1)	(2)	(3)	(4)	(5)	Mid- point (excludi ng low value)	RP (old)	Value / RP (old)	RP (new) / Value
Delhi	70.2	127. 8	125.1	103. 1	122.4	115.5	388. 1	30%	55%
Mumbai	41.6	110. 8	107.1	73.7	84.4	92.3	379. 9	24%	69%
Karnataka	122. 1	131. 5	126.6	131. 8	105.4	127.0	184. 9	69%	50%

#### (Rs. crores)

#### Marginal Operator

In order to estimate the market price of spectrum at an all India level we have calculated what a marginal operator would be prepared to pay for 5MHz of 1800MHz spectrum in each circle. The

<sup>&</sup>lt;sup>12</sup> Recall that the market price is determined by the behavior of the marginal operator and we do not know whether Vodafone is that operator.

<sup>&</sup>lt;sup>13</sup> As we explain in our answer to question 12 we have omitted Rajasthan from this table. Our view is that the failure of the auction in this circle was caused by the partial availability of the spectrum rather than the level of the reserve price. Our analysis indicates that, if the full allocation of spectrum is available, the previous reserve price would permit price discovery in the auction.



marginal operator in an auction is the operator whose valuation sets the market price of spectrum. Our assumptions for the marginal operator are:

- Total market revenue is Rs. 150,000 crores
- The operator achieves a 12% market share with an EBITDA margin of 14%
- The estimated value of its business is Rs. 17,500 crores
- The operator's maximum budget for the current round of spectrum auctions is assumed to be 33% of the value of its business. The reminder is set aside for the investors in the marginal operator and future spectrum purchases to accommodate the growth in the business.

Our calculations show that, on an all India basis, this operator would be prepared to pay a maximum of Rs. 5,800 crores for 5MHz of pan India spectrum in the 1800MHz band. Our recommend reserve prices are 60% of this value, in line with our international benchmarking above, and TRAI's approach in pages 96-98 of the consultation. Hence, setting the reserve prices at the levels that we propose should reassure the Authority that the auction is likely to be successful.

#### Conclusion

Attempting to calculate the market price of spectrum in each LSA is fraught with difficulty, error and risks. Our approach is to choose an *a priori* plausible set of reserve prices (based on the recent precedent of the successful 3G auction) and then test whether our proposal, with some minor adjustments, is likely to result in a successful auction. Using a variety of tests and benchmarks we find this to be the case and we firmly believe that, if adopted, our proposal will produce an auction outcome that will be in the long-term interests of the country.

## Q.16. Should the premium to be paid for the 900 MHz and liberalised 800 MHZ spectrum be based on the additional CAPEX and OPEX that would be incurred on a shift from these bands to the 1800 MHz band?

When all of the E-GSM band is eventually cleared and auctioned (and possibly some 900MHz from other sources), the premium applied should be based on an assessment of the additional capital and operating costs that would be incurred in a shift to E-GSM/900MHz *for the marginal operator* since it is this operator who will determine the market price for E-GSM/900MHz spectrum versus 1800MHz. We explain our view below.

Radio signals at different frequencies have different physical properties:

- Higher frequency radio signals lose more energy than lower frequency signals when travelling through air or over realistic terrain and buildings. All other things being equal, this means that a lower frequency signal can cover a greater distance than a higher frequency one.
- Lower frequencies are generally better at penetrating deeper into buildings. This means that, all other things being equal, a person using a mobile phone at a lower frequency will



be able to use that phone deeper inside a building compared with someone using a higher frequency.

These effects manifest themselves in the need to build more cell sites when using higher frequencies. These extra cell sites are needed to obtain the same level of coverage that lower frequency operators enjoy, but with fewer cell sites.

However, the *quantum* of this effect (i.e., the magnitude in the difference in the number of sites required) will depend on a number of factors:

**The 'density' of demand**: when the demand (measured in erlangs or megabytes per square km) is high, the dimensioning of the network (i.e., the number of sites required) is dictated by the required capacity of the network and *not* the frequency used. The higher frequency operator will only require additional sites to ensure the same quality of inbuilding coverage as its low frequency competitors. In the Indian metros we estimate that an 1800MHz only operator will require between 12-15% additional sites to match the coverage of an EGSM/900MHz operator. By comparison, in rural areas, where demand is low, the number of sites required is determined by the extent of geographic coverage required. Under these conditions, the operator using lower frequencies will require fewer sites. In general, the density of demand is strongly correlated with the typical geo-type classification: dense urban, urban, suburban and rural; the higher the population density, the higher the demand.

**Existing network deployment**: an operator who has deployed an 1800MHz network in a metro (dense urban/urban) area would see little cost saving (particularly if its BTS equipment needs to be replaced) from acquiring EGSM/900MHz ahead of 1800MHz because there would be no reduction in the number of existing sites, or the quantum of new sites needed to accommodate growth in demand; especially if that operator has used indoor base stations to boost its in-building coverage.

Similarly, an operator in a state circle that has fully built out its network coverage (including most rural areas) could see little benefit in acquiring 900MHz ahead of 1800MHz. Although fewer sites will be required in the rural areas, the operator may be unwilling to write-off its existing equipment or unable to break its contractual commitment to its infrastructure provider. In contrast, a new entrant, with no existing infrastructure, may prefer lower frequency spectrum to reduce its costs of deployment in less densely populated areas and to offer better in-building coverage in the metros.

In TRAI's terminology, the *relative* economic efficiency of the two bands can vary significantly between operators and LSAs. The above factors explain why this 'premium' is not fixed and can vary between operators, between service areas and within service areas.

As we have noted previously in this submission, the market price of spectrum is determined by the behavior of the 'marginal' operator. In any auction when bidders can shift demand between frequency types, it is likely to be the bidder who places the <u>lowest</u> value on holding E-GSM/900MHz versus 1800MHz who determines the 'premium' associated with holding low



frequency spectrum. If the seller of spectrum exaggerates this premium when setting the reserve price, there is a risk that marginal bidder may no longer participate in the auction (or only bid for 1800MHz) because *from its perspective* the E-GSM/900MHz band is mispriced versus 1800MHz. If this is the case, the seller can be left with unsold low frequency spectrum and an auction that has not determined its market price.

We therefore suggest that, as and when the E-GSM band is auctioned, the relative multiple of E-GSM/900MHz versus 1800MHz is set conservatively (i.e., with reference to the marginal bidder) in all circles to ensure price discovery in the auction. As long as the reserve price *and* the multiple are set conservatively, the auction will determine the relative value of the different frequency types.

In the metros (Delhi, Mumbai and Kolkata) given that these are areas where the traffic density is high we believe that for existing operators the 'premium' associated with E-GSM/900MHz is low and so the reserve price multiple should be set at 1.2. For the remaining circles the multiple can be slightly higher. Alternatively, for simplicity, the seller could set a common multiple of 1.3 across the country.

## Q.17. Should the valuation of spectrum and fixing of reserve price in the current exercise be restricted to the unsold LSAs in the 1800 MHz band, or should it apply to all LSAs?

The November and March auctions were unsuccessful despite the fact that most of the participants were 'distressed' bidders. Around 57% of the auctioned spectrum was unsold and, in four service areas, despite two rounds of auction, there were no bidders for the spectrum. Only in Bihar was the market price of spectrum determined through by the auction process.

We believe that the level of the reserve prices, in combination with the effect of the SUC regime, was the cause of the failed auctions. We urge TRAI not to forgo the opportunity to relook at the reserve prices for circles in which the spectrum was only partially sold. Simply auctioning the quashed spectrum at reserve prices that failed to find enough takers in November 2012 and March 2013 would only be paying lip service to the Hon'ble Supreme Court's Order of 15 February 2013.

Q.18. a) Should annual spectrum usage charges be a percentage of AGR or is there a need to adopt some other method for levying spectrum usage charges? If another method is suggested, all details may be furnished.

b) In case annual spectrum usage charges are levied as a percentage of AGR, should annual spectrum charges escalate with the amount of spectrum holding, as at present, or should a fixed percentage of AGR be applicable?

#### c) If your response favours a flat percentage of AGR, what should that percentage be?

The revenue share spectrum usage charge regime was not a part of NTP-99. It was a separate bilateral settlement between the industry and the Government in 2002 when the Government



offered, and the industry accepted, allocations of spectrum of up to 10MHz and usage charges at 4% of AGR. However, this method of charging operators for the on-going use of spectrum is now in desperate need of reform. We propose a new method of charging for spectrum which will address the many shortcomings with the present approach.

In the consultation paper, TRAI correctly notes that the current SUC regime leads to anomalous results; creates a non-level playing field; penalises larger operators; discourages mergers and represents a significant burden on the industry. In addition to these disadvantages we believe that the current policy of escalating charges, which is unique to India, discourages the purchase of spectrum; perpetuates the inefficient use of spectrum; distorts spectrum auctions; skews technology choices and, ultimately, may result in lower revenues for the government. We substantiate these points below and propose an alternative: to charge for using spectrum as a fixed fee per MHz of spectrum held, based on the market value of spectrum, for all future allocations of spectrum, in *every* band.

#### Escalating SUCs discourage the purchase of spectrum

Under the current regime, operators are discouraged from buying spectrum because they have to pay additional SUCs calculated as a percentage of *all* of their AGRs from *all* other services supplied.<sup>14</sup> This means that the more successful the operator, the higher is their current revenue and the more costly it is to purchase spectrum for new technologies and services, or to service greater demand from new or existing customers.

The quantum of this deterrent effect varies between operators.

In <u>absolute</u> terms, the additional cost faced by operators who acquire the same amount of spectrum can vary significantly. In the example below, operator A (a large operator) pays *thirteen* times the amount paid by operator C (a small operator) in additional spectrum usage charges for the same quantum of spectrum purchased (the multiple for the medium operator is seven times).

	Operator A	Operator B	Operator C
AGR (Rs Cr)	2,000	1,000	100
Spectrum	10MHz	10MHz	4.4MHz
SUC*	6%	6%	3%
SUC before acquiring more spectrum(Rs Cr)	120	60	3

<sup>&</sup>lt;sup>14</sup> Unless, of course, the operators in question are dual-technology players; in which case the revenues from GSM and CDMA services are bi-furcated.



Additional spectrum acquired through auction	5MHz	5MHz	5MHz
New SUC*	8%	8%	6%
New SUC after acquiring spectrum (Rs Cr).	160	80	6
Incremental SUC due to additional spectrum 5 MHz spectrum (Rs Cr)	40	20	3
Ratio of incremental SUC	13x	7х	1x

\*Under the NIAs in 2012 and 2013

The amount paid for additional spectrum *relative* to its value in use can also be significantly higher for larger operators. The table below shows how the additional (or marginal) cost faced by operators differs. These marginal spectrum fees have been calculated by assuming that an operator's revenue would increase in proportion to their additional spectrum holding. That is, if the spectrum holding increases by 25%, we have assumed AGR increases by 25%.<sup>15</sup> The results show that the larger operators face higher marginal costs from purchasing spectrum. For example, the percentage of incremental revenue that is 'paid away' in spectrum fees to the government is 16% for Vodafone, but only half of this amount for Aircel, for the <u>same</u> quantum of spectrum purchased.

mustration - L									
Operator	Current Allocation	SUC % for Current Allocation	New Holding if allocation up by 25%	SUC % for New Holding	Current AGR*	New AGR (up 25%)	SUC for Current Holding	SUC for New Holding	Incremental SUC as a% of Incremental AGR
	MHz	%	MHz	%	Rs. Cr	Rs. Cr	Rs. Cr	Rs. Cr	%
Airtel	10.0	6%	12.5	8%	666.34	832.93	39.98	66.63	16%
Vodafone	10.0	6%	12.5	8%	554.18	692.73	33.25	55.42	16%
MTNL	12.4	8%	15.5	8%	70.37	87.96	5.63	7.04	8%
ldea	8.0	5%	10.0	6%	149.74	187.18	7.49	11.23	10%
Aircel	4.4	3%	5.5	4%	69.98	87.48	2.10	3.50	8%
RCOM (GSM)	4.4	3%	5.5	4%	133.95	167.44	4.02	6.70	8%

Illustration - Delhi Circle

Assumed that traffic increases proportionately with spectrum allocation (accordingly AGR increased by % increase in each additional allocation) Marginal Spectrum cost (%) = Marginal increase in SUC paid/ Marginal increase in AGR SUC % as per NIA for March 2013 auctions

\* Current AGR as per TRAI Q4 FY13 report (MTNL only mobile)

The absolute and relative costs of additional spectrum resulting from escalating SUCs are sufficient to deter larger operators from purchasing spectrum. Any delay in the use of spectrum that is caused by escalating SUCs represents an opportunity cost to the economy that can never be recovered. Spectrum is unlike physical natural resources which are extracted from the ground. In case of coal mining, if the owner of the mine delays the extraction of the coal for a

<sup>&</sup>lt;sup>15</sup> Although this is a simplification, it is reasonable to assume a link between spectrum held and potential revenue, given that an increased spectrum holding will enable operators to enhance service offerings (e.g., for mobile data services) and expand network coverage



number of years, the same amount of coal is available to be mined, its profile of extraction is just shifted in time — but the total amount of coal mined is unchanged. This is not the case for spectrum: a delay in its deployment can never be made up by greater 'production' of minutes or megabytes later in time. A royalty payment on coal revenue may be appropriate because it causes no harm over the long-term; the same is not true for a royalty payment for spectrum where the timing of 'extraction' is critical.

#### Escalating SUCs perpetuate the inefficient use of spectrum

The current slab-based charges have not encouraged the efficient use of spectrum. This is illustrated in the table below which shows the SUC payment per MHz of spectrum for each of the active operators in Delhi and Mumbai for the financial year 2013<sup>16</sup>; this is a measure of the extent to which the spectrum held has been put to productive use.<sup>17</sup>

The analysis shows that the largest holder of spectrum (MTNL) pays only a 15% of the per MHz amount paid by Airtel in Delhi. In Mumbai, Vodafone pays twelve times the amount per MHz paid by MTNL even though the latter holds more spectrum.<sup>18</sup>

Operator		Delhi			Mumbai	
Operator	MHz	SUC	SUC/MHz	MHz	SUC	SUC/MHz
Vodafone	10.00	135	13	10.00	121	12
Airtel	10.00	142	14	9.20	62	7
Idea	8.00	31	4	4.40	10	2
Aircel	4.40	6	1	4.40	3	1
Reliance	4.40	15	3	4.40	20	5
Tata	5.00	26	5	4.40	41	9
MTNL	12.40	20	2	12.40	12	1
MTS	3.75	4	1	3.75	2	1
Loop	-	-	-	10.00	15	1

#### Escalating SUCs distort spectrum auctions

An escalating charge approach is unsuitable when there is an auction of spectrum. In an auction, the bidder takes account of both the amount payable through the auction as well as the recurring usage charges. If usage charges are higher at different levels of spectrum holding the entire auction process can be compromised. An operator paying a higher spectrum usage charge percentage from holding a larger block of spectrum prior to the auction would place a lower upfront value on the spectrum than under a non-escalating method of charging. The magnitude of this effect will differ between operators. Importantly, this bias in the auction is unrelated to the additional value that each operator can create with the spectrum purchased i.e., an operator may generate less value with the acquired spectrum than rival bidders, but be prepared to pay more for it in an auction only as a consequence of the SUC regime.

<sup>&</sup>lt;sup>16</sup> TRAI only reports two quarters of data for Loop.

<sup>&</sup>lt;sup>17</sup> To continue the mining analogy, it is the equivalent of: coal produced per mine (where all mines are identical and only the owners differ).

<sup>&</sup>lt;sup>18</sup> TRAI makes a similar point about the efficient use of spectrum in table 2.10 of the consultation.



#### The existing regime contains anomalies which skew frequency choices and are discriminatory

The current regime is incompatible with the concept of holding technology neutral spectrum. For example, if an operator buys E-GSM spectrum to use for 3G its SUC charges will increase. Instead, if it buys 2100MHz, there is no increase in the SUC slab. However, it could be, that it is more efficient (i.e., a lower cost per unit of traffic) to use 900MHz for 3G, but the operator opts for 2100MHz (which it then deploys less extensively) in order to avoid the higher spectrum usage fees.

BWA spectrum attracts a spectrum usage charge of 1% of AGR with the BWA revenues being segregated and reported separately. This compares with 10MHz of 1800MHz spectrum used for (say) LTE which is charged at 6%. The table below compares the frequency / technology choice for an operator contemplating launching an LTE service. The example shows that deploying 2300MHz spectrum for LTE is around 95% more SUC 'efficient' than deploying 1800MHz for LTE. This magnitude of this effect could exceed the lower cost per megabyte of supplying data services on lower frequency spectrum.

	Operator A	Operator B	Operator C
AGR (Rs Cr)	2,000	1,000	100
Spectrum (MHz)	10 MHz	10MHz	4.4 MHz
SUC (%)	6%	6%	3%
SUC Rs. Cr)	120	60	3
Additional AGR generated from LTE (20% of current AGR) (Rs. Cr)	400	200	20
	Scenario-1:	Operator acquires 1	OMHz for 1800 LTE
New SUC %	8%	8%	8%
New SUC after acquiring spectrum on earlier AGR (Rs. Cr)	160	80	8
Incremental SUC on old AGR (Rs. Cr)	40	20	5
Incremental SUC on additional AGR (Rs. Cr)	32	16	1.6
Total Incremental SUC (Rs. Cr)	72	36	6.6
	Scenario-2:	Operator acquires 2	OMHz for 2300 LTE
New SUC (Rs. Cr)	1% only on AGR of LTE services	1% only on LTE services	1% only on LTE services
Incremental SUC (Rs. Cr)	4	2	0.2



The current SUC regime disadvantages operators who use the same or similar bands for multiple technologies. For example, an operator who uses 900/1800MHz for 2G, 3G and 4G will face a far higher SUC bill than one who uses 850MHz, 2100MHz and 2300MHz. All of these services form part of the same market and, to some extent, are substitutes for one another. We can see no justification for the different treatment of different services which is dependent the frequency chosen to offer those services.

#### Our proposal

Vodafone proposes that all future allocations of spectrum are subject to an annual fee per MHz of spectrum<sup>19</sup> set as a percentage of the market determined price of the spectrum. The industry should migrate to this new regime over time as spectrum comes up for extension and existing frequency bands (2100MHz) and new bands (700MHz) are auctioned; with operators given the choice to migrate their existing holdings of spectrum to the new regime on the payment of a market-determined fee. The fee per MHz may vary by band of spectrum, but not by the user of the spectrum. This arrangement will have a number of advantages:

- Operators are not discouraged from buying spectrum because the cost of purchasing spectrum is not dependent on the size of their existing business;
- Operators will face an annual cost in holding un/under used spectrum and this cost is higher the higher the quantum of under utilized spectrum; this provides an incentive for operators to use spectrum efficiently;
- Future consolidation is not discouraged provided, on acquisition, the usage charges on the spectrum acquired are charged according to the new arrangements.
- Auctions of spectrum are not distorted. The total cost of spectrum in an auction is the same for each winner;
- A fixed charge per MHz will not favour any operator or class of operators and will not distort the choice between technologies in the future because the ongoing spectrum charges will be invariant to the choice of technology.

The effect of the delay in the purchase of spectrum under the current regime is likely to result in lower revenues accruing to government than under a fixed fee per MHz arrangement. Consider the following example of what would happen if a *single* operator decided to 'pull forward' its purchase of 5MHz of 1800MHz spectrum by one year (see the table below).

<sup>&</sup>lt;sup>19</sup> For example, in the NIA issued prior to the auction of spectrum the government would specify that (say) 2% of the market-discovered price would be charged each year, payable each quarter, as an ongoing spectrum charge for the duration of the license.



Assume that the pan India price of 5MHz of 1800MHz spectrum realised in the next auction is Rs.7,000 crores

At an interest rate of 9.75% this is equivalent to an annual annuity of: Rs. 808 crores

Assume that the per MHz spectrum usage charge is set at 2% of the upfront cost: Rs. 140 crores

For every year that the purchase of spectrum is advanced the Government earns and additional: Rs.948 crores.

In this simple example, the government would earn Rs.948 crores <u>more</u> for each year by which the purchase of 5MHz of 1800MHz is advanced<sup>20</sup> (because of the abandonment of the escalating SUC regime). This figure is over 20% of the <u>total</u> SUC bill for the calendar year 2012.

A fixed charge per MHz is better than a flat-rate SUC

We believe that this method of charging for spectrum better address the disadvantages of the existing regime than a move to a flat-rate SUC regime i.e., where the percentage charge does not vary with the amount of spectrum held. The table below summarises the relative advantage of a charge per MHz regime versus a flat-rate charge.

	Issues with escalating SUCs	Flat SUC as % of AGR across all technologies / spectrum bands	Flat SUC (SUC/MHz derived as a % of a market discovered price)
1.	Discourages operators from buying spectrum	Solves the issue	Solves the issue
2.	Operators are not penalised for using spectrum inefficiently	Does not solve the issue	Solves the issue
3.	Discourages M&A and spectrum sharing	Solves the issue	Solves the issue
4.	Distorts the outcome of auctions	Reduces the issue	Solves the issue
5.	Skews technology choices (2100 vs. 900 for 3G and 1800 vs. 2300 for LTE).	Reduces the issue	Solves the issue for the future
6.	Favours a particular class of operators	Reduces the issue	Solves the issue for the future

<sup>&</sup>lt;sup>20</sup> Obviously this number increases significantly if the effect spreads to other operators and/or other bands. It also does not include the consequential effect that subsequent spectrum purchases by the same operator are 'pulled forward'. This figure ignores the any additional revenue that the purchaser may generate and the consequential license fees.



#### Conclusion

Vodafone submits that there are significant damaging consequences from charging for spectrum on the basis of escalating charges as a percentage of revenue — not least the likely impact on government revenues. The deleterious effects of the current regime can be addressed by moving, over time, to a fixed charge per MHz for spectrum; where that charge is based on the market price of that band of spectrum at the time that it is sold via an auction. Moving to a fixed percentage spectrum addresses some, but not all, of the disadvantages with the current regime. If the latter is adopted, we concur with TRAI that 3% AGR is an appropriate figure.

## Q.19. What should be the ratio adopted between the reserve price for the auction and the valuation of the spectrum?

We have recommended the level at which TRAI should set the reserve prices in our answer to question 15.

Our methodology has been to choose an *a priori* reasonable set of reserve prices and benchmark these against other data to determine whether they are likely to lead to a successful auction i.e., whether the reserve prices a sufficiently below the estimated market price, either in aggregate or for certain circles, to mean that the auction will determine the market price. We find this to be the case, and therefore we recommend using the 2010 2100MHz reserve price in the forthcoming auction.

If instead, robust estimates of the market price for each LSA can be derived (and we explain in our answer to questions 13 and 14 why we doubt this to be the case) benchmark ratios of the sort estimated by the TRAI can be applied to set the reserve price. However, we note that TRAI's estimates of the appropriate ratio have an upward bias caused by the sample composition. If we strip out the auctions in which the reserve price is within 99% of the final price, the applicable ratio falls to 33%.

Additional issues		

We take the opportunity of this consultation to raise some other issues.

#### **Block size**

The block size of 1.25MHz the November auction has resulted in spectrum wastage by operators and being unintentionally left idle by the Government.

The only widely deployed commercial technologies in the 900MHz and 1800MHz bands are:

Band	Technologies deployed
900	GSM and UMTS (WCDMA)
1800	GSM and LTE



The bandwidth that can be deployed in the above technologies are:

Technology	Bandwidth supported
GSM	Multiples of 200KHz
UMTS (WCDMA)	Multiples of 5MHz
LTE	1.4MHz, 3MHz, 5MHz and 10MHz

The highest common factor that will support <u>all</u> these different bandwidths is 200KHz. Adopting a block size of 1.25MHz will result in a significant wastage of valuable spectrum in many scenarios, as is evident from the Table below:

Carrier Block size	Wastage for GSM	UMTS	Wastage for LTE
1.25 /6.25 MHz	0.05	na	na
2.5 /7.5 MHz	0.10	na	1.10
3.75/ 8.75 MHz	0.15	na	0.75
5/10 MHz (non-contiguous)	0.20	na	na
5/10 MHz (contiguous)	-	-	-

This wastage is exacerbated when the spectrum allocations are not as per the GSM ARFCN table. This has happened for some of our allocations after the November 2012 auction. Due to the unaligned start and stop frequency allocations, we are able to get only 5 ARFCN allocations, resulting in two blocks of 200KHz i.e. 400KHz being rendered unusable.

The block size of 1.25MHz is not aligned with the current SUC slabs, which have been formulated on the basis of a block size of 200KHz for the 900MHz and 1800MHz bands. Licensees who have acquired spectrum in the November 2012 auctions have, as a consequence, ended up paying a higher spectrum usage charge than their competitors.

In view of the above, we submit that there are compelling reasons to review the block size of 1.25MHz and revert to the allocation of spectrum in blocks of 200KHz. In the auction operators can be required to purchase a minimum of 1MHz in order to deter participants who are simply intent on driving up the price of spectrum.

#### Contiguity of Spectrum

The contiguity of spectrum holdings is critical to the deployment of technologies beyond GSM; a minimum of 5MHz of contiguous spectrum in 900MHz is required for use for 3G services. Non-contiguous spectrum can be expected to have a lower value than contiguous spectrum. The DoT should therefore make every effort to ensure that the spectrum auctioned in both the 900MHz and 1800MHz bands is contiguous.

The NIA to the March auction contained the following text on page 8:

Frequency reconfiguration i.e. rearrangement of spot frequencies in the same band, from within the assignments made to the licenses, may be


carried out, with the authorization if the WPC Wing, among the licensees, <u>only</u> when the entire spectrum held by them is liberalized. No charges will be levied for the rearrangement of frequency spots.

Without prejudice to on contention that our spectrum is already liberalized, this statement is too equivocal for the prospective bidders to rely upon. What certainty will the operators have that the DoT will approve the rearrangement of spectrum spots or that this will be done expeditiously?<sup>21</sup> Far better for the DoT to ensure that the auctioned spectrum is contiguous and that it is made contiguous *before* it is allocated to its purchasers. Alternatively, but less attractive, is for the WPC <u>not</u> to require approval, only an intimation, of any spectrum swaps.

If the DoT auctions a mixture of contiguous and non-contiguous spectrum, we suggest that it sells contiguous and non-contiguous spectrum in the same lot with the allocation based on the ranking principles articulated in the March NIA.

We understand that it may be proposed that operators are allowed to withdraw their winning bids if they are not awarded contiguous spectrum. This would be a novel auction feature that we have seen nowhere else in the world and which is clearly open to abuse. Auctions are typically designed to put spectrum into the hands of those who value it most, in the expectation that this will translate into benefits for customers. Auctions should not allow participants, who have no intention of buying and using spectrum, to drive up the costs of those that do. Such a feature could obviously results in post-auction disputes and challenges. We urge TRAI to consider this matter and make appropriate recommendations to government.

### Mergers and Acquisitions Framework

The M&A framework announced in the Press Release of 15 February 2012 not only discourages consolidation, but it appears to be out of date with subsequent developments:

- As TRAI points out: "[t]he escalating slab rate system of charging SUC is also a disincentive for mergers as any merged entity will have to move to a higher slab rate as a result of the increased holding of spectrum." This disincentive is exacerbated if the seller has to pay market-related fee on spectrum that it sells;
- Spectrum caps should be brought in line with the NIA provisions of November and March: a maximum of 50% of each band and 25% of total assigned spectrum;
- The concept of prescribed limit, besides being inconsistent with policy and licensing provisions, was recommended in the context of continued administrative allocation of spectrum. This is no longer the case, and hence the provision that spectrum held by the combined entity beyond prescribed limits must be surrendered within one year of M&A permission being granted should be removed from the guidelines.

The M&A guidelines also mentioned clarity on the on the circumstances in which a beyond the 35% market share limit would be permitted would come after TRAI's recommendation and a consultation with industry. This consultation is yet to take place. We urge that it is expedited.

<sup>&</sup>lt;sup>21</sup> Recall that it took the WPC seven months to make available the spectrum to its purchasers after the November 2012 auction



### Spectrum Sharing

Despite broad guidelines for spectrum sharing being laid down in 2012, no operators are sharing spectrum. This indicates that the rules discourage spectrum sharing (unsurprising since the sharers must pay SUCs on their combined spectrum). We urge that the spectrum sharing norms also be reviewed.

### Partial Allocations of spectrum within LSAs

We recommend that, at a minimum, spectrum should be made available in the State Capital and the four largest cities within an LSA. Failing this, the partial lots of spectrum should *not* be auctioned. Auctioning spectrum that is not available in the biggest cities neither provides new capacity for existing services nor allows new services to be launched in the most desirable markets. There have been no buyers for spectrum which did not meet the above condition in the past two auctions.

### Availability of Spectrum in Other Bands

We believe that more 2100MHz should be made available. The 2010 auctions allocated only 20-25MHz of the 2100MHz band out of the ITU band of 60MHz. Data growth is being constrained in the larger cities by the limited availability of 2100 MHz spectrum. India is already three years and 5 million users behind its original broadband target. In view of the diminishing interest in CDMA, the 1900MHz spectrum band can be used to swap with 15MHz of spectrum in 2100MHz band held by the Defence Ministry, this would enable three additional 5` MHz slots to be made available, in addition to the single slot already available in circles where only 20MHz was allocated in 2010. The swapping proposal was submitted to the Authority by the COAI in March 2013 and is shown in the diagram below:





Opportunity for 3 extra slots of 2x5 MHz in 2.1 GHz band

What should the DoT do to create 3 extra slots of 2x5 MHz in 2.1 GHz band?

- Exchange blocks 1900-1907.5 & 1980-1987.5 (7.5+7.5 MHz) with 1939-1954 (15 MHz) in 2.1 GHz band.
- Corresponding 2129- 2144 (15 MHz) of 2.1 GHz is outside the ambit of the MoD agreement.

Vodafone August 2013



TVR/VIL/077 18 June 2013

Secretary, DoT And Chairman, Telecom Commission Department of Telecommunications Ministry of Communications & IT Sanchar Bhawan 20 Ashoka Road New Delhi – 110 001

Dear Sir,

### Re: Terms for Extension of our Licenses for Delhi, Mumbai & Kolkata – Spectrum Price

- 1. This is in respect of our licenses for Delhi, Mumbai and Kolkata which are coming up for extension in November 2014.
- 2. We had applied for extension of our licenses on 19 December 2012 in accordance with the provisions of Clause 4.1 of our license wherein we had demonstrated/submitted that extension of our license is expedient and in public interest and had requested DoT to initiate suitable steps for extension of our license for consideration and mutual discussion on terms that fair, reasonable, non arbitrary non-discriminatory and mutually agreed.
- 3. We are however, deeply distressed that DoT has incorrectly rejected our applications for extension of our licenses without considering the points made by us and on various other erroneous grounds, including inter alia, the wrongful contention that we are seeking extension on 'the same terms and conditions' and inter alia that even an offer in this regard is not there in our communication or in our interaction with you.
- 4. For the purpose of abundant clarity, we reiterate that we are not seeking extension on the same terms, rather we have repeatedly requested DoT to initiate suitable steps for extension of our license for consideration and mutual agreement. It is evident from the above that we were expecting the DoT to initiate the process and make a suitable/fair offer for discussion.

### **Our Proposal**

5. However, in the light of your expectation from us, we would like to submit the following for consideration and discussion so as to arrive at mutually agreed terms as envisaged in Clause 4.1 of the License.

### Vodafone India Limited

- For extension of our licenses for 20 years along with current mix of spectrum and a flat spectrum usage charge of 3% of AGR, we are willing to pay Rs. 4,000 crores as given below:
  - A. Delhi: Rs. 1,700 crores
  - B. Mumbai: Rs. 1,700 crores
  - C. Kolkata: Rs. 600 crores
- II. It may be noted that:
  - a. The respective price for 1800MHz spectrum is more than twice the 3G reserve price.
  - b. We have used a multiplier of 1.3x of 1800MHz for 900MHz which is on the same basis as has been applied to 800MHz [as you would be aware, TRAI has repeatedly equated the value of 800MHz and 900MHz as having similar propagation characteristics]
- III. Further, as has been the approach of DoT in the November 2012 and March 2013 auctions, the option of a staggered versus upfront payment may also kindly be made available to us for our licenses that are coming up for extension.
- 6. We are open to discussing the above terms in order to arrive at mutual agreement with the DoT.
- 7. In the alternative, the respective unit price of 1800MHz as derived from the paras 5 (I) and (II) above for the respective service areas can be considered as reserve price for the auction of available 1800MHz spectrum. We submit that such reserve price of 1800MHz spectrum can be considered as an offer from us, in the interim, for existing 1800MHz and 1.3 times thereof for our existing 900MHz allocations, which can be adjusted to the market discovered price for 1800MHz. Once fair market prices have been established for 1800MHz as per above approach, the same can be applied to the 'extension' spectrum for our 1800MHz and with 1.3 multiplier for our 900MHz allocations.
- 8. A brief note on conduct of fair and successful auctions in 1800MHz for determination of market discovered price as mentioned above, is enclosed as Annexure-1.

We earnestly hope that our submission will merit your kind consideration and support.

We reiterate that we are willing to discuss this issue further so as to arrive at mutually agreed terms and conditions for extension as provided under our license and as is also desirable for continuity of service and public interest.

We respectfully submit that our above submissions are without prejudice to our legal rights and contentions in the matter or any other or further submissions made /to be made on the issues.

Kind regards,

Sincerely yours,

T. V. Ramachandran Resident Director Regulatory Affairs & Government Relations

Copy to : Member (F), Telecom Commission : Member (T), Telecom Commission : Wireless Advisor, Govt. of India, DoT : DDG (WPF), DoT

### Annexure-1

### CONDUCT OF FAIR AND SUCCESSFUL AUCTIONS FOR 1800 MHZ

- 1. As you are aware, the outcome of any auction is affected by:
  - The level of the reserve price(s);
  - The amount of spectrum put up for auction; and
  - The structure of Spectrum Usage Charges (SUCs) levied on holders of spectrum.
- 2. In order to establish a fair market price for spectrum it is necessary that sufficient spectrum is put up for auction, the reserve price is set at a 'reasonable' level and the SUC is changed to a flat/uniform rate.

### **Reserve Prices**

- 3. It is now an admitted fact that the reserve prices set for 1800MHz spectrum in both the November '12 and the March '13 auctions were exorbitant in Delhi & Mumbai and extremely high in Kolkata. This is evident from the following:
  - a. In November 2012, despite the participation of five bidders in the auction, no spectrum was sold in either Delhi or Mumbai. Only one operator whose license had been quashed acquired spectrum in Kolkata. Two operators, Videocon & Uninor, whose licenses had been quashed, opted to close their operations in Mumbai and Kolkata rather than purchase spectrum at the reserve prices set by DoT. No spectrum was sold in any of these metros in the March auction.
  - b. At the 1800MHz reserve price in the March 2013 auction the annualised cost of spectrum for Vodafone as a percentage of Adjusted Gross Revenue (AGR) is estimated to be as high as 61% in Delhi and 66% in Mumbai. These costs, coupled with the other expenses of running a network sites, marketing, customer acquisition, labour, etc. mean that there is no business case to purchase spectrum at these prices; as evidenced by the failure of the auction.
  - c. In the recent auctions of "4G" spectrum held in the United Kingdom the final price per MHz in 800MHz band in UK (which, in fact, is comparable to the 700MHz band in India), was 40% lower than the reserve price set by DoT for 900MHz in Delhi and Mumbai.
- 4. The fact that the reserve prices have been set at a very high level has also been acknowledged by the Government
  - a. Dr. Montek S Ahluwalia, Dy. Chairman Planning Commission of India has recently commented "[spectrum is a national resource. We had two unsuccessful attempts to auction it. *It's quite clear that reserve price was too high*...." (emphasis supplied).

- b. Dr. Rahul Khullar the Chairman of TRAI in a recent media report (The Mint, 28 May 2013, copy enclosed as Annexure-1A) has said that "...*in retrospect perhaps it is correct to say that the reserve price was set a little too high*". (emphasis supplied).
- c. In a subsequent media report (Financial Express, 5 June 2013 copy enclosed as Annexure-1B), Dr. Khullar has gone on to further state that :

"...the recent spectrum auctions failed because of a high reserve price that did not reflect market realities...."

"the years 2011, 2012 and 2013 were not 2006, 2007 and 2008....the former were boom years and latter years were of down turn.."

"the concept that spectrum can be priced in an absolute sense is wrong"

"Pricing of spectrum has to be done in the context of market realities. It can't be the case that the base price of a new round of auction should be the price at which spectrum was sold in an earlier round of bids. Market realities change, the industry's paying capacity changes and these need to be taken into account while determining the price of spectrum." (emphasis supplied).

5. The above clearly demonstrates that the reserve price for 1800MHz needs to be brought down to far more reasonable levels so as to ensure robust participation and fair market discovery.

### Quantum of spectrum

- 6. Fair market prices for spectrum can only be established through an auction which has an adequate supply of spectrum and no coercive participation. In the November 2012 auction, the DoT did not put the total quantum of the quashed spectrum in 1800MHz band up for auction, which coupled with the excessive reserve prices distorted the auction outcome.
- 7. As a matter of good practice, government should include the entire available spectrum in the auction. Un-used spectrum represents an (unrecoverable) loss to society; in terms of services that are not provided to consumers, revenues foregone by the government and the overall economic growth and development of the country.
- 8. The government should put all available spectrum in the band up for auction. This will not only ensure fair price discovery but will also ensure optimal use of this resource in public interest.

### Spectrum Usage Charges (SUC)

- 9. SUCs are an important part of the overall spectrum cost incurred by operators; these are applied as a percentage of AGR and depend on the quantum of spectrum held; the more spectrum that is held, the higher the percentage of AGR which is paid to the government.
- 10. The escalating spectrum usage charges regime was devised as a way to pay the incremental fee for additional spectrum that was allocated administratively. However, once spectrum is allocated via an auction/market linked process, it is illogical to continue with an escalating SUC regime. The current rising slab-based SUC suffers from several drawbacks as:
  - a. An **escalating SUC imposes very different costs on operators** depending upon the quantum of spectrum that they hold.
  - b. Different operators face very different marginal pricing of the same increment of spectrum as operators with higher allotments of spectrum and consequently more customers face a higher charge. For example, the SUC of 6% AGR for 15MHz spectrum, the marginal SUC is as high as 11% of AGR. With the further escalation in the SUC in the November 2012 and March 2013 auctions, this marginal rate would be even higher.
  - c. This regime penalizes performing operators that contribute more to the tele density objectives and venture out into the rural areas.
  - d. It **also compromises the integrity of the auction result** as the annual usage charges that are paid by operators are not factored in whilst deciding the final bid. Thus, the spectrum does not necessarily go to the operator that has placed the highest value on the spectrum. The continuation of the escalating charge regime thus can distort the outcome of an auction;
  - e. Further, the SUCs slabs are also applied inconsistently and in a discriminatory manner dependent on technology: different technologies are treated in a differently, this is inconsistent with having technology neutral spectrum; This also creates a non-level playing field amongst operators offering as in case of operators offering GSM + WCDMA services, the spectrum is clubbed and charged at the highest slab rate, but in case of operators offering GSM+CDMA services, the spectrum and revenues are segregated and they pay far lower SUC whilst holding equal /more quantum of spectrum, leading to loss to the Government exchequer
  - f. Furthermore, the **SUC slabs discriminate between two different frequency bands used for the same technology**. For example, if an operator buys 5MHz of 2100 band for 3G, that will not increase the SUC slab but if that operator buys 5MHz of the 900MHz band for 3G, it will increase its SUC slab.
- 11. There is thus a pressing need to review the current SUC regime and consider introduction of a flat rate for SUC irrespective of quantum held or technology mix deployed. The SUC regime should be changed to a flat rate spectrum usage charge of 3% of AGR as recommended by TRAI (revised recommendations, 12 May 2012)

12. The test of whether the auction has delivered a fair market price would be that 100% of the spectrum at auction has been sold and that there is a movement in the reserve price. If insufficient spectrum is sold then successive auctions must be held with revised terms until this test is met.

NNEQURE-1A.



Date: 28-May-2013

HeadLine :	Spectrum pricing is to be seen in context of market, overall economy					
Newspaper :	Mint	Language :	English			
Journalist :	Vivek Law	Edition :	All			
Page No :	<sup>18</sup> Position : Top	Height: 42	2 <b>Column :</b> 6			

Rahul Khullar, chairman of (he Telecom Regulatory Authority of India (TRAI), comments on the re-farming, or reallocation, of spectrum, predatory tariffs and value-added services. Edited excerpts from an interview:

We met about a year ago when you just took charge. The previous TRAI regime had worked very hard on putting together the entire process for auctioning of licenses. When you took charge you and your team worked on it as well because the reference was made but a year down the line we are pretty much where we were. The auctions turned out to be a dud, Nothing happened. What are your thoughts?

I think my predecessor made a recommendation on a reserve price and that, as I told you last year, was a final recommendation in the sense I could do nothing about it.

The back reference that was made to us at that point of time was to ask the question, what is the impact of such a reserve price on telecom tariffs?' The answer quite simply even at that point of time was even at that price the impact on telecom tariffs would not be significant.

We stand by that analysis that that is not the relevant consideration.

You would recall that what I had told you last year was that it's not the price of spectrum that's the problem.

The problem is that the industry is carrying large legacy costs and it's not being able to deal with those legacy costs.

Therefore the problem lies elsewhere.

If you want to blame it on the price of spectrum, you can, but that's a very silly way of going about it.

I still stand by that.

Now what your question is pointing to is that it's not the impact on tariffs that was really the important issue and that is correct because that was the bogey raised by the telecom providers at that time.

The substantive issue which was really raised was the price was too high.

I think one year down the road, all of us are a little wiser about that and in retrospect perhaps it is correct to say that the reserve price was set a little too high and that for the moment (that) is all 1 will say on that issue.

On the question of the impact on the industry, it's not that the auctions were a dud as you put it, meaning people did buy spectrum, but you are correct about two things.

Firstly, the 900 MHz spectrum never got sold.

Secondly, in the second round even 1800 MHz spectrum didn't get sold and to that extent there is a problem.

Now the much larger answer to these questions is that pricing spectrum has to be seen with respect to market conditions and the overall condition of the economy.

It is not an absolute at any point of time.

So you could sell 900 MHz spectrum at day one for X and 300 days later you may be able to sell it for Y which is significantly less than X.

So, all this is a half decent explanation for what has transpired over the last year...The point of the matter which I really think we need to reflect on as Indians is that how do we go forward from here and do we need a little



breathing space In terms of planning auctions and reasoning and thinking things through rather than responding to external stimuli at all points of time.

Has the government referred anything to you on the fresh set of auctions?

No, not yet.

I believe that press reports say something to that effect but we have received no reference.

On the larger issue the one that you made about the future of telecom, one thing that we saw increasingly and you raised this point when we last spoke even back then that excessive litigation is slowing down the industry; those were the exact words that you used. What we have seen eventually is, it is only getting worse. Today, pretty much every decision that is coming out on the policy front is being challenged in some court or the other. I am sure you would say that's a very unhealthy thing but how does one tackle that from an industry point of view?

Let me say two things. I think this is one of those very peculiar industries, which is a house divided by technology.

I have made this point again and again.

Those sort of internal disputes or intra industry disputes between one corporate and another corporate have been a way of life for the industry for the last 10 years and so you continue to see that sort of legal strife.

I think much of that is unnecessary and now that people are recognizing what we recognized last year when I told that CDMA (code division multiple access) is a dying technology; perhaps as it indeed dies out you will see less of this intra-corporate or intra industry but inter-corporate warfare.

I think the second set of litigation has been industry versus the regulator and industry versus the government.

I think industry versus the regulator, may be I am paying myself too much tribute here.

However, that has come down a bit.

It's not as nasty or as vitiated as it used to be before and I think on the whole it has reduced but I am subject to correction.

I don't wish to claim credit where it's not due to us but the other litigation which has increased significantly is industry viz-a-viz government.

A lot of that has to do with the state of the economy and the state of the industry.

When the industry was in good times, even a tough decision taken by the government, we would sort of solve it but when you are on bad times you start questioning good or bad.

Whatever the decision is, you are going to start questioning it.

That explains why that litigation has indeed increased and then of course, there is a public interest litigation which can take off at any time on anything and much as I stand for consumer organizations and for consumer protection, there is a distinction between people who do main knowledge and expertise and well-wishers who wish to organize themselves as non-government organizations may not possess same degree of domain knowledge or expertise to correctly assess or understand the problem.

However in the enthusiasm, they create certain difficulties for us.

I think the industry is gradually improving.

Its economic conditions are improving but that does not mean the end of litigation.

Also, with all due respect to all judicial authorities, a real circumspection is required before you start entering into all manner of cases.

Very often what drives the case to a judicial tribunal or a judicial court as the case may be, may be driven by agenda which is both political and economical and not necessarily requiring settlement of any major legal principle or any matter of law.

Have your views on refarming changed or are they still what they were last year?



No, my views of refarming have been consistent.

You need to vacate, meaning every country has done it, as technology advances you need to use the best spectrum for the best technology.

Now I don't think there is any change in that view and we reiterated that even when the DoT (department of telecommunications) asked us for our recommendations last year.

So, I don't think refarming per se is wrong.

I think it goes back to the question which you raised right in the beginning, 'what is the appropriate price for 900 MHz spectrum?', which means to say that if I have to vacate 900 MHz spectrum and move to 1800 MHz then what is the price you are going to charge me to move to the 1800 MHz spectrum because 1 will also be having additional opex and capex to cany.

Equally, to avoid taking on those, would I be willing to pay a premium for over 900 MHz for spectrum and that is, as I said, a very tricky issue.

So I don't want to go in to that particular issue that's technical and still wide open but I think the short answer to your question is yes.

I don't think anything has changed in my mind about refarming at this point of time.

When we last spoke, you had flagged the point that there was predatory pricing and that tariffs were ridiculously low.

## We have seen the industry react to that In many ways in the recent past. We have seen some hikes and some attempts really to come back to normalcy levels. Do you think that is something that is inevitable and as a regulator, you are okay with it?

When I said it seemed outrageous but it was a bit like saying 'it's the economy, stupid.' Everybody got sort of carried away that here is the new revolution and a day will come when telecom tariffs will fall to zero or one paisa.

The point to recog- nize is that there are real costs and there was predatory pricing.

Please notice that it was the regulator who said it and not the guys who were doing it.

Now what has happened at the start of this year around six months ago is the internal recognition within telecom service providers that unless their top-line improves they are simply not going to have the Ebitda (earnings before interest, tax, depreciation and amortization) margins to cover their capital and other costs.

What they are essentially doing is that they are not fiddling with the headline tariffs and what they are doing is a clawback which means if I give freebies away I am sort of clawing those back bit by bit so as to improve my revenue realizations and thereby improve the topline.

Now, initially when they started there was this that goes first and this constant dread that if I claw back and that guy doesn't, will I lose customers.

I think, by and large, all of them have sensed without any collusion that they have to somehow improve their topline.

As a regulator, we will get in to the picture only when we feel that headline tariffs are being affected and yes, indeed tariff increases are pinching the consumer.

Please recall that last year when you spoke to me I said, I pose this question to you that look if you are living in an economy with 10% inflation, if you are willing to pay 10% per annum higher for milk, for Coca-Cola, for X, for Y, for Z then why not for a telephone call.

#### I stand by that.

I want to ask you two questions from a consumers' point of view. Very recently you called a meeting of all the telecom operators. I am not getting into the specifics of what you said there but I was rather alarmed to find out, and correct me if those numbers are wrong, that 20 million subscribers or connections have problems with a value added service activated without permission. To my mind, that almost seems like a scam because it's not obviously an honest mistake which somebody made if it's 20



### million and I don't think we have ever in the history of India seen that many people writing in to a regulator, irrespective of which field they are form?

I don't want to discuss my meeting with the CEO's of the TSPs (telecom service providers) because the contents of that are confidential and so I am not able to divulge that.

But yes, I will share this that I did discuss with them about the value added service problem.

Now, this is not a new problem and it has been engaging our attention for the better part of the last eight months.

Essentially, what was happening was that consumers were feeling that they were getting ripped of because a button pressed here or something pressed there and bingo! a 100 bucks or 40 bucks is charged to the customer.

And there seemed to be no relief in the matter.

Now, to be perfectly honest, what happened was that a regulation was indeed issued in 2011 or late 2010, if I remember right, to regulate how VAS (value added services) would be operated.

Unfortunately, that regulation remained on paper, but unenforced for a long period of time till I decided when in September last year to prosecute some telecom providers for breaching the regulation and for not being in compliance.

The moment 1 did that they went to court and pre-empted any prosecution action on my part.

The court then ruled in our favour and not in favour of the TSP's.

The telecom service providers then came back to us and said that the regulation that was passed is impractical and we simply cannot implement it and there are huge costs for the implementation.

I said, 'fine, let the industry devise a solution but there are two things I am not willing to compromise on.' One is there is no easy exit which means there is only entry door and no exit door.

I said it's a complete rip off and it means if a consumer is once locked in cannot leave a value-added service.

He is totally screwed and you simply cannot carry on a regime where you do not provide easy exit which means to say, if I make a mistake and I say I have pressed a button by mistake and I have been charged 50 bucks.

It is fine but at least 1 should be able to stop it so that I am not charged 50 bucks again.

What was happening up till that point of time was that there was no easy exit.

That easy exit has been installed.

The second aspect and on which I was not willing to compromise was the confirmation that the consumer actually wants a service.

I took a meeting on Friday to discuss this and so within the next 10-15 days you should see reconfirmed entry will be in place technically and in a manner which can be independently audited by the regulator in another 10 days.

The other one which is the easy exit is already in place.

Let's go away from the domain of telecom and talk about media where the most contentious issue has been is this whole advertising regime that you wish to bring in the 10+2 minutes. There has been a lot of consultation which the industry seems to be having with you. Where do things stand? Are you willing to relook after hearing them or is that final decision?

I didn't come up with 12 minutes or 10+2 minutes.

The cable television Act and the cable television rules have 12 minutes (of advertising per hour of programming) written in the law books over a decade ago.

I don't enforce that law; the ministry of information and broadcasting does.

And the truth of the matter is, the broadcasting industry has been operating in brazen disregard of that law.



Last year, my predecessor issued a regulation sometime in May, if I remember it right, as a quality of service guideline or regulation which stipulated the same 12 minutes and then provided a number of provisos.

The broadcasters then came to us, they screamed blue murder and I said 'alright, we are willing to talk to you about it.' They then took us to court.

In court, I said 1 will not take any penal action and the court said why don't you have another look at it and 1 agreed that I will have another look at it again.

Therefore, for the next six-eight months, I relooked at the entire matter and this is dating to July-August last year.

I then went through a consultation process where consumers and users were consulted and it was at the end of that in end of March that we issued a regulation saying 12 minutes of clock time, no provisos and it's a simple rule which is 12 minutes is 12 minutes, and second is reporting which means that you are obliged to report to us.

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# Will align auction price ANNEAURE -1B. with market realities if asked, says Trai chief

#### **Rishi Raj** New Delhi, June 4

**ELECOM** Regulatory Authority of India (Trai) chairman Rahul Khullar has said that the recent spectrum auctions failed because of a high reserve price that did not reflect the ground realities. "Of course, the auctionsfailed because of the high reserveprice, which was not in sync with market realities. In hindsight, everyone knows it. The years 2011, 2012 and 2013 were not 2006, 2007 and 2008 ... The former were boom years and the latter years were of downturn," Khullar told FE.

Asked how he would go about it if the government decided to seek his recommendations now on what the reserve pricefor the next round of auctions should be, Khullar said: "I will go through a consultation process, look into industry issues and whatever has happened in the past. I would focus on objective reality.

Elaborating, he said that "the concept that spectrum can be priced in an absolute sense is wrong". "Pricing of spectrum has to be done in the context of market realities. It



Rahul Khullar, Trai chairman

Of course, the auctions failed because of the high reserve price, which was not in sync with market realities. In hindsight, everyone knows it

can't be a case that the base price of a new round of auctions should be the price at whichspectrumwassoldinan earlier round of bids. Market realities change, the industry's paying capacity changes and these need to be taken into account while determining the price of spectrum."

Khullar's reference was to the concept pointed out by Trai earlier that the closing price of 3Gauctions should be the base price for the new auctions.

5 JUN 2013

If the government finally decides to refer the matter to the Trai, which then comes with a reduced price, then it would solve much of the problem the sector is facing right now with several matters landing up in courts. Not only would spectrum get sold but issues relating to renewal of licences would also get resolved. Khullar admitted to the same in the context of refarmingtaking back the more efficient 900MHzspectrumfromoperators and giving them 1,800 MHz while putting the former for auction - saying its success depended on setting a reasonable price. "The operators don't think that they hold either the licence or spectrum in perpetuity. If the price is set at a reasonable level, the process would go through."

The base price for auctions of 900 MHz spectrum was set at twice that of the 1,800 MHz band, which was seen as very high and unreasonable by the industry. **Continued on Page 2** 

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#### NEW DELHI

### Spectrum...

The matter has been challenged by operators like Bharti Airtei and Vodafone and the matter is current ly in the Delhi High Court. The Trai chairman's comments on high reserve price comes at a time when the empowered group of ministers (EGoM) headed by finance minister. P Chidambaram is set to decide if fresh recommendations should be soughtfromtheregulatoronfixinga new reserve price for the next round of auctions. Planning Commission deputy chairman Montek Singh/ Ahluwalia, who is also a member of the EGoM, was the first to write to telecomminister Kapil Sibal that after two failed auctions, the government should seek fresh recommendations on the reserve price from Trai. The department of telecommunications is amenable to the idea but a final decision has to be taken by the EGoM when it meets next.

The government reduced the reserve price twice but not by enough to make it attractive to the industry. The result was that the first round of auctions held in November 2012 saw tepid response, leading to a revenue of a paltry Rs 9,408 crore for the government, and the second one planned in March 2013 had to be called off as no bidders came forward.

However, Khullar did not blame his predecessor JS Sarma, during whose time the base price was recommended at a steep Rs 18,000 crore for 5MHz of pan-India spectrum in

the 1,800 MHz band. "The high base price was due to the surcharged atmosphere of the time. Those were extraordinary times. The Supreme Court had cancelled the licences. The Comptroller and Auditor General of India had pointed to huge losses. Everyone was running scared and wanted to be excessively cautious. Nobody wanted to be caught on charges of nepotism and favouritism. Such an atmosphere of excessive caution led to a price which was out of sync with reality,"

Khullar said.

PAGE NO .:

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Report for Bharti Airtel Limited, Idea Cellular Limited and Vodafone India Limited

TRAI's recommendations on spectrum refarming: Critique of key assumptions and procedural considerations

June 2012

Pankaj Agrawal, Sourabh Kaushal and Ashwinder Sethi

www.analysysmason.com

### Contents

1	Executive summary	1
2	Introduction	4
3	Regulatory context for spectrum refarming in India	5
4	Impact of refarming on consumers, the environment and operators	8
5	Practice followed by other regulators	14
6	Impact of refarming on value of spectrum	19
7	Conclusions and next steps	23

Annex A Key assumptions and modelling results





### 1 Executive summary

The latest recommendations of TRAI on auction of spectrum<sup>1</sup> propose the refarming of 900MHz spectrum in-lieu of assignment of 1800MHz spectrum.

Unfortunately, there isn't any comprehensive document which explains the rationale for these recommendations, outlines the approach adopted to arrive at this conclusion, and evaluates the implications on consumers and stakeholders. If we review the consultation papers, recommendations, operator submissions and associated documents on spectrum refarming in India, we find that the issue of refarming has been brought up by TRAI in consultation documents which were primarily meant to address other spectrum management issues. There is a consistent trend of such out-of-context inclusion of refarming discussion across multiple consultation papers and recommendations from 2009 onwards.

Another point to note is the consistent avoidance of a dedicated consultation paper for spectrum refarming, despite TRAI itself acknowledging the need for such a consultation paper in its various consultations and recommendations. In addition, operator responses have also repeatedly mentioned that a separate, dedicated consultation process for refarming is imperative. However, these requests and commitments have been consistently ignored, with only a superficial treatment of the impact of refarming in TRAI consultation documents.

In this report we do three things:

- We assess the impact of refarming by thoroughly examining its impact on consumers, the environment and business viability of operators in the India market
- We review how regulators in international markets have examined the refarming issues
- We evaluate TRAI's assumption that so-called liberalisation of 900MHz and 1800MHz spectrum will result in a material increase in value of these bands

#### Assessing the impact of refarming on consumers, the environment and operators

The first three operators in each circle in the Indian mobile market were initially assigned the 900MHz spectrum band to start their operations, and built their networks using the 900MHz band. Over years, operators with 900MHz spectrum (seven operators in total, including BSNL and MTNL) have expanded their networks to include rural areas and now have a substantial presence across urban and rural areas (100% population coverage in urban areas and 80% population coverage in rural areas).

Given that operators with 900MHz have deployed 900MHz base stations over years, and the TRXs to upgrade these bases stations are not available with OEMs, the 900MHz base stations will need to be replaced with 1800MHz base stations. To provide equivalent coverage, operators will also need to

<sup>&</sup>lt;sup>1</sup> Recommendations on auction of spectrum, Telecom Regulatory Authority of India, 23 April 2012



deploy additional sites on 1800MHz to address coverage gaps due to the radius differential between 900MHz and 1800MHz.

- We estimate that operators with 900MHz band will need to replace 286,590 base stations and install an additional 171,954 base stations to provide equivalent coverage on 1800MHz
- Such a replacement of base stations and deployment of additional sites will result in an incremental capex of INR 54,739 crores, and incremental annual opex of INR 11,762 crores
- If the incremental investment in refarming and the costs of spectrum are passed on to consumers in the form of enhanced retail voice tariffs, the overall tariffs will go up by as much as 64 paise per minute (30 paise due to refarming and 34 paise from spectrum investments), with a much higher impact on tariffs in non-Metro circles

Interestingly, the major capex impact is on account of the fact that existing operating networks will have to be replaced and will account for 58% of the total capex. The better propagation characteristics of 900MHz band as compared to 1800MHz band will have a smaller contribution to this overall impact.

In addition, operators will also have to write-off their existing 900MHz assets at an estimated cost of INR 22,310 crores. At an industry level, an additional capex of about INR 26,653 crores will be required to deploy new towers to support the incremental base stations.

In the scenario that operators with 900MHz spectrum are not able to provide equivalent coverage due to business case and operational feasibility, then there is a risk of reduction in geographic coverage by as much as 40%. Such a reduction of coverage is estimated to directly impact the connectivity to about 70 million subscribers, and other consumers trying to reach them. Also, the business case for a new operator acquiring 900MHz spectrum at the proposed prices will not allow for expansion to rural markets to address these coverage gaps.

Finally, the installation of additional sites will increase diesel consumption and contribute to environmental pollution equivalent to that of an additional 4.5 million cars.

### Practice followed by other regulators

An analysis of the spectrum refarming approach adopted by regulators in other markets indicates the striking lack of rigour, detail and comprehensiveness in the consultation process adopted by TRAI for developing the refarming recommendations. We find that in markets where refarming consultations have been carried out, regulators have considered a major sub-set of the following issues:

- Consumers: service quality and coverage, impact on tariffs, and service continuity
- Technology maturity, existing demand and adoption curve
- Operator business case, investment and network plan
- Economic outcomes: impact on tele-density, rural coverage and overall economy
- Spectrum pricing and auctions: basis of determining auction price
- Competition: market parity and competitive landscape



The second important aspect to be considered in such a comparison is that full withdrawal of spectrum from an operational network remains unprecedented. Partial withdrawal has generally happened to allow entry for new operators, but has impacted only a marginal portion of the overall spectrum holdings. Even in such a situation, the regulator carried out the withdrawal activity through collaborative discussions with service providers.

Finally, key issues around operational implementation have been not considered. For hot swapping of customers from one network to another, the availability of both spectrum bands (900MHz and 1800MHz) is required. The availability of such spectrum for the transition period is assumed, although the financial implications of operators holding both the spectrum bands for 18 months has not been commented upon by TRAI. The regulatory uncertainty will either result in operators not making further investments in 900MHz network, or writing off the investments made during the next 2 to 3 years.

### Impact of refarming on the value of spectrum

TRAI believes that refarming of spectrum in the 900MHz band will allow for more efficient use of spectrum and ultimately result in higher revenues for operators through deployment of new technologies. This is more of an academic argument as current market conditions in India suggest that the so-called liberalised 1800MHz spectrum will continue to be primarily used for providing voice services using GSM technology, and the objective of absolute revenue enhancement from increased penetration of data services will not be realised in the near foreseeable future.

- Operators using 900MHz spectrum currently support 51% of the total mobile user base, and even if this user base is migrated to the so-called liberalised 1800MHz band, operators will still need to provide GSM based voice services to this user base until at least 2025
- Also, the market for data services is still immature in India and likely to be adequately served by 3G in 2100 MHz for the foreseeable future. The key is that compared to 2100UMTS, the 1800LTE technology and device ecosystem remains relatively nascent, which will get reflected in device prices, service affordability and adoption issues
- Also all the proposed new technologies (UMTS, LTE) to be deployed on the so-called liberalised spectrum need at least 5MHz of spectrum. The availability of limited spectrum coupled with the need to support voice users makes the liberalisation argument hypothetical
- Finally, anecdotal evidence suggests that there already exists a technology neutral environment in India. An evaluation of various documentation and responses by the Department of Telecommunications, and market evidence of some operators using the 800MHz spectrum in a liberalised fashion to provide EVDO-based data services suggests that the technology environment in India remains liberalised

### Conclusions and next steps

In summary, the proposed refarming will have a substantial cost to the industry, increase retail tariffs and cause significant inconvenience to consumers as also adversely impact the environment, with no benefit to any stakeholder.



### 2 Introduction

Bharti Airtel Limited ('Bharti Airtel'), Idea Cellular Limited ('Idea Cellular'), and Vodafone India Limited ('Vodafone India') have commissioned Analysys Mason Limited ('Analysys Mason') to examine the recommendations proposed by the Telecom Regulatory Authority of India ('TRAI') on spectrum refarming in April 2012<sup>2</sup>, and critically evaluate the underlying rationale and procedural considerations in developing these recommendations.

Analysys Mason is a trusted adviser on telecoms, technology and media. With around 235 staff in 12 offices, we are respected worldwide for our exceptional quality of work, independence and flexibility in responding to client needs. For 25 years, we have been helping clients in more than 100 countries to maximise their opportunities. Our headquarters are in London and we have a presence in Cambridge, Dubai, Dublin, Edinburgh, Madrid, Manchester, Milan, New Delhi, Paris, Singapore and Washington DC.

The remainder of this document is laid out as follows:

- Section 3 reviews TRAI consultations on spectrum refarming since 2009 to provide a background for the current recommendations on refarming of 900MHz spectrum
- Section 4 focuses on evaluating the impact of refarming of 900MHz spectrum on consumers, the environment and business viability of operators in the Indian market
- Section 5 analyses the practice adopted by regulators in international markets for spectrum refarming, including the consultation process and approach
- Section 6 evaluates the critical assumption that liberalisation of the existing 900MHz and 1800MHz spectrum bands will result in a material increase in their value
- Annex A includes results and assumptions of our model to quantify the impact of refarming of 900MHz spectrum on consumers, the environment and business viability of operators in India

<sup>&</sup>lt;sup>2</sup>Recommendations on auction of spectrum, Telecom Regulatory Authority of India, 23 April 2012



### 3 Regulatory context for spectrum refarming in India

It is imperative to understand the regulatory context leading to the build-up of the current recommendations on spectrum refarming. If we consider the consultation process, industry responses and subsequent recommendations of TRAI, we find that:

- The issue of refarming has been consistently brought up in consultation documents, apparently out of context, while TRAI is evaluating other elements of spectrum management process such as spectrum auction and pricing. There is a consistent trend of such out-of-context inclusion of refarming discussion across multiple consultation papers and recommendations from 2009 onwards
- The TRAI consultation papers and recommendations mention that the refarming of 900MHz spectrum will have a significant impact on operators, and hence necessitate a separate consultation process. Subsequent operator submissions have also repeatedly mentioned that a separate, dedicated consultation process for refarming is imperative. However, for some reason, these requests and commitments have been consistently ignored, with only a superficial treatment of the impact of refarming in consultation papers

The refarming discussion was started by TRAI in 2009, from a broader perspective of achieving the objective of "enabling spectrum to move to its most efficient users and uses". This included the objective of the use of spectrum band from current non-commercial uses (such as security, navigation) to commercial uses. In addition, this included allowing a band under commercial use to be reused for deploying a newer or advanced technology.

It's interesting to note that this consultation followed a reference from the Department of Telecom requesting the regulator to examine the report of an expert committee on the "Allocation of Access (GSM/CDMA) spectrum and pricing" and did not include refarming in its mandate. The committee report had mainly focused on spectrum allocation and pricing, as well as merger, transfer and sharing of assigned spectrum. TRAI also mentioned in this paper that additional issues which were not covered by the committee report also need to be addressed, specifically refarming of spectrum.

This consultation was followed by TRAI recommendations in May 2010<sup>3</sup>, which expanded the scope of refarming to include the refarming of 900MHz spectrum, and grant of 1800MHz spectrum in lieu. The recommendations mentioned that, "there is a need to carefully assess the likely impact of re-farming of 900MHz from the perspective of traffic management, frequency coordination, site optimization, management of voice & data traffic loads etc. as it poses significant challenges for operators. The Authority is of the opinion that even as there should be a definite decision to refarm the spectrum; the details are to be worked out in greater detail, for which a separate consultation process may be necessary." However, no separate consultation was conducted by TRAI on the issue of spectrum refarming.



<sup>&</sup>lt;sup>3</sup>Recommendations on Spectrum Management and Licensing Framework, 11 May 2010

The need for a separate consultative process to discuss the issues involved in refarming was again reiterated by TRAI in its November, 2011 response to  $DoT^4$ .

However, the detailed consultation process suggested in the 2010 recommendation and November 2011 letter was not addressed. In February 2012, the Hon'ble Supreme Court of India in its judgment dated 2ndFebruary 2012<sup>5</sup> directed the TRAI to make fresh recommendations, "for grant of licence and allocation of spectrum in 2G band in 22 Service Areas by auction, as was done for allocation of spectrum in 3G band."

TRAI floated a consultation paper on auction of spectrum in 2012<sup>6</sup> which included an analysis of spectrum availability by bands, proposed auction design and quantum of spectrum to be auctioned. However, in addition to these analyses, the consultation paper also included the issues of liberalisation of spectrum as well as refarming, and outlined three options for the refarming of 900MHz spectrum, and sought comments from industry participants.

The need for such a consultation was also stressed by some of the operators holding spectrum in the 900MHz band, before TRAI finalised its recommendations.

- In its response, Bharti Airtel mentioned that, "It is submitted that refarming of spectrum in 800/900 MHz band has larger implications and requires detailed deliberation on issues concerning continuity of services to the existing customers, financial implications, network re-engineering and optimization etc."
- Idea Cellular submitted, "We are surprised that the Authority has suddenly chosen to link the issue of refarming with the proposed auction process. We believe the topic of refarming of 900/800 MHz for its current GSM/CDMA use is a separate topic and the same needs to be properly discussed in the Public forum through a separate consultation process."
- Vodafone India in its response noted that "... issues pertaining to 'refarming' do not flow out of the Supreme Court judgment pursuant to which the TRAI is carrying out the present consultation..."

The need for a separate consultation process for refarming was again ignored by the TRAI, and in its April 2012 recommendations, it recommended that "refarming of 900MHz should be carried out 'progressively' and that this spectrum should be replaced by spectrum in the 1800MHz, which should be charged at the price prevalent at the time of re-farming."

In this report we do three things:

- We assess the impact of refarming by thoroughly examining its impact on consumers, the environment and operators
- We review how regulators in international markets have examined the refarming issues



<sup>&</sup>lt;sup>4</sup> TRAI's response to DoT dated 3/11/2012 w.r.t. its reference to May, 2010 recommendations

<sup>&</sup>lt;sup>5</sup> Writ petitions no 423/2010 and 10/2010

<sup>&</sup>lt;sup>6</sup> Consultation paper on auction of spectrum, 07 March 2012

• We evaluate TRAI's assumption that so-called liberalisation of 900MHz and 1800MHz spectrum will result in a material increase in value of these bands

We find that the refarming proposed by TRAI will have significant detrimental effects on consumers in the form of higher prices and a poorer quality of service, on the environment because of higher energy consumption and on the long-term viability of operators.

We also show that TRAI's proposed approach is at odds with the practice followed by the regulators in international markets.

Furthermore, we do not believe that liberalising the use of 900MHz will lead to a material increase in its value because a) it is impractical to clear these bands given the demand for voice traffic, and b) the market for data services is still nascent in India and likely to be adequately served by 3G in 2100MHz for the foreseeable future.





# 4 Impact of refarming on consumers, the environment and operators

## 4.1 Operators with 900MHz band will need to replace 286,590 existing base stations and install an additional 171,954 base stations to provide equivalent coverage on 1800MHz frequency

The first three operators in each circle in the Indian mobile market were initially assigned the 900MHz spectrum band to start their operations, and built their networks using the 900MHz band. Over years, operators with 900MHz spectrum (seven operators in total, including BSNL and MTNL) have expanded their networks to include rural areas and now have a substantial presence across urban and rural areas (100% population coverage in urban areas and more than 80% population coverage in rural markets).

Given that operators with 900MHz have deployed 900MHz base stations over years, and the TRX to upgrade these bases stations are not available with OEMs, all these base stations will need to be replaced with 1800MHz base stations. On an overall basis it is reasonable to conclude that the 900MHz base stations for operators using 900MHz spectrum will need to be replaced with 1800MHz base stations in rural as well as urban areas. In addition to replacement of equipment, operators will need to deploy additional sites on 1800MHz band to fill coverage gaps, given the lower coverage radius achieved on 1800MHz versus 900MHz.

We find that at an overall level, the active equipment would need to be replaced on nearly 286,590 sites and additionally about 171,954 new sites would need to be deployed to provide equivalent coverage on 1800MHz frequency band. We estimate that the active equipment will need to be replaced on the existing 94,670 sites in urban areas, and an additional 56,802 base stations on 1800MHz will need to be deployed to provide equivalent coverage. In rural areas, we estimate that the active equipment will need to be replaced at about 191,920 site locations, and an additional 115,152 base stations. Please refer to Figure A.1 and Figure A.2 in Annexure for circle wise calculations.

4.2 The replacement of 900MHz base stations and deployment of additional sites on 1800MHz will result in an incremental capex of INR 54,739 crores, and incremental annual opex of INR 11,762 crores

We estimate the capex for replacement of 900MHz sites and deployment of new 1800MHz sites to be INR 18,082 crores in urban areas. For rural areas, the replacement capex and the incremental site capex is estimated to be INR 36,657 crores.

In addition, deployment of additional sites on 1800MHz will lead to an incremental annual opex of INR 11,762 crores in urban and rural areas. This includes tower rental, electricity and diesel charges, and



other associated costs for additional towers that will be deployed on 1800MHz spectrum band. Please refer Figure A.3 and A.4 in Annex A for circle wise calculations. Interestingly, the major capex impact is on account of the fact that existing operating networks will have to be replaced and will account for about 58% of the total capex. The better propagation characteristics of 900MHz band as compared to 1800 MHz band will have a smaller contribution to this overall impact.

In addition, operators will also have to write-off their existing 900MHz assets estimated at INR 22,310 crores. At an industry level, an additional capex of about INR 26,653 crores will be required to deploy new towers to support the incremental base stations.

4.3 There is a risk of reduction of existing geographic coverage by as much as 40% and loss of connectivity for 70 million subscribers, in case operators do not match coverage due to business case viability and operational feasibility

As the current network has been designed and built to a 900MHz frequency plan, the conversion of this network to 1800MHz frequency plan will result in severe coverage gaps, even with the use of small cell and in-building solutions to address coverage issues. The effect of switching from a 900MHz network to an 1800MHz network is illustrated in Figure 4.1.





Such a migration is bound to create a coverage discontinuity across residential and commercial areas, with an increase in number of call drops, at least during the period of migration and optimization, and most likely for many years in the foreseeable future. In some instances, there might be restrictions on the number of sites which can be deployed (such as in cantonment areas), which might also have an impact on coverage. The impact of migration to 1800MHz in urban areas will be primarily felt in terms



of deteriorating quality of service in urban areas, which includes commercial complexes, office buildings and public areas.

More importantly, at the current ARPU levels, increasing the capital expenses by 1.6x will have a significant impact on business viability of services in rural areas. Operators are likely to reduce the areas that they cover, which may result in a potential decline in rural tele-density. In such a situation, we believe that the geographical coverage could reduce by as much as 40%, primarily due to the lower coverage achieved using the 1800MHz band as compared to the 900MHz band.

Such a reduction of coverage is estimated to directly impact the connectivity to about 70 million subscribers. More importantly, due to the inherent two way nature of the communications business, the subscribers in other markets will also not be able to reach out to this 70 million user base, thus directly impacting the utility of their mobile connections.

In addition, this will also have a financial implication with a reduction in revenues for operators offering services in these areas.

4.4 The overall process of migration from 900MHz to 1800MHz may take up to three years for completion, during which the quality of service will be severely hit

The current 900MHz network has been deployed by operators over a period of about sixteen years, and it will take a significant amount of time to physically replace equipment on these 900MHz sites and build additional sites.

The current site deployment experience suggests that not more than 400 sites per month can be converted from 900MHz to 1800MHz for one operator. For an operator with 10,000 sites in a circle, such a migration plan will require more than two years for the network replacement and deployment to complete in that circle. For migrating all the existing 900MHz base stations to 1800MHz, along with deployment of additional 1800MHz sites on an all India basis, we believe that up to three years will be required for the two900MHz private operators in each circle.

In this transition phase of migration from 900MHz to 1800MHz frequency, the overall quality of service will suffer as the networks will need to be kept live for a hot swap and it will take some time to optimise coverage. The decline in service quality will get reflected in an increase in the number of dropped calls, patchy network coverage, as well as a reduced call completion rate.

4.5 The business case for a new operator acquiring 900MHz spectrum at the proposed prices will not allow for expansion to rural markets to address these coverage gaps

In the scenario of a new operator acquiring the refarmed 900MHz band, the overall business viability remains a question mark especially due to the high level of investment in acquiring the spectrum. We



estimate that for such a new operator the time for EBITDA breakeven will be as high as 10 years, as illustrated in Figure 4.2.

Parameter	Units	Value
All India capex (equipment and spectrum)	INR Cr	50 748
All India spectrum cost (2×5MHz)	INR Cr	36 222
Equipment capex for coverage / capacity <sup>7</sup>	INR Cr	14 526
Estimated wireless subscriber base (2020) <sup>8</sup>	Million	1520
Estimated subscriber base for a single operator on 900MHz <sup>9</sup>	Million	76
Capex per user	INR	6677
Expected monthly ARPU <sup>10</sup>	INR	176
Monthly EBITDA per user (@29.5%) <sup>11</sup>	INR	52
Time required for breakeven in months	Months	129 months (more than 10 years)

Figure 4.2: EBITDA breakeven for a 900MHz 3G operator in India [Source: Analysys Mason, 2012]

The business economics, as well as existing market scenario of muted data demand (especially in rural areas) suggests that the operator focus will be primarily concentrated in urban areas in the initial years. This will keep the coverage gaps in rural areas unfilled for a long time, with an impact on service continuity. Even the experience of new entrants on 1800MHz in India market suggests that the initial focus of service offerings has been urban and semi-urban areas, with rural areas being left out, presumably due to relatively poor economics.

4.6 If the incremental investment in refarming and the costs of spectrum are passed on to consumers in the form of enhanced retail voice tariffs, the overall tariffs will go up by as much as 61 paise per minute, with a higher impact on tariffs in non-Metro circles

In addition to connectivity and coverage issues, consumers will also face a steep increase in tariffs as a consequence of additional investments by operators in refarming. The pan-India impact of investments in spectrum has been estimated to be up to 34 paise per minute<sup>12</sup>. The additional impact of refarming

<sup>&</sup>lt;sup>12</sup> Impact of TRAI's spectrum recommendations on consumers and industry, COAI and PwC (May 2012)



<sup>&</sup>lt;sup>7</sup> Calculation based on average 107,600 sites required to meet the current level of pan India coverage / capacity as deployed by existing operators using the 900MHz spectrum band

<sup>&</sup>lt;sup>8</sup> Analysys Mason estimate based on circle wise analysis

<sup>&</sup>lt;sup>9</sup> Assuming 75% market share for existing operators and 25% for new 900MHz operators; new five 900MHz operators with 2×5MHz spectrum each, with an equal market share of 5%

<sup>&</sup>lt;sup>10</sup>Based on current ARPU of leading operators

<sup>&</sup>lt;sup>11</sup>Average EBITDA margin for leading private operators using 900MHz spectrum

will be as high as about 30 paise per minute as a result of increased capex and opex for replacing existing 900MHz sites with 1800MHz sites, deploying new 1800MHz sites for addressing coverage gaps. Figure 4.3 provides details on such an impact on tariffs by different category of circles.

Figure 4.3: Impact on cost per outgoing minute (INR	) due to 900MHz spectrum refarming [Source: Analysys
Mason, 2012]	

Metric	Metro	Category A	Category B	Category C	Pan India
Increase in capex and opex cost per outgoing minute (INR)	0.21	0.29	0.34	0.28	0.30
Increase in spectrum cost per outgoing minute (INR) <sup>13</sup>	1.11	0.47	0.10	0.04	0.34
Total Increase in cost per outgoing minute (INR)	1.32	0.76	0.44	0.32	0.64

4.7 If the cost of refarming is not passed on to consumers, then the EBITDA margins of operators with 900MHz spectrum holdings will decline by about 8%

If the cost of refarming is not passed on to the consumers, incremental operational expenditure from additional sites will result in a decline of about 8% in EBITDA margins for operators with 900MHz holdings, as illustrated in Figure A-6 in Annex A.

Such a decline in profitability will only impact operators using 900MHz spectrum, and will skew the competitive parity in the market place with other operators. More importantly, the current scenario of liquidity crunch and high total debt (Total debt of about INR 185,720 crores as of FY12 with Debt to EBITDA ratio of 4.87<sup>14</sup>) burden faced by the industry is likely to further impact existing operators using 900MHz spectrum as they will not be able to invest in to 2G and 3G network expansion, as well as deployment of new technologies such as LTE.

4.8 The installation of additional sites will increase diesel consumption and contribute to environmental pollution equivalent to that of an additional 4.5 million cars

We estimate that the migration from 900 MHz to 1800 MHz will require a total of about 171,954 additional base stations to maintain the same coverage in rural areas. This would mean that 107,471 additional towers will be deployed pan India (assuming an average tenancy of 1.6 base stations per tower).

Since a majority of these additional sites will be in rural areas where availability of electricity is an issue, the diesel consumption at these sites will be high. Assuming an average consumption of 11,500

<sup>&</sup>lt;sup>14</sup> Impact of TRAI's spectrum recommendations on consumers and industry, COAI and PwC (May 2012)



<sup>&</sup>lt;sup>13</sup> Impact of TRAI's spectrum recommendations on consumers and industry, COAI and PwC (May 2012)

litres of diesel every year per tower, the additional towers will result in an additional diesel consumption of about 1.2 billion litres of diesel every year [please refer Figure A-5 in Annex A for detailed calculations and estimations].

Also, a telecom tower on an average requires 6 kWh to 8 kWh of energy per hour per tower, which will lead to an additional 2.7 billion kWh of electricity consumption per year. For every litre of diesel, about 2.48 kg of CO2 is emitted and for every kWh of electricity consumed, 0.84 Kg of CO2 is emitted. Thus, the additional 171,954 sites will result in an incremental 5.4 million tons of CO2 emitted per year. This is equivalent to CO2 emitted by about 4.5 million cars (petrol car with engine size of 1000cc and average running of 1000 Kms per month) in a year.

Also, if a new operator acquires pan India spectrum in the 900MHz band after refarming, it will have to deploy about 107,600 sites in order to provide same coverage as current operators using 900MHz spectrum. This will mean an additional deployment of towers, leading to an additional CO2 emission of almost 3.4 million tons per operator per year, as illustrated in Figure 4.4. If three new operators acquires pan India licence, then these operators will have a total carbon footprint of 10.2 million tons per year.

Figure 4.4: Additional CO2 emissions due to deployments by a new pan India operator in 900MHz [Source: Analysys Mason, 2012]

	Number of BTSs	No. of additional towers	Additional diesel	Additional electricity	Additional CO2 emissions	
	Nos.	Nos.	Million Litres	Million kWh	'000 tons	
New operator	107 600	67 250	773	1718	3361	

In addition, this migration will generate a huge amount of e-waste as the existing equipment will need to be discarded. Since such e-waste is not bio-degradable, disposing them off without further polluting the environment will add to existing issues, and cost.





### 5 Practice followed by other regulators

5.1 International regulators follow a much more rigorous consultation process for refarming, accounting for key near term and long term issues for consumers and industry

The TRAI consultation and recommendations lack the rigour, and comprehensive review of potential impact on consumers and industry considered by regulators in global markets while considering critical issues such as refarming of spectrum.

Some of the key questions which have been considered by almost all these regulators, and should have been considered for India as well include the following:

### **Consumers**

- Will consumers have access to same level of coverage and service quality after refarming?
- Will there be an increase in tariffs due to the additional investments required?
- Will there be continuity of GSM services for existing users?
- Will the consumers be able to bear the cost of new technologies (handsets, data pricing)?

### Technology maturity

- Is there a reasonably mature ecosystem for new technologies?
- Is there demand for new technologies such as UMTS / LTE?
- Will refarming of spectrum result in a faster adoption of new technologies?

#### **Operators**

- Will there be a business case for existing operators to continue services?
- What will be the increased investment for operators to maintain equivalent coverage?
- How many existing sites will be affected and how many new sites will have to be built?

### **Economic outcomes**

- What will be the impact on teledensity?
- What will be the impact on rural coverage?
- What will be the impact on overall economy, if the coverage is reduced and the connected become unconnected?

### Spectrum pricing and auctions

- Will revenues from spectrum auction be higher than licence extension?
- If auctioned, what should be the basis of determining auction price?

#### **Competition**

- Is there competitive parity amongst existing holders of licences across spectrum bands?
- Are there new entrants looking to get spectrum in a particular frequency band?



Figure 5.1 provides an overall summary of issues considered by regulators across markets where 900MHz refarming and spectrum management has been undertaken, or is being considered.

Figure 5.1: Factors analysed by regulators during the consultation process for spectrum management [Source: Analysys Mason]

Criteria		Austria	Denmark	France	Ireland	Italy	Malaysia	Sri Lanka	Sweden	NK	India
Safeguard consumers interest											
Will the consumers be able to get the same service coverage and QoS after refarming	~		~				1		1	1	
Forced churn of consumers											
<ul> <li>Will GSM services be continued for existing users</li> </ul>	~		~	~	~				~	~	
Cost of spectrum release for existing users of spectrum											
<ul> <li>What will be the impact on investment and business case viability for existing operators to maintain same service and coverage levels</li> </ul>					*	1		~		1	
Legal certainty			_								
<ul> <li>Will renewal create an environment for increased investment compared to reallocation</li> </ul>	~	~			1				1		
Security of investment											
<ul> <li>Is the licence period long enough for investment</li> </ul>	~	~	1		4			1	1		
Highest value use of spectrum											
<ul> <li>Is there demand for new technologies such as UMTS / LTE</li> </ul>	1	1	~	1	1	~	~		1	~	
<ul> <li>Is there a reasonably mature ecosystem for such technologies</li> </ul>				~	~						
<ul> <li>Will the consumers be able to bear the cost of new technologies (handset, data pricing)</li> </ul>					1						
Realizing spectrum value											
Will revenues from spectrum auction be higher than licence renewal	1	1									1
<ul> <li>If auctioned, what should be the basis of determining auction price</li> </ul>	~	✓									1
Competitive parity											
<ul> <li>Is there competitive parity amongst existing holders of licences across spectrum bands</li> </ul>	✓	~	~	1	1	~	1	~	1		
<ul> <li>Are there new entrants looking to get spectrum in a particular frequency band</li> </ul>	1	1	~	1	1	~	1	1	1	~	
Societal welfare											
<ul> <li>Will refarming of spectrum help in faster adoption of new technologies</li> </ul>	~					1	1		1	1	
Will refarming adversely impact the environment	~					1				1	



5.2 Regulators have made sure that the stakeholder issues are addressed in a fair and objective manner, even if it requires a multi-year consultation process to do so

In the case of UK, Ofcom started the consultation process on liberalisation of 900MHz and 1800MHz band in September 2007. In February 2009, it initiated the second consultation process focussing on the future of the spectrum currently used to provide 2G and 3G mobile services in the UK. Finally, in January 2011, it decided to liberalise the 900MHz spectrum in hands of incumbents without any change in quantum of spectrum holding.

In Ireland, the national regulatory authority, ComReg, carried out an extensive consultation process which went on for almost four years, from July 2008 to Mar 2012, before finalising its decision on the process of liberalisation, as illustrated in Figure 5.2.

Figure 5.2: 900MHz and 1800MHz spectrum liberalisation consultation process followed by ComReg, the Ireland NRA [Source: ComReg]

Consultation date	Description
17 July 2008	Liberalising the use of the 900 MHz and 1800 MHz spectrum bands
10 March 2009	Liberalising the future use of the 900 MHz and 1800 MHz spectrum bands and spectrum release options
21 December 2009	<ul> <li>Response to consultation and further consultation on liberalising the future use of the 900 MHz and 1800 MHz bands</li> </ul>
17 September 2010	Consultation paper on 800MHz, 900 MHz & 1800 MHz spectrum release - On the inclusion of the 800 MHz band in the 900 MHz award process
15 December 2010	Consultation paper on inclusion of the 1800 MHz band into the proposed joint award of 800 MHz and 900 MHz spectrum
24 August 2011	• Response to Consultation and Draft Decision on a Multi-band spectrum release - Presenting ComReg's comprehensive proposals as well as a draft decision supported by a draft regulatory impact assessment
24 October 2011	<ul> <li>Draft Information memorandum on Multi-band Spectrum Release - a draft information memorandum which details the processes and procedures ComReg envisages it will employ if it were to implement its proposals as detailed in draft decision on a multi- band spectrum release (24 August 2011)</li> </ul>
16 March 2012	Release of the 800 MHz, 900 MHz and 1800 MHz Radio Spectrum Bands - Response to Consultation and Final Decision

We believe that a detailed and focused consultation process which takes into consideration the impact of refarming on consumers, operators as well as environment will be imperative to demonstrate credibility of the refarming process.


5.3 Full withdrawal of spectrum resulting in the shutdown of existing operational networks is unprecedented. Partial withdrawal has generally happened to allow entry for new operators, but has impacted only a marginal portion of the overall spectrum holdings

We have not come across any refarming situation globally where a specific band of spectrum (especially 900MHz) has been fully withdrawn for refarming. Partial withdrawal has generally happened to allow entry for new operators, but has impacted only a marginal portion of the overall spectrum holdings.

In all the cases the withdrawal of spectrum from incumbents has been partial (mostly  $2 \times 2.5$ MHz of the total spectrum holding of the operator in the 900MHz band), and has formed a very small share of the total spectrum holdings of existing operators, as illustrated in Figure 5.3. In these markets, incumbent operators had a lot of spectrum in multiple bands (such as 900MHz, 1800MHz, 1900MHz, 2100MHz and 2600MHz) and withdrawal of a small part of the spectrum will not impact their on-going operations substantially. Even in these markets, the regulator carried out the withdrawal activity through collaborative discussions with service providers.

Market	Operator	900MHz refarming (MHz)		Spectrum holdings in other key bands (MHz)			
		Before	After	1800	1900	2100	2600
Sweden	Tele2	2×10	2×7.5	2×3	_15	2×19.8	2×20
	TeliaSonera	2×10	2×10	2×3	5		2×20
	Telenor	2×10	2×7.5	2×3	5	2×19.8	2×20
	Swefour	2×5	2×5	-	-	-	-
	Hi3G	-	2×5	-	5	2×19.8	2×10/20
	Bouygues Telecom	2×9.8	2×9.8	2×26.6(21.6)	5	2×14.6	-
France	Orange France	2×12.4	2×10	2×23.8	5	2×19.6	-
	SFR	2×12.4	2×10	2×23.8	5	2×9.8	-
	Free Mobile	-	2×5	-	-	2×5	-
	Telia	2×14.8	2×11.8	2×23.6	5	2×15	2×20/15
Denmark	TDC Mobil	2×9	2×9	2×17.2	5	2×15	2×20
	Telenor	2×9	2×9	2×20.2	5	2×15	2×20/10
	Hi3G	-	2×5	2×10	5	2×15	2×10/25

Figure 5.3: 900MHz spectrum redistribution across select markets [Source: Analysys Mason, 2012]

<sup>15</sup>Represents spectrum holding by Svenska, a company owned by Tele2 and TeliaSonera



More importantly, in these markets, incumbent operators with 900MHz spectrum are still using the spectrum for GSM services rather than UMTS. As of February 2012, only Hi3G (Sweden), Orange (France) and SRF (France) have launched UMTS services in 900MHz.<sup>16</sup> Also, in these markets, the 900MHz band includes the EGSM spectrum of 10MHz+10MHz, which has been given to some operators in India that have used it to deploy CDMA services.

In summary, partial withdrawal of spectrum for competitive entry has been the primary approach to refarming, with adequate mechanisms in place to ensure that operators have sufficient spectrum across bands to provide services across technologies.

5.4 Implementation of the current recommendations on refarming will have an enormous operational element which has not been given sufficient consideration

Also, the recommendations have completely ignored the on-the-ground operational process required for migration of two live networks simultaneously from one frequency band to another, while maintain customer connectivity. The key elements which have been ignored include:

- Spectrum availability For the period of migration, operators will need access to both the spectrum bands (900MHz and 1800MHz) to ensure that customers do not get disconnected from their service. The recommendations do not consider such a scenario and appear to have adopted more of an academic approach rather than an on-the-ground analysis to actually understand the impact of these recommendations
- Interference issues The migration of 800MHz network to 1900MHz band will lead to interference with the existing 2100MHz 3G operations as this band is adjacent to the uplink band on the exiting 2100MHz 3G network. The interference issues, if not resolved, will make the refarming of 800MHz impractical. This might lead to disparity among operators as 900MHz refarming, if it happens, will be carried out in next few years (at least for two operators across circles) while the refarming of 800MHz spectrum may not become possible as a result of interference.

All the above operational issues need to be given sufficient consideration during the consultation process as well as while developing the recommendations along with key stakeholders' participation at all the steps of the process.





#### 6 Impact of refarming on value of spectrum

TRAI believes that refarming of spectrum in the 900MHz band will allow for more efficient use of spectrum and ultimately result in higher revenues for operators through deployment of new technologies. This is a theoretical argument as current market conditions in India suggest that the incremental economic value of this so-called liberalised spectrum may be limited due to a range of factors such as potential demand for wireless data services in the near future, and the maturity of the device ecosystem.

#### 6.1 The so-called liberalised 1800MHz spectrum will have to deployed to support existing voice users, with limited data revenue potential due to ecosystem maturity issues

Operators using 900MHz spectrum currently support 456 million users (51% of the total mobile user base) on their networks. If the proposed recommendations are implemented and this user base is migrated to 1800MHz, operators will still need to have access to GSM based voice services. Even in global markets, the expectation is that GSM (on 900MHz) will at least continue up to the year 2020, and will remain the predominant technology for carrying voice. For India, given the voice-centric nature of the market, we expect that GSM based services will continue up to the year 2025.

Also all the proposed new technologies (UMTS, LTE) to be deployed on the so-called liberalised spectrum need at least 2×5MHz of spectrum. For markets such as Mumbai and Delhi, running voice services in addition to deployment of data technologies is virtually impossible without a significant degradation in quality of service. The availability of such limited spectrum coupled with the need to support voice users makes the liberalisation argument academic.

Also, the market for data services is still immature in India and likely to be adequately served by 3G in 2100 MHz for the foreseeable future. The demand for data remains been limited due to the high prices of devices and services, and most importantly the lack of relevant content, applications and use cases. If we consider the current state of 3G service offerings in the 2100MHz band, industry inputs indicate that only 4 to 5% of the overall mobile user base has a 3G-enabled phone, and the adoption of 3G services remains limited. With the right market enablers, this adoption will grow over years, but as of today, data services remain a small part of operators' overall business even on a mature technology and device ecosystem such as 2100UMTS.

Compared to 2100UMTS, the 1800LTE technology and device ecosystem remains relatively immature, especially for providing data services in emerging markets. Also, the lack of voice support on LTE necessitates the deployment of GSM on 1800MHz, or else creates dependence of additional coverage layer for providing voice support. This means that the so-called liberalised 1800MHz spectrum will continue to be primarily used for providing voice services using GSM technology, and the objective of



absolute revenue enhancement from increased penetration of data services will not be realised in the near foreseeable future.

The lack of such an upside from data, and the requirement to carry GSM based voice services for existing users completely defeats the objective of the so-called liberalisation of spectrum through refarming.

#### 6.2 Despite a lack of incremental upside from so-called liberalised spectrum, the price of spectrum been set at a substantially high level

Although the revenue upside from the liberalisation of 1800MHz spectrum is uncertain, the reserve price for this band has been set at a substantially high level in comparison with international benchmarks (as illustrated in Figure 6.1). Such a high price will also have a cascading impact on the prices of spectrum in the 900MHz and 700MHz bands.

Market	Year	Duration (years)	Allocation process	Reserve price (USD/MHz/Pop)
Bulgaria	Dec-11	10	Beauty contest	_
Portugal	Nov-11	_	Auction	0.05
Sweden	Oct-11	25	Auction	0.01
Italy	Sep-11	17	Auction	0.07
South Korea	Aug-11	_	Auction	0.57
Germany	May-10	15	Auction	0.004
India Metros (proposed)	2012	20	Auction	10.32 to 10.94
India Cat A Circles (proposed)	2012	20	Auction	0.72 to 1.49

Figure 6.1: Prices for 1800MHz spectrum (PPP) across countries [Source: Analysys Mason, 2012]

Given this market and economic context, it is possible that none of the Indian operators bids for 1800MHz spectrum given its high reserve price. In some cases, operators may not have any other alternatives but to get access to the 1800MHz spectrum block to continue their operations. This mainly applies to new operators whose licences have been cancelled after they have made significant investments in capital expenditure (capex) and market development. More importantly, these new operators are experiencing substantial EBITDA losses<sup>17</sup> even after four years of operation, and given this scenario, the higher economic value of spectrum will not encourage these operators to participate in



<sup>&</sup>lt;sup>17</sup> Uninor reported an EBITDA loss of USD 571 mn in 2011, source: Telenor reported data

the auction process. In summary, the spectrum price will in effect become an administered price rather than a price discovered by the market participants in a free and non-coercive fashion.

Also, for operators that have already invested substantial capex in acquiring 2100MHz spectrum and rolling out networks, the utility of the liberalised 900MHz spectrum will be limited.

TRAI's recommendations also create an uncertainty about the future auctions of spectrum in the 900MHz band. The reserve price for 1800MHz spectrum is very high. If such a price is applied to licence extensions, and if licensees further incur an exorbitant cost to set up additional sites and migrate to 1800MHz due to refarming, then the purchasing capacity of such operators for later auctions will be significantly impacted. If the licences have an extension clause, then it would be right to presume that the continuity of spectrum, which is an underlying feature of the established networks and the agreements, should also be given in the extension of the licence. In summary, such a withdrawal of 900MHz spectrum does not appear to be in the overall economic interest.

#### 6.3 Given the limited holdings, the practicalities of clearing spectrum need to be considered

Operators have limited holdings of spectrum and if 900MHz spectrum is refarmed, then they will be left with very little spectrum in which to accommodate the entire volume of voice traffic. Further since new technologies such as UMTS and LTE require a minimum of 5MHz spectrum, the quantum of spectrum left for GSM to carry voice would be minuscule.

#### 6.4 Anecdotal evidence suggests that there already exists a technology neutral environment in India

The existing licences are technology neutral. Given that the underlying spectrum was assigned as part of the licence, it may be concluded that the allocated spectrum can be used by operators to deploy any technology of their choice.

An evaluation of various documentation and responses by the Department of Telecommunications also supports this position. Further, market evidence of some operators using the 800MHz spectrum in a liberalised fashion to provide EVDO-based data services also suggests that the technology environment in India remains liberalised.

As per the letter issued by the Department of Telecommunications on 13 September 1999<sup>18</sup>, "all new Cellular Mobile Service Providers will be technology neutral; however, the technology must be digital. The existing licensees of cellular services on their migration to the NTP-99 regime in terms of migration package already offered to them, will also be permitted to expand their networks using any other technology or the GSM technology to which they have been bound so far as per the existing licences."



<sup>18</sup> F.No.842-304/99-VAS

This is further supported by Department of Telecommunications' responses to queries regarding technology neutrality raised by operators during the 3G and broadband wireless access (BWA) spectrum auctions, as shown below in Figure 6.2.

Figure 6.2: Responses by the Department of Telecommunications to queries raised during the 3G and BWA spectrum auctions in 2010 [Source: Department of Telecommunications]

Query	Department of Telecommunications' response
Please confirm whether 3G services can be rolled out in 2G spectrum assignments? (Q188, Page 45)	Provision of services is governed by the licence held by the service provider. The current auctions are for spectrum, not licences
In light of the policy of technology neutrality and Unified Access Service licences, are there any restrictions whatsoever on the use of the 800 /900 /1800 /2100 /2300 MHz, or any other spectrum band, for providing access services? (Q274, Page 64)	The permissible usage is governed by the provisions of the respective service licences





#### 7 Conclusions and next steps

It can broadly be concluded that the current recommendations and the preceding consultation on spectrum refarming lack the rigour and considered thought required for addressing issues with such significant implications. Implementing these recommendations in their current form will not be beneficial for the consumers, the environment, as well the business viability of operators. In summary, the proposed refarming will have a substantial cost to the industry, increase retail tariffs and cause significant inconvenience to consumers as also adversely impact the environment, with no benefit to any stakeholder.

We believe that given the above regulatory context, and the clear gaps in the consultation approach adopted to develop the current recommendations, it is imperative to have a dedicated and detailed consultation process for spectrum refarming at the earliest. Such a consultation paper should include rationale for such refarming, regulatory impact assessment on consumers, the environment and industry participants, operational considerations, and provide a fair chance for operators to present their views and perspectives.





#### Annex A Key assumptions and modelling results

#### Figure A.1: Number of additional and replacement sites for maintaining same level of coverage using 1800MHz sites in urban areas [Source: Analysys Mason]

Circle category	BTS for replacement from 900MHz	Additional 1800MHz BTS
Metros	23285	13971
Category A	37780	22668
Category B	24806	14884
Category C	8799	5280
Total sites	94 670	56802

#### Key Assumptions:

- Urban BTSs have been estimated based on assumption of 100% geographical coverage
- BTS radius assumptions for urban sites on 900 MHz: 1.50 Kms radius for urban areas and 0.6 Kms radius for dense urban areas
- Additional sites has been calculated using the coverage factor of 1.6x for 1800MHz

#### Figure A.2: Number of additional and replacement sites for maintaining same level of coverage using 1800MHz sites in rural areas [Source: Analysys Mason]

Circle category	BTS for replacement from 900MHz	Additional 1800MHz BTS
Metros	-	-
Category A	66789	40073
Category B	92257	55354
Category C	32874	19725
Total sites	191920	115152

#### Key Assumptions:

- Rural sites have been calculated based on circle wise total number of BTS by operator minus urban sites estimated in Figure A.1
- Additional sites has been calculated using the coverage factor of 1.6x for 1800MHz



Circle category	1800MHz migration capex <sup>19</sup> in urban areas	1800MHz migration capex in rural areas	Total incremental capex
Metros	-	4447	4447
Category A	12757	7216	19973
Category B	17 621	4738	22 359
Category C	6279	1681	7960
Total	36657	18082	54739

#### Figure A.3: Additional capex required by operators using 900MHz spectrum for migration to1800MHz – all figures in INR crores [Source: Analysys Mason, TRAI]

#### Key Assumptions:

- Estimated based on average per site capex for a configuration of 4-4-4
  - Additional site: Per site capex of INR 13.5 lacs (includes cost of BTS, antennas/RF, microwave link and labour/service charges)
  - Replacement site: Per site capex of INR 11.0lacs (includes cost of BTS, antennas and labour/service charges)

Figure A.4: Additional opex and capex per year required by operators using 900MHz spectrum for migration to 1800MHz – all figures in INR crores [Source: Analysys Mason, TRAI]

Circle category	Incremental capex (amortized)	Annual incremental opex <sup>20</sup>	Reduction in spectrum usage charge	Total incremental annual cost
Metros	855	956	(162)	1649
Category A	3839	4291	(487)	7643
Category B	4297	4804	(374)	8727
Category C	1530	1710	(136)	3104
Total	10521	11 762	(1159)	21 123

<sup>&</sup>lt;sup>20</sup>Additional annual opex due to increased number of sites in rural areas as a result of migration to 1800MHz



<sup>&</sup>lt;sup>19</sup>Cumulative Capex for migration to 1800MHz

#### Key Assumptions:

- Incremental capex has been depreciated linearly assuming a life time of 9 years, and cost of capital at 12.63% (average SBI PLR as mentioned in TRAI recommendations on auction of spectrum)
- Incremental annual opex is estimated based on monthly opex per site of INR 57,000 (including tower rental, electricity/diesel, security and other costs)
- Reduction on spectrum usage charge is calculated based on circle wise spectrum usage charge contributed by operators using 900MHz spectrum (5.9% to 5.4% across different circle categories) as reported by TRAI on a quarterly basis (QE December 2011) minus new proposed spectrum charges (3%)

Circle Category	Number of additional BTS	No. of additional towers	Additional diesel	Additional electricity	Additional CO2 emissions
	Nos.	Nos.	Million Litres	Million kWh	'000 tons
Metros	13 971	8 732	100	223	436
Category A	62 741	39 213	451	1002	1960
Category B	70 238	43 899	505	1122	2194
Category C	25 004	15 628	180	399	781
Total	171 954	107 471	1236	2746	5371

#### Figure A.5: Additional CO2 emission due to increase in number of sites [Source: Analysys Mason]

#### Key Assumptions:

- Number of additional towers has been calculated assuming an average tenancy of 1.6
- Additional diesel consumption has been estimated based on an average diesel generator usage of 10.5 hours per day consuming 3 litres per hour (about 11,500 litres per tower per annum)
- Additional CO2 emissions have been calculated
  - CO2 emission of 2.48 kg for every litre of diesel
  - CO2 emission of 0.84 kg for every kWh of electricity consumed



#### Figure A.6: EBITDA margin impact on operators using 900MHz spectrum due to refarming [Source: Analysys Mason]

Parameter	Units	Value
Combined FY 2012 revenues of leading GSM operators	INR Cr	95 207
Combined opex of leading operators	INR Cr	67 144
Combined EBITDA margin of these operators	INR Cr	28 063
Combined EBITDA margin of these operators	%	29.5%
Additional opex due to refarming	INR Cr	7671
Revised EBITDA after refarming	INR Cr	20392
Revised EBITDA margin after refarming	%	21.4%

#### Key Assumptions:

Calculated using reported financials of Bharti Airtel, Idea Cellular and Vodafone



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# **Cellular Operators Association of India**

## WITHOUT PREJUDICE

1

RSM/COAI/123 June 15, 2012

Shri R. Chandrashekhar, IAS Secretary, DoT and Chairman, Telecom Commission Department of Telecommunications, Sanchar Bhawan, 20 Ashoka Road, New Delhi – 110001

Dear Sir,

# <u>Misleading Recommendations of TRAI on "Liberalization of Spectrum"</u> <u>Under existing regime of technology & service neutrality, spectrum allotted currently is</u> <u>already liberalized</u>

This refers to TRAI recommendations on 'Auction of Spectrum' dated 23.04.2012, where the Regulator has opined:

- a. "...the spectrum assigned for 2G services is for a specific technology; it cannot be used for any other technology, until its use is liberalized". (Para 2.18)
- b. "In India, for 2G mobile services, spectrum has been assigned in the 900 MHz band, for GSM technology. In its recommendations of May 2010, this Authority had noted, in Para 1.78 thereof, that "the spectrum given in the bands of 800, 900/1800 MHz are for using specific technology i.e. CDMA and TDMA (GSM) respectively. The Wireless Telegraphy License given for using spectrum in these bands also restricts the licensee to use a particular technology i.e. either CDMA or GSM. As such, the Authority is of the view that the licensee is permitted to use the assigned spectrum only for deploying the specific technology as specified in the Wireless Telegraphy License." While the licenses themselves are technology neutral, the spectrum in the 900 MHz band for GSM technology cannot be used for any other technology, until its use is liberalised." (Para 2.39)
- c. "On the issue of liberalization of spectrum, the argument of operators that the spectrum is already liberalized is incorrect. Clause 43.5 (i) & (ii) of UAS licence clearly restricts the use of spectrum in the 800/900/1800 bands to a prescribed channel plan." (Para 2.29)
- 1. The above interpretation of the policy and licensing regime by TRAI is completely fallacious and not borne out by the facts on record. TRAI has disregarded that:
  - a. The restriction to use only GSM technology to offer mobile services was removed with the announcement of NTP-99, which allowed CMSPs the freedom to provide all types of mobile services "*utilizing <u>any type of network equipment</u>*, *including circuit and/or packet switches, that meet the relevant International Telecommunication Union* (*ITU*)/Telecommunication Engineering Centre (TEC) standards."

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- b. All cellular mobile services providers migrated to NTP-99 and upon migration, all the provisions of NTP-99, including the right to any type of network equipment/technology neutrality became part and parcel of their licenses.
- c. Technology neutrality and the right to use any technology was reconfirmed by the Government vide its Press Release 13.09.1999 which stated that

"the existing licensees of cellular services on their migration to NTP-99 regime in terms of the migration package already offered to them, will also be permitted to expand their networks using any other technology or the GSM technology to which they have been bound so far as per the existing licenses."

d. Government vide Press Note dated 01.10.1999 clarified that in terms of NTP-99,

"there is going to be the same licensing regime for all operators. As specifically provided in NTP-99, any cellular mobile service provider (CMSP) can provide any type of network equipment. Therefore, Telecom Commission has decided that choice of technology is to be left to CMSP and has to be digital only. Thus, the choice of technology would be available to all existing CMSPs on migration to NTP-99."

e. DoT once again reconfirmed and clarified on 09.04.2001 that

"the operators have been permitted to operate the cellular mobile telephone

- services in any technology, however, the technology shall be digital and has to operate in the designated frequency band" i.e. 890-915MHz paired with 935-960MHz.
- That Clause 24.7 of the 4<sup>th</sup> Cellular License of 2001 states that the bandwidth will be f.

"allocated based on the technology requirements e.g. CDMA @ 1.25 MHz, GSM @ 200 KHz etc" and that while efforts would be made to make available larger chunks to the extent feasible, the frequencies assigned may not be contiguous and may not be same in all cases.

It is noteworthy that even though 1800 MHz spectrum was allocated under the 4<sup>th</sup> Cellular License, the license provided for the bandwidth to be allocated as per the technology requirements, illustratively (a) CDMA; (b) GSM and (c)'etc.', technologies.

# g. The UAS Guidelines dated 11.11.2003 unambiguously stated that the

"Unified Access service providers are free to use any technology without any restriction".

h. The provisions of the UAS License which clearly permit any technology, require the licensee to provide only the details thereof and also clearly permit any value addition/ upgradation that the technology permits at later date with prior intimation to Licensor and TRAI.

"23.1 The Licensee shall provide the details of the technology proposed to be deployed for operation of the service. The technology should be based on

2

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standards issued by ITU/TEC or any other International Standards Organization/ bodies/Industry. Any digital technology having been used for a customer base of one lakh or more for a continuous period of one year anywhere in the world, shall be permissible for use regardless of its changed versions....

23.6 The LICENSEE may provide additional facilities in case of any value addition/ upgradation that the technology permits at later date with prior intimation to

### Licensor and TRAI."

- That in the Question and Answers to NIA for 3G Auctions, it was clarified by DoT
  - in answer to Question No. 274 that in the light of the technology neutrality whether there are any restrictions on the use of 800/900/1800/2100/2300 MHz or any other spectrum band for providing access service, the DoT has replied that the usage is governed by the provisions of the respective service licenses.
  - in answer to Question 181 as to whether 3G can be rolled out in 2G spectrum • assignments, DoT again responded that provision of service is governed by the license held by the service provider and that current auction is for spectrum and not for licenses.
- 2. In fact, TRAI itself has also repeatedly noted that the licenses are technology neutral and the restriction to use only GSM technology was lifted in 1999 itself.
  - a. This is evident from para 4.4 (page 105) of TRAI's recommendations dated 28.08.2007, where TRAI has stated "The initial CMTS license was amended by an order dated 01.10.1999 of DoT and the license was made technology neutral. Before the amendment, it was mandatory for the licensees to use the GSM technology."
  - b. That further in its Consultation Paper of 16.10.2009, TRAI raised question i.e. "in view of the policy of technology and service neutral licenses, should any restriction be placed on these bands (800, 900 and 1800 MHz) for providing a specific service.....(?)".
    - It is incomprehensible why TRAI, while recognizing and admitting to the policy of technology and service neutral licenses should seek to place any restriction on providing a particular service. More important, however, for the present context is that the policy of technology neutrality is not questioned or sought to be reviewed.
- 3. We submit that Clause 43.5 of license relied upon by TRAI to support its erroneous interpretation deals with frequency authorization and allocation and not with technology permissibility. It is submitted that

a. Clause 43.5(i) and 43.5(ii) of UAS License do not restrict the use of spectrum in 800/900/1800 bands to any specific technology or to any prescribed channel plan. These clauses only provide for the allocation of spectrum in appropriate units based on choice of technology i.e. @ 200Khz per carrier or @30KHz per carrier in case of TDMA based systems or @ 1.25 MHz per carrier in the case of CDMA based systems.

3

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The above license provision also states that "While efforts would be made to make available larger chunks to the extent feasible, the frequencies assigned may not be contiguous and may not be the same in all cases or within the whole Service Area."

b. There is no mention of channel plan at all for these bands either in the license or in any of the National Frequency Plans (NFAP 2002, 2008 and 2011).

In fact the NFAP 2002 in IND 44 mentions in respect of 900MHz band that "Additional requirements up to 6.2 + 6.2 MHz for cellular mobile telephone systems may be coordinated on a case-by-case basis in the frequency band 902.5 - 915 MHz paired with 947.5 - 960 MHz. These may not be contiguous and may be in smaller chunks of 0.6 MHz and may not be same in all cases, while efforts would be made to make available in larger chunks to the extent feasible."

Thus, even in 2002 a minimum chunk of 600 KHz was mentioned in NFAP and it was mentioned that effort will be made to make available larger chunks to the extent feasible, which meant chunks could be larger than 600KHz.

 Similarly in NFAP 2002 in IND48 it was mentioned that "Requirements of cellular and WLL systems in the frequency band 1700-2000 MHz may be coordinated on a case by case basis. Cellular mobile telephone systems may be coordinated for (10+10) MHz in the frequency band 1710-1785 MHz paired with 1805-1880 MHz and on full utilization of allocated spectrum in 800 MHz band, additional (10+10) MHz of spectrum may be coordinated for the WLL systems in the frequency bands 1710-

1785 paired with 1805-1880 MHz on a case-by-case basis.

This additional spectrum could be in chunks of (5+5) MHz if possible, otherwise smaller chunks in multiples of 1.25 MHz could be considered for allocation on case-by-case basis. These allocations may not be contiguous. However, efforts would be made to make the spectrum width as large as possible."

As is evident from the above, while there is no channel plan linked with spectrum bands in 800/900/1800 MHz as wrongly inferred by TRAI in 2012, there is clear provision in the current license too that efforts would be made to make available larger chunks to the extent feasible.

- 4. Also, without prejudice to our contention that technology neutrality does not mean dual spectrum, the Hon'ble TDSAT, in its judgment dated 31.03.2009 in Petition 286 of 2007 has stated that:
  - The Telecom Commission decided that all new cellular mobile service providers will be technology-wise neutral.
  - The only stipulation is that the technology must be digital.
  - The existing licensees of cellular services on their migration to the NTP-99 regime in terms of migration package already offered to them will also be permitted to expand their networks using any other technology or the GSM technology to which they have been bound so far as per the existing licences.



 In its judgement dated 22.8.2008, the Delhi High Court held that "it is apparent that even as back as in 1999, the Respondent no.1 had notified technology neutral Cellular Mobile Service Providers and also envisaged expansion of networks by using any other technology.

We have challenged TDSAT's order in Petition 286 of 2007 submitting that that spectrum and technology are different and that technology neutrality does not mean dual spectrum and therefore dual spectrum cannot be given under technology neutrality policy.

5. We would also like to point out that contrary to TRAI claims that the spectrum given in the bands of 800, 900/1800 MHz are for using specific technology i.e. CDMA and TDMA (GSM) respectively, the dual spectrum operators have been openly offering 3G EVDO services in the 800MHz band.

This issue has been brought to the notice of TRAI several times seeking level playing field and fair competition amongst all players. However, these representations have been consistently disregarded by TRAI.

If indeed it were TRAI's view that under license, 800MHz can only be used for CDMA, it is indeed surprising that TRAI has not initiated proceedings against the dual spectrum operators for offering services to customers in violation of license terms.

The fact that, this has not been done so far, thus belies TRAI's own view (now taken in **Paras 2.18 and 2.29**) that spectrum is technology specific and not "liberalized"

6. We would also like to submit that Spectrum comes bundled with license. Use of spectrum is governed by provisions of license. This has been repeatedly and amply clarified by DoT in response to the various queries leading to the auction of 2.1GHz and 2.3GHz spectrum in 2010.

The attempt by TRAI to try and de-link the two and claim that license is technology neutral while spectrum is not is trying to create an artificial and incorrect distinction where none exists.

- 7. We would further submit that TRAI's definition of liberalized spectrum use as:
  - a. "Liberalisation of spectrum refers to the removal of technology restrictions to give the licensee an option to deploy new technologies in the same. For example, UMTS or HSPA could be deployed in spectrum bands where traditionally GSM, CDMA or TDMA has been used." (Para 2.18)
  - b. "...Liberalisation of spectrum essentially means the removal of technology restrictions to enable new access technologies to be deployed within the same band or bands as existing and legacy technologies. This would mean that the operators will be free to choose any technology in the spectrum bands held by them. ..." (Para 3.73)

# has already been permitted under NTP 99 read with DoT's Press Note of 13.09.1999, 01.10.1999 and letter dated 09.04.2001.

5

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We respectfully submit that in view of the above, any contention by TRAI that spectrum is not liberalized needs to be rejected outright.

Thanking you,

Kajan S. Mastlers

**Rajan S. Mathews Director General** 

## Encl:

- i. DoT's press note dated 13<sup>th</sup> September 1999
- ii. DoT's press note dated 1<sup>st</sup> October 1999
- iii. DoT's letter File No. 842-304/99-VAS dated 9<sup>th</sup> April 2001
- CC : Shri. R. Gopalan, IAS, Secretary, Economic Affairs, Ministry of Finance
  - : Shri. J. Satyanarayana, IAS, Secretary, Department of IT
  - : Shri. Saurabh Chandra, IAS, Secretary, Department of Industrial Policy & Promotion
  - : Smt. Sindhushree Khullar, IAS, Secretary, Planning Commission

: Shri. J. K. Roy, Member (T), Telecom Commission

- : Shri. S C Misra, Member (S), Telecom Commission
- : Smt. Sadhana Dikshit, Advisor (F), Telecom Commission

# **Cellular Operators Association of India**



Ministry of Communications (Department of Telecommunications)

(8)

Subject

BUSSIONS

(1999 SERIES)

Cellular Mobile Telephone Services to be technology - neutral.

The Government have adopted New Telecom Policy-99 effective from 1<sup>4</sup>

April, 1999. The NTP-99 which is seen as a considerable improvement over the earlier

policy, was formulated by a high level Group on Telecommunications consisting of

experts from Industry, Financial Institutions and Telecom.

The NIP-99 envisages that Cellular Mobile Service Providers (CMSP)

under the new licensing regime shall be free to provide all types of mobile services using

any type of network equipment that meet the relevant International Telecommunication

Union (ITU)/Telecom Engineering Centre (TEC) standards. The technology neutral

approach for provision of cellular mobile services will enable faster and cost effective

roll out of the cellular networks by leveraging technological developments.

### Accordingly, the Telecom Commission have now decided that -

All new Cellular Mobile Service Providers will be technology wise

neutral; however, the technology must be digital. The existing

licensees of cellular services on their migration to the NTP-99

regime in terms of migration package already offered to them, will

also be permitted to expand their networks using any other technology or the GSM technology to which they have been bound

so far as per the existing licences.

#### The Dept. of Telecom/MINL would operate cellular services **(b)**

under the same terms and conditions of licence as would be

applicable to private operators. In view of the objectives of NIP-

99, till the terms and conditions of new licences are finalised for which recommendations of TRAI have already been sought, DOT/MTNL would be permitted to operate cellular mobile services under provisional licence; the terms and conditions as finalised would be applicable to all licensees under NTP-99 including MTNL and DOT. In terms of NTP-99, the licence fee

# thus received would be reimbursed to DOT to provide resources

for meeting immense rural and social obligations.

(J.R. GUPTA) DEPUTY DIRECTOR GENERAL (VAS)

F. No. 842-304/99-VAS dated the 13th September, 1999

Forwarded to the Director (PR), Ministry of Communications, New Delhi for giving wide publicity to the contents of the above Press Note.

### Copy to:

- All the concerned Ministries.
- 2. Telecom Regulatory Authority of India, New Delhi.
- 3. Cellular Operators Association of India.

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# PRESS INFORMATION BUREAU GOVERNMENT OF INDIA

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# CLARIERCOVIES REGARDING LICENCE GRANTED TO MTNL FOR CELLULAR MOBILE SERVICES

New Delhi: Asvina 9, 1921

Reports have appeared in certain sections of media expressing concern that the license granted by the Government to Mahanagar Telephone Nigam Limited (MTNL) for Cellular Mobile Telephone Service does not provide level playing field to other licensees. In this connection Government clarifies that in terms of New Telecom Policy-1999 (NTP-99), there is going to be the same licensing regime for all operators. As specifically provided in NTP-99, any Cellular Mobile Service Provider (CMSP) can provide any type of network equipment. Therefore, Telecom Commission decided that choice of technology is to be left to CMSP and has to be digital only. Thus, the choice of technology would be available to all existing CMSPs on migration to NTP-99.

As regards the payment of license fee by MTNL, the percentage of revenue would be the same as for any other CMSP.

Interconnect revenue sharing arrangements for cellular services for payment of access charges between Department of Telecommunications (DoT) and MTNL for STD and ISD traffic will be same as applicable to the other private operators.

If any company is a basic service provider as also a CMSP, then maintenance of accounts and furnishing of returns, etc. would have to be separate as there are separate licenses for different services. MTNL has further assured the Government that they would be maintaining separate accounts for the operation of cellular services. It would be the responsibility of MTNL, like any other service provider, to maintain such books of accounts or other documents as required.

It is to be recalled that the NTP-99 was approved by the Government with the objective of creating a modern and effective telecommunications network augmenting the availability of affordable and effective communications for the citizens by leverage on technological development and increased competition. It was, in this context, that in regard to the Celhular Mobile Service, the NTP-99 provides that apart from the two operators already licensed, DoT/MTNL would be licensed to be a third operator. Various measures taken by the DoT have been part of the implementation of policy decisions forming part of NTP-99 which was made effective from  $1^{n}$  April 1999.

APFN: BKS: CS 27]1, 1 - 1059 - 1920 m

# Nov 12 02 12:08p Rajiv Pandit 4 6384984 P-1 6384984

GOVERNMENT OF INDIA MINISTRY OF COMMUNICATIONS DEPARTMENT OF TELECOMMUNICATIONS (VAS CELL) SANCHAR BHAWAN, 20, ASHOKA ROAD, NEW DELHI-110 001.



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**N** •

Dated: April 09, 2001.

MA. SATYARAL

(DA) -

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Subject: Additional frequency spectrum for Cellular Mobile Telephone Service – request from Operators regarding.

# Dear Sirs,

This office has received requests on the above subject from existing cellular operators for additional spectrum in 900/1800 MFIz Band for Cellular services and for allocation of frequency spectrum in 800 MHz band for CDMA services.

2. It is seen that proper and sufficient justification for additional frequency spectrum and details of alternate methods adopted for optimal capacity enhancement has not been given.

It is, therefore, imperative that request for additional frequency spectrum in the designated band (as per the guidelines issued) for cellular service must accompany detailed justification. You should also indicate as to what alternate methods have been adopted for capacity enhancement and whether all available options have been exhausted.

3. The Cellular Services are to be operated by the existing licensees in designated Cellular Mobile Telephone Service band i.e., 890-915 MHz paired with 935-960 MHz. The operators have been permitted to operate the Cellular Mobile Telephone Service in any technology, however, the technology shall be digital and has to operate in the designated frequency band. As such, no additional frequency spectrum needs to be allocated.



# Copy to: DDG (BS)