



Vodafone Response to TRAI Consultation Paper dated 2 December, 2014 on Valuation and Reserve Price of Spectrum: 2100MHz band

I. PREAMBLE

We warmly welcome this consultation by the Authority on the valuation and reserve price of spectrum in the 2100MHz band.

The need for more 2.1GHz spectrum has long been voiced by the industry, which is struggling to cope with the growing demand for data and broadband services.

A. 2.1GHz must be supplemented with additional spectrum in core 900MHz & 1800MHz bands

1. **It is first submitted that supply in the core bands in 900/1800MHz, is the fundamental requirement** of the telecom networks.
2. While addition of 2.1GHz into the auctions is most welcome, we respectfully submit that additional spectrum in 2.1GHz cannot mitigate the insufficiency of spectrum in the core and critical bands of 900MHz and 1800MHz, which sub optimal supply has also been recognized by the Authority.
3. **We urge that in addition to 2.1GHz, all out efforts must also be made to increase the supply of spectrum in 900/1800MHz bands.**
4. We have through the COAI made detailed submissions on how additional spectrum can be made available in the 900MHz and 1800MHz band as also in the bands of 800MHz and 2100MHz so as to ensure fair and equitable auctions. Our key submissions are reiterated below:
 - **900MHz** - Additional 900MHz can be made available by **re-arrangement of carriers allocated to BSNL** and by **auctioning partial spectrum excluding use by Government agencies in select locations.**
 - **800MHz**- We reiterate that ideally the best use of this spectrum would be as Extended GSM, we believe that failing that, it should at least **be offered as a contiguous chunk of 5MHz so that it can be used for broadband technologies** and is of interest to all existing operators.
 - **1800MHz** - Additional 1800MHz spectrum can similarly be made available by **re-shuffling existing allocations.**



5. In addition, we would like to re-iterate that the **1.8MHz spectrum in 1800MHz** band that has been **reserved for Aircel** following the Hon'ble TDSAT's order dated 31 January 2014 **cannot be held back indefinitely**. The Hon'ble Tribunal's order made it clear that allocation of the said 1.8MHz would be subject to Aircel and Dishnet filing undertakings both before the Tribunal and DoT that their liability to make payment or otherwise for the additional 1.8 MHz spectrum shall abide by the outcome of the decision in petition no.392 of 2012 and that the allocation of the spectrum to them as directed above would be subject to their filing the undertakings on affidavit. We verily believe that no such undertakings have been filed. It is submitted that the Authority should insist that either Aircel/Dishnet should file the said undertaking and take the spectrum subject to conditions contained in the Hon'ble TDSAT's order or the spectrum should be put up for auction.
6. We are encouraged to note that the Authority in its reference back to the DoT dated 24 November 2014 has urged Defence should move to its designated band and vacate spectrum earmarked for commercial use, in a definite time-frame and that in case this is not possible, the spectrum in the Defence band ought not to be kept unutilised..

B. Increased Supply of 2.1GHz

1. At the outset, we support the recommendation of the Authority [on 15 October 2014] that the entire 2x60MHz internationally identified in the 2.1GHz band must be made available for commercial use. We submit that all out efforts will be required at the highest political levels to ensure the same.
2. It may be noted that most regimes have allocated nearly the entire 2.1GHz spectrum for commercial mobile services.

Asia Pacific				
S. No.	Country	Quantum of Spectrum Allocated in 2100 MHz(Uplink + Downlink)	Total Allocated	% of Spectrum allocated
1	Afghanistan	60MHz + 60MHz	120MHz	100%
2	Bangladesh	35 MHz + 35 MHz	70MHz	58%
3	Cambodia	55 MHz + 55 MHz	110MHz	92%
4	China	30 MHz + 30 MHz ; 15 TDD	75MHz	63%
5	Hong Kong	59.2MHz + 59.2 MHz	118.4 MHz	99%
6	Indonesia	50 MHz + 50 MHz	100MHz	83%
7	Japan	60 MHz + 60 MHz	120MHz	100%
8	Korea	60 MHz + 60 MHz	120MHz	100%
9	Laos	60 MHz + 60 MHz	120MHz	100%
10	Malaysia	60 MHz + 60 MHz	120MHz	100%



11	Mongolia	40 MHz + 40 MHz	80MHz	67%
12	Myanmar	45 MHz + 45 MHz	90 MHz	75%
13	Nepal	20 MHz + 20 MHz	40MHz	33%
14	New Zealand	55 MHz + 55 MHz	110MHz	92%
15	Philippines	35 MHz + 35 MHz	70MHz	58%
16	Singapore	59.6 MHz + 59.6 MHz	119.2MHz	99%
17	Sri Lanka	60 MHz + 60 MHz	120MHz	100%
18	Taiwan	55 MHz + 55 MHz	110MHz	92%
19	Thailand	60 MHz + 60 MHz	120MHz	100%
20	Vietnam	60 MHz + 60 MHz	120MHz	100%
Europe				
S.No.	Country	Quantum of Spectrum Allocated in 2100 MHz (uplink + downlink)	Total Spectrum Allocated	% of Spectrum allocated
1	Albania	45MHz + 45MHz	90 MHz	75%
2	Austria	59.4MHz + 59.4MHz	118.8MHz	99%
3	Belgium	59.4MHz + 59.4MHz	118.8MHz	99%
4	Bulgaria	25 MHz + 25 MHz	50 MHz	42%
5	Croatia	45 MHz + 45 MHz	90MHz	75%
6	Czech Republic	59.4MHz + 59.4MHz	118.8MHz	99%
7	Denmark	60 MHz + 60 MHz	120 MHz	100%
8	Estonia	59.4MHz + 59.4MHz	118.8MHz	99%
9	Finland	59.4MHz + 59.4MHz	118.8MHz	99%
10	France	59.2 MHz + 59.2 MHz	118.4MHz	99%
11	Georgia	45MHz + 45MHz	90 MHz	75%
12	Germany	59.4MHz + 59.4MHz	118.8MHz	99%
13	Greece	45MHz + 45MHz	90 MHz	75%
14	Hungary	45MHz + 45MHz	90 MHz	75%
15	Iceland	45MHz + 45MHz	90 MHz	75%
16	Ireland	60 MHz + 60 MHz	120 MHz	100%
17	Italy	60 MHz + 60 MHz	120 MHz	100%
18	Lithuania	59.4MHz + 59.4MHz	118.8MHz	99%
19	Netherlands	60 MHz + 60 MHz	120MHz	100%
20	Norway	59.4MHz + 59.4MHz	118.8MHz	99%
21	Poland	59.2MHz + 59.2 MHz	118.4MHz	99%
22	Portugal	59.4MHz + 59.4MHz	118.8MHz	91%
23	Romania	59.4MHz + 59.4MHz	118.8MHz	99%
24	Russia	60 MHz + 60 MHz	120MHz	100%
25	Serbia	45MHz + 45MHz	90 MHz	75%
26	Slovakia	60 MHz + 60 MHz	120MHz	100%
27	Slovenia	55 MHz + 55 MHz	110MHz	92%
28	Spain	59.2MHz + 59.2 MHz	118.4 MHz	99%
29	Sweden	59.4MHz + 59.4MHz	118.8MHz	99%



30	Switzerland	59.2 MHz + 59.2 MHz	118.4 MHz	99%
31	Turkey	50 MHz + 50 MHz	100 MHz	83%
32	United Kingdom	59.7MHz + 59.7 MHz	119.4 MHz	100%

Source: Spectrummonitoring.com

3. As an immediate measure, we request that **at least additional 2x20 MHz may be made available for auction**, as a part of the forthcoming auction of 800, 900 and 1800MHz band.
4. **This can be achieved by implementation of the swap proposal of 1900MHz with additional 2100MHz** spectrum, which has already been shared with the authority as a part of the response to the previous consultation and which proposal has also been made to the DoT/Government. It may be noted that the same **also has the support of the CDMA operators** [for whom this was purportedly being held as an extension band]
5. In addition, the **2.1GHz spectrum won by STEL** in three service areas viz. Bihar, Orissa and Himachal Pradesh **may also be put to auction**.
6. In addition to the above, we would like to submit that **even where the 2.1GHz band is being used by Defence**, the same is used only in very **select and limited geographical locations**. There is thus a very strong case that, **excluding the geographical use of this spectrum by Defence**, the **2.1GHz spectrum in the rest of the service area**, may be **auctioned in a partial manner**, much in the same manner as partial 1800MHz spectrum was auctioned in February 2014.
7. The **approach towards pricing of such partial allocations** has **already** been **enunciated by DoT** in its NIA dated 12-Dec-2013, and we suggest that the same approach may be adopted in the present instance as well.

C. Need for Clean Spectrum

1. It is **imperative that the spectrum put up by DoT for auction** and acquired at very high prices through an auction **must be clean, interference free and usable spectrum**.
2. It may be appreciated that if the above conditions are not met, there is no difference between licensed and un-licensed spectrum.
3. In this regard, the Authority is aware that the 2.1GHz spectrum acquired by us at very high prices in 2010 is facing severe interference in some service areas, viz. Gujarat and Haryana, as a result of which, the spectrum is virtually unusable.



4. We have been raising this concern with DoT / WPC for the last two years, however, till date, this matter has not been addressed. It may be appreciated that the interference has severely impacted the quality of our services in these service areas and is causing extreme customer dissatisfaction. It has also adversely impacted our brand perception in the market place apart from causing revenue loss due to non/low usability of the spectrum and porting out of our customers to competitors. Further, due to interference, we are also unable to use our spectrum efficiently resulting in loss to exchequer due to lower revenue collection on account of spectrum usage charges and license fees.
5. The Authority has also recognized this concern and has escalated the same to the WPC/DoT vide its letter No. 103-3/2013-NSL-II dated 1 October 2014.
6. The **fundamental difference between licensed and unlicensed spectrum** is that **licensed spectrum is required to be "clean" frequency**, free from interference. We have acquired this spectrum at huge cost through the auctions conducted in 2010, however we are unable to fully and efficiently utilize the same due the heavy interference in the allocated spots.
7. We request that **before any further 2.1GHz spectrum is auctioned**, the Authority may kindly recommend that this **issue of interference being faced by existing 2.1GHz spectrum holders be addressed** either by resolving the issue of interference, or, in the alternate, by swapping the frequency spot allocated to us with a clean - interference free frequency spot in 2.1GHz.
8. It may further also be clearly stated by the Authority that spectrum put to auction must be guaranteed to be interference free and also put in place suitable framework of compensation, in case the spectrum is found to unusable.
9. We would also like to submit that all commercial allocations must be informed to ITU to mitigate chances of cross border interference in various bands.

D. Review of Spectrum Usage Charges

1. As the Authority is aware, the SUC vide a Cabinet decision dated 31 January 2014 prescribed that auctioned spectrum will be applied an SUC and in respect of existing allocations, a weighted average will be applied.
2. We note that the DoT in its reference back to the Authority has stated that
 - *"TRAI has not made any recommendation in respect of Spectrum Usage Charge (SUC)*



- *Spectrum Usage Charge (SUC) forms part of the price of the spectrum to be auctioned.”*
And that
- *“In respect of SUC, for the spectrum to be auctioned in the forthcoming auction, TRAI is requested to give its reconsidered opinion on continuation of the same principle for SUC as adopted in February, 2014 auction.”*

In response to which, the Authority has reiterated its September 2013 recommendation that *“the SUC for all auctioned spectrum should be at a flat rate of 3% of AGR for wireless services. For the transition phase, till the time the entire spectrum is converted into auctioned spectrum or acquired in spectrum trading or on which the TSP has paid the prescribed market value, the Authority recommended a highest slab rate of 5% of AGR.”*

3. We support this recommendation of the Authority and request that the same be extended to all spectrum auctioned from 2012 onwards.
4. At the very least or in the alternate, it may be recommended that the **spectrum proposed to now be put to auction may attract an SUC of 3%** and a **weighted average of 5%** may be **applied to spectrum acquired in February 2014** and **existing applicable slab for earlier allocations**. This would be appropriate as a suitable glide path to bring all spectrum usage charges to a uniform 3%AGR.



E. Review of Transmit Power Limit of 20W

1. BTS Transmit power guidelines for the mobile networks were introduced in 1995 when GSM was the most common network. Since then technologies have evolved, however, transmit power regulation have not been reviewed and the same norms are being followed for all new technologies such as 3G and LTE. Current guidelines of RF power from DoT on transmit power (RF) from the BTS is 20W at the output of the BTS port.
2. There are **significant differences between GSM** (narrowband technology) **and 3G / LTE** technologies (broadband technologies) **which necessitate different treatment of RF Power** related to these technologies.
 - a) Power in GSM is across 200KHz channel vs. 3G/LTE is in wideband say 5MHz, 10MHz or 20MHz,
 - b) GSM has continuous power transmission irrespective of the traffic in the BTS, while 3G / LTE-FDD / LTE-TDD have discontinuous power transmission owing to following aspects
 - I. Pilot power, which is typically 10% of the total transmit power of Node-B in 3G network, is continuous and total power is based on the amount of voice & data traffic in the Node-B,
 - II. Power transmission only in fraction of time in case of LTE-TDD deployments
 - III. Continues power transmission in LTE-FDD networks are only transmitted on some RE (Resource Elements)
 - c) MIMO is mandatory in LTE and optional in 3G which is not applicable for 2G networks.
3. 3G and LTE which are wideband technologies, need higher transmit power for coverage & capacity. Global deployments in US, Europe, China and APAC markets for 3G & LTE are using 40W to 80W of transmit power in the BTS irrespective of bands (3G in 900 and 2100, LTE-FDD in 1800, 800, 2100, 900 band, LTE-TDD in 2300, 2600 band) to take care of growth in mobile broadband traffic.
4. We submit that given that the new broadband technologies introduced beyond 2010 are having different characteristics like frequency band, MIMO, wide band spectrum usage, its pertinent for these regulations to be revised. A white paper prepared by COAI highlighting this issue and need for review of this 20w transmit power requirement is enclosed as **Annexure – 1**
5. We request that the Authority may include the need for this review as a part of its recommendations on 2.1GHz.



F. Simultaneous Auction of 900 and 1800MHz as also the 800 MHz and 2100 MHz bands

1. We also submit that once **spectrum in the core bands of 900 and 1800MHz as also the 800 MHz and 2100 MHz bands** is made available as suggested above, the **auction** of spectrum **in all these bands should be done concurrently and not sequentially**. This will **ensure maximum supply** in the auction pool **as also allow the maximum flexibility** to the operators to choose the best possible spectrum mix under the circumstances.
2. We are gratified to note that even DoT, in its reference to TRAI, has indicated that it intends to auction the 2.1GHz spectrum along with the auction of spectrum in 800, 900 and 1800MHz bands. [para 1.3]

G. Interim Solution for Licenses coming up for extension in 2015-16

1. We understand that some of the above measures to make additional spectrum available may take some time as it will entail dialogue and agreement at the highest political levels as also some degree of re-arrangement and harmonization of spectrum allocations of existing licensees.
2. **Under these circumstances, in the overall interest of the economy and the general public, we would like to offer a practicable and viable solution in respect of licensees whose initial term is up to 2015-16.** It is submitted that this solution does not touch upon the subject of the pending litigations on this matter, which will finally get addressed through a judicial process, and is without prejudice to views and rights of either the service providers or the Government, on this subject.
3. **We would thus like to propose that that until adequate additional spectrum, as recommended by the Authority, is made available, for the conduct of fair and equitable auctions:**
 - a. The licensees whose initial term is up to 2015-16, may be allowed to continue with their existing in-use spectrum.
 - b. Auctions be conducted when there is adequate supply of spectrum in the 800 MHz, 900 MHz, 1800 MHz and 2100 MHz bands, which should be auctioned simultaneously in a “Big Bang” auction.
 - c. For the intervening period, licensees pay the price discovered in February 2014 for 1800MHz with 900 MHz multiplier as recently recommended by TRAI. This may be adjusted subsequently if required, for the price discovered in the next round of auctions.



Or alternatively, if it is taking too long to resolve supply constraints,

- a. Government can work towards a plan to auction all 900 MHz spectrum allocated to the 1996-2000 licensees together, when BSNL/MTNL licenses/ spectrum comes for extension .
4. **We believe that our above proposal will ensure the continuity of services, meet the Government's exchequer objectives, ensure fair and equitable auction and address any other concerns which the Government may have.**
 5. We have already made this proposal to the Government and we request that the same may also merit the kind consideration and support of the Authority.

Against the above backdrop, we would like to respond to the issues raised for consultation by the Authority.

II. ISSUES FOR CONSULTATION

Q1. In the auction for 2100 MHz spectrum held in 2010, certain roll-out obligations were mandated for the successful bidders. Stakeholders are requested to suggest if any changes are required or whether the same roll-out obligations should be mandated in the forthcoming auction, along with justification.

- a. We do not support any change in the 2.1GHz rollout obligations and submit that the same obligations as were prescribed in 2010, may be continued with for the 2.1GHz spectrum auctioned in future as well.
- b. In case of a TSP already having spectrum in 2.1GHz, it may be specified that the rollout obligations already achieved will be counted and the TSP may offer coverage already achieved in accordance with rollout obligations prescribed in 2010 as a part of compliance towards roll out obligation for the present auction of 2.1GHz.
- c. While we are not seeking any review of the rollout obligations for 2.1GHz, we note that the Authority has rightly recognized the concerns of the TSPs as regards compliance with the rollout obligations for 2.1GHz. It is submitted that:
 - i) It was only in Oct-2012, DoT issued an extremely onerous and impractical testing procedure - and that too, only on a provisional basis.
 - ii) Further, even the list of Rural SDCAs was made available after significant delay
 - iii) Concerns regarding the impracticality of the TSTP have been repeatedly raised by the TSPs to DoT and in fact, concerns regarding the same were also raised by some TERM Cells.



- iv) That appreciating these concerns, the DoT has set up a high level committee to go into the issue and review the same.
 - v) It is hoped and expected that the provisional TSTP will be reviewed by DoT and a practical TSTP will be prescribed for testing compliance to 2.1GHZ rollout.
 - vi) It is respectfully submitted that under the above circumstances, it has not been possible for the TSPs to plan and initiate activities required for meeting rollout obligations.
 - vii) We have been representing to DoT that the time period for meeting the rollout obligations should commence only after DoT has issued a practical TSTP and has also shared the list of Rural SDCAs for respective service areas with the TSPs.
- d. We request that the above constraints be examined and addressed by the Authority as a part of its present recommendations.

Q2. Whether a bidder should be allowed to bid for more than one block of spectrum, in case a sufficient quantum of spectrum (more than one block in LSA) is put to auction?

- a. We submit that there should be no restriction on number of blocks that bidders should be allowed to bid for subject to compliance with the spectrum caps of 25% of total commercially assigned access spectrum and 50% of the band, as notified by DoT, which should be applied to the 2.1GHz spectrum as well.
- b. This would also be in consonance with the Authority's recommendations on spectrum trading, where the Authority has taken a view/recommended that:
 - o *"All spectrum bands earmarked for Access Services by the Licensor will be treated as tradable spectrum bands. Currently spectrum in 800MHz, 900MHz, 1800MHz, 2100MHz, 2300MHz and 2500MHz spectrum bands have been allocated for Access Services"*
 - o *"The buyer should be in compliance of the spectrum cap (ceiling) of 25% of its total spectrum holding in 800/900/1800/2100/2300/2500 MHz bands with applicable paired band put together and 50% within a given band in each of the LSA"*
- c. We would also like to submit that in case an operator with an existing allocation in 2100 MHz acquires additional spectrum in this band, then ideally, such operator should get contiguous allocations, so as to be able to benefit from efficiencies of contiguous spectrum.
- d. At the very minimum such operators should be enabled to have all their allocation within the Inter Band Width [IBW] of 20MHz – by either granting them fresh spectrum in range of the earlier spectrum or by reshuffling their earlier allocation. This is essential for making efficient use of the total 2100 MHz spectrum with the operator.



Q3. Whether the spectrum caps (of 50% of total spectrum in a band/25% of total spectrum assigned across bands) prescribed in recently held auctions in the 800/900/1800 MHz bands should also be prescribed for the upcoming auctions in the 2100 MHz band?

- a. While we believe that in the long term, it would be desirable to move away from prescribing spectrum caps [as has been done in many developed markets] - for the present, the spectrum caps prescribed by DoT for all access spectrum, should be extended /applied to 2.1GHz spectrum as well.

Q4. In case only one block of 5 MHz of spectrum in 2100 MHz is available in an LSA, should only those TSPs be allowed to participate who do not have 2100 MHz spectrum in that LSA at present?

- a. No, we do not support such an approach. The Government has never followed an approach of restricting participations in the auctions and we do not support any such restrictive practice. Participation in auctions should be allowed for all eligible entities.

Q5. Should the indexed value of May 2010 auction determined prices of 2100 MHz spectrum be used as one possible valuation for 2100 MHz spectrum in the forthcoming auction? If not, why not? And, if yes, what rate should be adopted for the indexation?

- a. We are firmly of the view that indexing historic market prices, to estimate current value of spectrum is not appropriate because the expectations about the future, on which those historic prices are based, change over time. Indexation 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.
- b. As the Authority has rightly noted, [para 3.4]
- *"...the fact that the 2010 auction was conducted in a supply-constrained scenario cannot be lost sight of.*
 - *....The demand for spectrum in the 2100 MHz band was conditioned by the excessive competition engendered by entry of new licencees in 2008....*
 - *The changes in the techno-economic circumstances since the time of the 2010 auction also need to be considered while approaching the valuation exercise based on the prices revealed in that auction. These changes include both substantial aspects - such as the likely demand for 3G services in the background of the evolution of the ecosystem for 4G/ LTE technology, the likely availability of spectrum in other bands such as 700 and 2500 MHz, etc., - as well as issues of perception regarding the value of 2100 MHz spectrum for rolling out next generation services demanded by consumers. ..."*



- c. The peculiar circumstances in which the 2010 auctions were held and the distortion in the ensuing result is also evident from the vast variation in the auction prices paid by Vodafone in two separate auctions, in Germany and India in 2010 that concluded within days of each other.
- d. At the same time that the 2.1GHz auctions were being held in India, Vodafone Germany participated in the spectrum auctions in Germany, where the results were as below:

	Vodafone India	Vodafone Germany
Spectrum Acquisition date	19 May 2010	20 May 2010
Total Spectrum	10MHz	95MHz
• 800MHz	-	2x10 MHz
• 2.1 GHz	2x5MHz	2x5 MHz
• 2.6 GHz	-	2x20 MHz
• 2.6GHz (unpaired)	-	25 MHz
Tenure	20 years	15 years
Price	Rs. 11,620 crores	Rs. 8160 crores
Price /MHz	Rs. 1,162 crores/MHz	Rs. 86 crores/MHz
Price /MHz/year	Rs. 58 crore/MHz/year	Rs. 5.73 crores/MHz/year

Thus, **in India, 11% of the spectrum went at 1.4 times the price.**

The subscriber base and ARPU of India and Germany at that time, were as below:

	India	Germany
Subscribers (in million)	680	105
Mobile Revenues (in USD billion)	25	26
ARPU USD/Sub/Month	3	21

India thus had **6.5 times more subscribers, but a 7 times lower ARPU.**

Vodafone India thus paid a 10 times higher price for spectrum for 7 times lower ARPU (return) than Vodafone Germany.

- e. Further, the unsuccessful auctions of November 2012 and March 2013 also provide ample evidence that using past market prices to set current reserve prices, does not work.
- f. The Authority has also noted/stated that the reserve prices for the 2010 auction were set in a 'top-down' manner; some rough and ready measures such as initially linking the reserve prices to the GDP formed the basis for the reserve-price-setting exercise. Later valuation exercises



conducted by the Authority took the 'bottom-up' approach whereby the valuation was done on the basis of LSA-specific factors.

- g.** In view of the above, indexation of 2010 market prices to arrive at a present valuation for 2.1GHz should not be contemplated and this should not be one of the methodologies /approached adopted by the Authority.

Q6. Should the value of the 2100 MHz spectrum be derived on the basis of the value of the 1800 MHz spectrum using the technical efficiency factor (0.83) as discussed in Chapter III?

- a.** We believe that the technical efficiency factor may be one of the factors that can be used by the Authority to arrive at the value of 2.1GHz.
- b.** We would like to suggest that apart from 1800MHz, the Authority may also like to apply a technical efficiency factor based on the values of 800MHz and 900MHz as recently recommended by the Authority or as available from recent auctions.
- c.** It may also be suggested that as 2.1GHz is primarily going to be used for data only services, it may merit consideration to look at the per MHz price discovered for 2.3GHz spectrum in 2010, which was auctioned as a data only spectrum.

Q7. Should the value of spectrum in the 2100 MHz band be estimated on the basis of the producer surplus model outlined in Chapter III? Please provide your views on the assumptions made. Please support your response with justification, calculations and relevant data along with the results.

- a.** At the outset, it may be noted that 2.1GHz, which is going to be used for data, is very different from the core and critical spectrum of 900MHz and 1800MHz spectrum which are used to provide voice services, which will continue to be the predominant mainstay for mobile telephony at least for the next 5-10 years.
- b.** It is therefore important to understand that there is a need to exercise far greater caution, whilst making predictions or assumptions regarding growth of data services and thereby the valuation of any data spectrum.
- c.** Specifically, in response to the producer surplus model, while we agree that, in general, additional spectrum can result in avoided cost / a producer surplus, but keeping in mind our above submission regarding difficulty in predicting data growth, we submit that the proposed approach to spectrum valuation may be simplistic and could lead to an over estimation because:



- i) It **presumes that traffic demand can be forecast for the next 20 years**. In reality, the mobile market in India is highly capacity-constrained and the evolution of mobile traffic depends crucially on future new spectrum assignments and industry consolidation. The dependency between future traffic and spectrum therefore means that using an estimate of future traffic to value spectrum **creates a circularity**.
- ii) It assumes that the 2.1GHz spectrum either **the only spectrum or the best spectrum** to meet future demand. If there are alternative, better value alternatives (which over a 20 year period is particularly likely), the calculation will be an over-estimate.
- iii) The working hypothesis [in para 3.9] that spectrum has a value equal to the capex savings with the spectrum is simplistic, because it **ignores optional value of future capex** – paying for spectrum is a committed cost, whereas capex forecasts still provide the TSP with the option of whether to spend or not each year
- iv) The model [para 3.11] focuses on 3G and ignores the **substitutability of 3G services** by other mobile standards, i.e. the option to carry data across a **choice of mobile technologies and bands**, including LTE and WiFi.
- v) We also believe that taking the **average of the values of the producer surplus of various TSPs** may be a bit simplistic. The aim of a conventional auction is to determine the clearing price, i.e. the price at which demand equals supply, or the price at which the surplus demand is withdrawn. This equates to the value of the strongest “loser” in the auction, not the average of the participants.

Q8. Should the value of spectrum in the 2100 MHz band be estimated on the basis of the growth in data usage outlined in Chapter III? Please provide your views on the assumptions made. Please support your response with justification, calculations and relevant data along with the results.

- a. Keeping in mind our above submission regarding difficulty in predicting data growth, we submit that estimating value of spectrum in the 2100 MHz band on the basis of the growth in data usage may be simplistic and could lead to an over estimation because: :
 - i) It **presumes that revenues for data services and can be forecast for the next 20 years**. In reality, the mobile market in India is highly capacity-constrained and the evolution of mobile services and revenues depends crucially on future new spectrum assignments and industry consolidation. The dependency between future services revenue and spectrum therefore means that using an estimate of future traffic to value spectrum **creates a circularity**.
 - ii) It assumes that the 2.1GHz spectrum is either **the only spectrum or the best spectrum** to meet future demand. If there are alternative, better value alternatives (which over a 20 year period is particularly likely), the calculation will be an over-estimate.



- iii) The assumption [Para 3.18] that spectrum has a value equal to the net revenue potential is simplistic, because it incorrectly compares **certain up-front expenditure on spectrum** with **uncertain or optional future revenues**.
- iv) The model focuses on 3G and disregards the option to carry data across a **choice of mobile technologies and bands**, including LTE and WiFi.
- v) The approach assumes the spectrum is acquired by a new 21GHz entrant to the LSA, which may not necessarily be the case. The value to an existing 21GHz holder in the LSA may be different.
- vi) The estimate of **market share** achieved by player that secures the spectrum is arbitrary
- vii) Forecasting that **ARPU** will grow in line with data volume [Para 3.19 (v)], together with the assumption on tariff decline [Para 3.19 9vii)], is simplistic and wholly contrary to what can be observed in more advanced mobile data markets.
- viii) The assumption **for voice services on 3G** is arbitrary and depends on a variety of factors such as operators' access to other bands and deployment of GSM and LTE, and the development of VoLTE
- ix) The danger of ignoring the **substitutability of 3G services** by other mobile standards, and putting **undue reliance on arbitrary market forecasts**, is repeated in 3.19 v / Annexure 3.1.
- x) Estimating **capex on a "per subscriber" basis** (3.19 xi) is simplistic and disregards that operators must build a coverage layer before they invest in capacity.

Q9. Would it be appropriate to value the 2100 MHz spectrum as the simple mean of the values arrived from different valuation approaches as discussed in Chapter III? If no, please suggest with justification which single approach should be adopted to value the 2100 MHz spectrum?

- a. As submitted above, we strongly reiterate that the 2010 values or any indexation thereof should not be used as an option whilst arriving at the value of 2.1GHz spectrum.
- b. We have also pointed out that the producer surplus approach as also the data usage approach carry a **substantial risk of overestimating market value** - hence create a major risk of unsold spectrum. There is thus a need to exercise far greater caution if these methods are used to arrive at a value of 2.1GHz spectrum.
- c. We also submit that taking the **arithmetic mean** will help, but it will only reduce the standard deviation of the original estimates by half. The arithmetic mean also risks being pulled upwards by a very high outlier.
- d. It is therefore our view that taking the **median** has less risk of outlier distortion, but taking the lowest value amongst the various options would incur the least risk of overestimating.



- e. It may be noted that the **balance of risks** (overvaluing vs undervaluing) is **highly asymmetric** - an underestimate of value can easily be corrected at auction, but an overestimate cannot, since it will lead to fallow/unsold spectrum. Also, any sold spectrum will be above the correct market price, leading to economic distortions, such as reduced investment in networks or higher prices to the end customer.
- f. Accordingly, we recommend the following:
- i) Never rely on a single method to estimate value; use **multiple estimators**.
 - ii) Use an estimate **erring on the low side** (because of the asymmetry of risk), for example take the lowest of the four proposed methods.
 - iii) When estimating values based on surplus or business case, use the business case of a **marginal operator** (the likely price setter in an auction) rather than a strong operator (the likely winner in an auction).
 - iv) If an unbiased estimator is needed, use the **median** rather than the mean, to minimize distortion from outliers.
 - v) **Take no more than 50% of the median estimator, or no more than 66% of the lowest estimator**, which, in our opinion, provides enough of a margin for error.
- g. We note that as per the approach followed by the Authority, in recent reserve price calculations, the results across multiple approaches has been averaged so as to arrive at a reasonable approximation valuation of the respective bands. We request/urge that our above suggestions may kindly be incorporated into the approach adopted by the Authority for the valuation of 2.1GHz band.
- h. We once again emphasize that the 2010 results should not be used in this estimation, reasons for which have been elaborated in our response to Q.7.

Q10. What should be the ratio adopted between the reserve price for the auction and the valuation of the spectrum of 2100 MHz band?

- a. We note that the Authority, in the past, has applied a discount of 20% between the estimated valuation and the recommended reserve price.
- b. However, in view of our submissions that 2.1GHz is not the core and critical spectrum and the tremendous risks and uncertainties associated with predicting data growth, we would like to suggest that far greater caution be exercised in setting the reserve price of 2.1GHz.
- c. As submitted above, an underestimate of value /reserve price can easily be corrected at auction, but an overestimate cannot, since it will lead to fallow/unsold spectrum. Also, any sold spectrum



will be above the correct market price, leading to economic distortions, such as reduced investment in networks or higher prices to the end customer.

- d. We would therefore recommend **taking no more than 50% of the median estimator, or no more than 66% of the lowest estimator**, which, in our opinion, provides enough of a margin for error.

New Delhi

15 December 2014