

VODAFONE RESPONSE TO TRAI CONSULTATION ON AUCTION OF SPECTRUM

I. PRELIMINARY COMMENTS

We welcome this consultation. It covers many issues which have the potential to put the communications India industry back onto a robust and sustainable footing. This can only be done by providing a coherent and sustainable policy framework for spectrum assignment and pricing, and by making sufficient spectrum available to an industry which has long suffered from some of the world's most extreme spectrum shortages.

We believe that there are two key principles which should drive the TRAI's thinking in this regard:

Clearly the primary focus of the consultation must be to derive a way forward which is consistent with the Supreme Court's decision. That decision lays down several fundamental principles and elements which must be observed – particularly the requirement that new spectrum can only be awarded by a genuine and fair auction.

It must be noted in this context that we do not believe that a genuine auction could be held if the auction was restricted only to the operators who entered the market in 2008. By definition, the demand for spectrum would be equal to (or more likely lesser than) the supply of spectrum. This would therefore result in the award of spectrum at the reserve price – therefore effectively an administrative assignment of spectrum at a reserve price determined administratively.

We note that the cancellation of the 2008 new licences has not materially affected the level of competition in the industry, since few of those new entrants actually built significant network, and their ability to build significant customer bases was inevitably hampered by the highly competitive environment. It remains the most competitive communications industry that can be found. While the auction contemplated by the TRAI should certainly be open to new entrants, we do not believe therefore that there is any policy case for restricting the auction to new entrants.

The Supreme Court order requires more than simply holding any auction – it necessitates revision of several elements of the historic administrative system of spectrum assignment to ensure that the auction is fair and transparent, particularly spectrum usage charges. If these are not addressed, a fair and genuine auction cannot be held since different bidders will face radically and arbitrarily different marginal costs of new spectrum. If these are not addressed, the auction will favour bidders who intend to use the spectrum least efficiently (since a bidder which did not intend to build a significant network and customer base would pay low spectrum usage charges). This fundamentally undermines the point of an auction which is to ensure that spectrum is put to the best possible use. Maintaining the slab-based spectrum usage charge system skews the auction in favour of companies who do not intend to build a significant business – precisely the opposite outcome that auctions are intended to realise.

The TRAI should also prioritise the interests of Indian consumers who in the end will pay the price for poor policy and regulatory choices. The networks which support the majority of Indian consumers are operating on ~1/4 of the spectrum of international networks, and with customer bases and minutes of use which are far higher. Existing operators must be given a fair chance to deploy scale networks of a comparable quality to international networks and which meet the needs of Indian consumers. This means that existing operators should be given a fair opportunity to acquire additional 1800MHz spectrum. Spectrum is a scarce resource which is put to excellent use for mobile services, driving transformational

economic growth. There is no case for leaving spectrum idle – all spectrum available should therefore be auctioned, including spectrum which has been lying idle with DoT for some time. The 700MHz spectrum represents a serious opportunity for India given that this band is internationally harmonised for LTE, and several international operators have already made significant commitments to LTE on 700MHz, which will drive economies of scale for India.

The proposals which have been put forward in relation to “refarming” of 900 MHz spectrum, besides having no nexus with the Supreme Court order pursuant to which these consultations are held, are novel, radical and disruptive. While several international policy-makers have considered re-distribution of 900MHz spectrum, most have chosen not to do so due to the disruption to customers and the fact that it reduces opportunities for deploying different technologies on the 900MHz band. Only a few regulators have pursued this path, and only in very specific circumstances – to create one additional 900 MHz block for a 4th operator. In the very few cases where redistribution has taken place, the three existing operators held far more spectrum than is the case in India and therefore each retained 2x10MHz 900 MHz spectrum even after redistribution¹. Other countries, such as the UK, found no justification for any redistribution of the 900MHz spectrum. The situation in India is completely different with operators already holding much smaller amounts of 900MHz spectrum. The most severely impacted stakeholder in any “refarming” exercise in India would be the rural consumers who are being served predominantly by the 900MHz operators. These consumers will be left completely stranded as their existing service provider will be deprived of the spectrum used to serve them whilst the new operator will have no network /presence and will take years to build up to the level of investments and presence of an existing 900MHz operator.

Given the importance of this consultation, we have requested a leading international economic consultancy with extensive experience in the area of spectrum assignment, **Frontier Economics**, to **provide a report examining several of the most important aspects of auction design**. Their full report is will be submitted to the Authority shortly.

II. EFFECT OF THE JUDGMENT OF THE HON'BLE SUPREME COURT

1. At the outset, it may be noted that the Hon'ble Supreme Court in its judgment dated 2 February 2012, has noted that vide the Press Release dated 29 January 2011, the Government of India has already taken a decision to segregate spectrum from licence and allot the same by auction. Having so noted, the Hon'ble Supreme Court has gone on to state that

*“This Court has repeatedly held that **wherever a contract is to be awarded or a licence is to be given, the public authority must adopt a transparent and fair method for making selections so that all eligible persons get a fair opportunity of competition**. To put it differently, the State and its agencies/instrumentalities must always adopt a rational method for disposal of public property and **no attempt should be made to scuttle the claim of worthy applicants**. When it comes to alienation of scarce natural resources like spectrum etc., **it is the burden of the State to ensure that a non-discriminatory method is adopted for distribution and alienation**, which would necessarily result in protection of national/public interest. **In our view, a duly publicised auction conducted fairly and impartially is perhaps the best method for discharging this burden ... In other words, while transferring or alienating the natural resources, the State is duty bound to adopt the method of auction by giving wide publicity so that all eligible persons can participate in the process.**” (emphasis supplied)*

¹ This was the case in France, Spain and Italy

2. In view of the above, we submit that the **Hon'ble Authority has erred in its recording of the decisions taken by the Department of Telecommunications in Para 1.7** as the same do not take into account the effect of the above judgment.

We also submit that **several of the TRAI's recommendations on Spectrum Management and Licensing Framework would need to be reviewed/revised** as they are in conflict with the principles laid down by the Hon'ble Supreme Court in its judgment dated 2 February 2012.

3. In view of the above it is submitted that:
 - a. **Contracted Spectrum:** Any reservation of spectrum to ensure balance of "contracted" spectrum for select operators is **not only in violation of the Hon'ble Supreme Court's judgment, but also in contradiction to the Government's own statement on 29 January 2011** that "in future, the spectrum will not be bundled with the license..." and that "in future, there will be no concept of contracted spectrum and, therefore no concept of initial or start up spectrum. Spectrum will be made available only through market driven process"

This is **without prejudice to our submissions that there is no "contracted" spectrum of 6.2MHz** under license. Our detailed submissions on the same have already been made to TRAI vide several representations and the same are not being reproduced here for the sake of brevity.

- b. **Restricted Participation:** Any attempt to reserve spectrum or hold auctions only for select classes of operators such as say, new entrants only, would **lead to incorrect results** thereby **negating the very purpose of an auction**. To illustrate an extreme situation, if the spectrum freed up through license cancellation was auctioned only amongst new entrants, it would lead to supply being equal to or greater than demand (given that Etisalat and STel have publicly announced their intension to exit) thus making the auctions irrelevant and the result no different from an administrative price. A

Further, a **fair and correct value can only be determined if all the spectrum is put up for auction which is open to all eligible participants as rightly enunciated by the Hon'ble Supreme.**

- c. **Prescribed Limit:** We also do not agree with the concept of "prescribed" limits of 8/10MHz for GSM as they have no basis in policy or license or even the guidelines prescribed by the DoT. In fact, the DoT guidelines dated 17 January 2008 state that 15MHz is the present upper limit for GSM spectrum.

Further, we believe that **this concept of a "prescribed" limit of 8/10MHz is not even relevant any longer as TRAI itself has stated** (in its reconsidered recommendations [6.42] on Spectrum Management & Licensing Framework) **that the "prescribed limit** is with respect to the quantum of spectrum that can be assigned by the Government and it does **not preclude the licensee from acquiring spectrum in the open market through auctions or M&A**. Since now, **pursuant to the Hon'ble Supreme Court's judgment** dated 2 February 2012, **spectrum is to be allocated only through auctions, the very concept of a limit on administrative assignments becomes irrelevant.**

- d. **Extension:** It may further be pointed out that the TRAI recommendation [6.32] that at extension, spectrum will be assigned only upto “prescribed” limit besides being in conflict with the terms of our license, will also no longer stand once spectrum beyond this so called “prescribed” limit is being acquired through the market.
- e. **Available spectrum:** We submit that the spectrum available in the 1800MHz band given by TRAI in Table 1.2 wrongly does not cover the GSM/dual spectrum granted to Tata which was issued pursuant to the Press Release of 10 January 2008 and has been quashed by the Hon’ble Supreme Court vide its judgment dated 2 February 2012.

Dual Spectrum allocations: It may be noted that in this context, COAI has filed an application in its Civil Appeal No. 3472 of 2009 submitting that as the Tata dual spectrum has been quashed by the Hon’ble Supreme Court, the same ought to also be applicable to other dual spectrum operators and the GSM spectrum granted to Reliance, Shyam and HFCL ought to also be taken back and allocated through auctions in terms of judgment and order dated 2 February 2012.

- f. **Partial Allocations:** We must also point out that while TRAI has excluded partial allocations whilst calculating available spectrum in Table 1.2, it did not adopt the same approach whilst approving the flawed pricing of 1800MHz spectrum done by the experts which (besides several other flawed assumptions) wrongly assumed, that spectrum was ubiquitously assigned to the operator across the entire service area.

III. ISSUE WISE RESPONSE

Q1. How can the various principles outlined by the Hon’ble Supreme Court in various observations brought out in para above be sufficiently incorporated in the design of spectrum auction?

- a. We would first like to reiterate the key significant observations made by the Hon’ble Supreme Court in its judgment dated 2 February 2012 which lay down the foundation for the principles to be followed for the auction of spectrum. These are as below:
- i. A natural resource’s value rests in the amount of the material available and the demand for it (Para 63),
 - ii. The demand of a natural resource is determined by its usefulness to production (Para 63),
 - iii. The doctrine of equality, which emerges from the concepts of justice and fairness, must guide the State in determining the actual mechanism for distribution of natural resources (Para 69),
 - iv. A transparent and fair method for making selections so that all eligible persons get a fair opportunity of competition (Para 76),
 - v. No attempt should be made to scuttle the claim of worthy applicants (Para 76),
 - vi. The State to ensure that a non-discriminatory method is adopted for distribution and alienation (Para 76),
 - vii. A duly publicized auction conducted fairly and impartially is perhaps the best method (Para 76),

- viii. The procedure adopted for distribution is just, non-arbitrary and transparent (Para 69),
 - ix. People be granted equitable access to natural resources and/or its products (Para 69),
 - x. The process of distribution must be guided by the constitutional principles including the doctrine of equality and larger public good (Para 72),
 - xi. Spectrum has been internationally accepted as a scarce, finite and renewable natural resource which is susceptible to degradation in case of inefficient utilization (Para 65) and
 - xii. One of the main objectives of NTP 1999 was that spectrum should be utilized efficiently, economically, rationally and optimally and there should be a transparent process of allocation of frequency spectrum, which cannot be overlooked (Para 73).
- b. We believe that the principles enunciated by the Hon'ble Supreme Court will be fully met if :
- i. **All available spectrum is put up for auction** and it is not allowed to lie unutilized and be susceptible to degradation
 - ii. **Auctions are open to all participants**, both new as well as existing operators.
 - iii. The **reserve price is set at a level that encourages maximum participation** and only deters frivolous bidders
 - iv. **Auctions are conducted in a fair and transparent manner** and a **true value is discovered based on the correct supply and demand** for spectrum.

Q2. What are the key objectives to be kept in mind in the auction of the spectrum?

- a. It may first be noted that the **auctions must be in consonance with the principles and directions laid down by the Hon'ble Supreme Court** as enunciated above.
- b. It may further be noted that the draft NTP-2011 states that "*The **primary objective of NTP-2011 is maximizing public good by making available affordable, reliable and secure telecommunication and broadband services across the entire country. The main thrust of the Policy is on the multiplier effect and transformational impact of such services on the overall economy. It recognizes the role of such services in furthering the national development agenda while enhancing equity and inclusiveness. Direct revenue generation would continue to remain a secondary objective...***"
- c. In respect of spectrum, the Draft Policy states:
 - **Ensuring adequate availability of spectrum and efficient spectrum management are critical**
 - Given the **continued predominant role of wireless technologies in delivery of services** in ICT sector, NTP-2011 incorporates framework for increasing the availability of spectrum for telecom services including triple play services (voice, video and data) for which broadband is the key driver.
 - **Ensure adequate availability of spectrum and its allocation in a transparent manner through market related processes. Make available additional 300 MHz spectrum for IMT services by the year 2017 and another 200 MHz by 2020**

- d. In view of the above, we believe that **the objectives must be such that the auctions are designed to meet the objectives enunciated by the Hon'ble Supreme Court and the Draft NTP-2011.**

A. QUANTUM OF SPECTRUM TO BE AUCTIONED (Paras 3.5-3.9)

Q3. What should be the amount of spectrum which should be auctioned?

Multiplier effect of mobile services on GDP and economic growth

- a. **Spectrum is a valuable input and is used to deliver a multitude of economic, social, business and production benefits to society and consumers.**
- b. There are **several international studies and reports that document the benefits of mobile services and their multiplier effect on GDP and economic growth.** It is generally accepted that a **10 percentage points increase in mobile penetration results in a 0.6 percentage points increase in growth of GDP.**
- c. **An India specific study** on the socio-economic impact of telecommunications, **carried out by** the Indian Council for Research on International Economic Relations (ICRIER)², has found clear evidence to suggest that mobile penetration facilitates economic growth. The study analyzed the relationship between State Domestic Product (SDP) and mobile tele-density **and established a significant positive correlation between increase in mobile penetration and growth.** It estimated that **Indian states with higher mobile penetration are expected to grow faster, with the growth rate being 1.2 percentage points higher for every 10 percentage points increase in mobile penetration.** It concluded that there are significant benefits to be reaped from increase in teledensity and the only realistic way to achieve rapid growth in teledensity is through the wireless platform.

Un-used spectrum, creates no value for and gives no benefit to society

- d. **Un-used spectrum on the other hand, creates no value for and gives no benefit to society.** Keeping this resource as inventory is a waste of this valuable resource.
- e. **Non-utilization of available spectrum is an opportunity lost forever.** A paper by Prof Thomas W. Hazlett³ on Spectrum policy and competition in mobile services as a part of the Vodafone Policy Paper Series 12⁴ states that "***to restrict the spectrum available to mobile networks is to reduce the value of the services they provide. If there were other uses of spectrum that, at the margin, yielded better returns than mobile networks, then spectrum resources could be most productively utilized in the alternative employment. But the restrictions that policy makers consistently impose on spectrum for mobile services most often simply freeze virtually unused bands in place. These actions do not enable alternative wireless applications of higher value, they simply squander bandwidth. This does yield regulators option values, as they can decide what to***

² India: The Impact of Mobile Phones, Vodafone

³ Thomas W. Hazlett is Professor of Law & Economics at George Mason University, where he also serves as Director of the Information Economy Project. He previously taught at the University of California, Davis and the Wharton School, and is a columnist for the *Financial Times*. In 1991-92 he served as Chief Economist of the Federal Communications Commission

⁴ Making Broadband Accessible For All,

*do with unused frequencies at a later date. But these options have negative value to society. **The bandwidth that lies idle is not saved but destroyed, as the opportunities not used are gone forever.***"

There is a huge cost to society if spectrum is left un-utilized

- f. Prof Hazlett in the above paper has stated that **social losses from delaying spectrum allocations are highly likely to overwhelm whatever social gains** are associated with the immediate public finance dividend from auctions. The **loss to the economy by non-allocation of available spectrum has actually being quantified.**
- g. Prof Hazlett quantified that the **delay in the 3G auction caused economic damage to India of around US\$60 billion (over INR 3,000 billion) per year.** The **3G auctions resulted in a one-off payment to Government of INR 677 billion,** which, **if annualized at 10%, imply an annual revenue stream of INR 67.7 billion.**⁵

Thus the **economic costs of delay is over 40 times greater than the annual revenue stream achieved from delaying the auction.**

- h. In addition to the above, **there would have also been a general increase in government taxation receipts** as a result of increased economic activity; assuming a 10% return increasing economic activity by INR 3,000 billion per year would have resulted in increased government taxation receipts **by around INR 300 billion per year.**⁶

The **loss in government tax revenue resulting from avoided economic activity is over 4 times higher than the tax revenue from the 3G auction.**

- i. Further, **a study commissioned by the GSM Association in 2009⁷, estimated that a two year delay in the rollout of 3G services cost the Indian economy USD 16 billion (PPP) as lost GDP.** The study also estimated that that the GDP benefit to India from 3G network investments (assumed at USD 20 billion over 5 years) would be to the tune of USD 95 billion (PPP).
- j. **Irrespective of whether one focuses on total economic benefits to the Indian people, or solely on impact on government finances, it is clear that the benefits of early and liberal allocation of spectrum by far outweighs the auction revenues gained by restricting access to spectrum.**

Sub-optimal Spectrum allocations also have other adverse implications

- k. In addition to the above loss of benefit/opportunity to consumers, **non-allocation of available spectrum also it also has other adverse implications.** It leads to sub-optimal/fragmented allocations of spectrum which, in turn, leads to **increased network costs (deploying more towers), lower innovation, reduced capacity and lower rural coverage.** More towers in turn

⁵ See Hazlett, T, 2011, "Spectrum Policy and Competition in Mobile Services", in *Making Broadband Accessible for All*, SIM Panel Research Paper No. 12.

⁶ Central government tax revenue represents around 10% of annual Indian GDP. Govt tax revenue in 2009-10 was Rs 624537 Cr and GDP was Rs 6133230. See <http://indiabudget.nic.in/ub2011-12/rec/tr.pdf> and http://mospi.nic.in/mospi_new/upload/PRESSNOTE-Q4%202010-11%2030%20May%202011.pdf

⁷ 3G mobile networks in emerging markets: The importance of timely investment and adoption, 26 January 2009

result in **increased use of diesel /power to run the sites**, which leads to higher energy consumption. Due to the sub-optimal spectrum allocations, the diesel consumption has gone up by millions of tonnes per year. This waste of energy is avoidable and government's objective of green telecom can be met in a substantial manner if optimal spectrum allocations are ensured.

- l. It is a well-known fact that **data services require large amounts of spectrum** and therefore **significant amounts of spectrum need to be made available to fuel India's mobile broadband objectives**. Quality broadband cannot be offered in the small existing allocations and operators need to have access to large contiguous blocks of spectrum. This has also been an important consideration in other markets. For example, in the United States, despite the fact that around 500MHz of paired spectrum was already available for commercial mobile use, the National US Broadband Plan in March 2010 warned that unless an additional 500MHz was made available, many advanced services would not happen.

Non utilization of spectrum is its most inefficient use and against tenets of telecom policy

- m. **One of the key objective of NTP 1999 is that spectrum should be utilized efficiently, economically, rationally and optimally.**
- n. **The most inefficient use of spectrum is if this resource is left un-utilized**

No spectrum should be withheld from the market

- o. In light of the above, **it is essential, in our view, that no spectrum should be withheld from the market and the entire spectrum available for mobile telecommunications should be put to productive use at the earliest**. This will result in increased benefits for the public while maintaining effective competition in the marketplace and also allowing for innovations and continued investments in the sector.
- p. **When spectrum is available to the marketplace, efficiencies are obtained**, leading to more cost effective services, services expand, and new networks will be built. A successful regulatory focus that creates the right incentives for mobile broadband services can generate exceptionally high social returns.

Quantum of spectrum available

- q. From the information available in the public domain, there is, in aggregate, **211 MHz spectrum (average 9.5 MHz per service area) already available with the DoT which has been lying unutilized for more than a year**. By not allocating this resource in a timely manner, the **Government has already delayed the opportunity to put this spectrum to use and contribute to the benefit of society**.
- r. **In addition to the above, the Hon'ble Supreme Court** has declared that the licences granted to the private respondents on or after 10.1.2008 pursuant to two press releases issued on 10.1.2008 and subsequent **allocation of spectrum to the licensees are illegal and are quashed**.

- s. **It is our view that this includes** not only the licenses and GSM /CDMA spectrum granted to the new entrants in 2008 but also the license amendment and **GSM spectrum granted to TTSL pursuant to the Press Release of 10 January 2008.**
- t. It may further be noted that **COAI has filed an application in its Civil appeal No. 3472 of 2009 pending before the Hon'ble Supreme Court in the dual spectrum matter**, where it has been contended that:
 - i. **DOT's decision communicated on 19.10.2007 falls within the period of September 2007 and March 2008**, which has been noted by the Hon'ble Court in its judgment dated **02.02.2012** in Writ Petition 423/2010 where it **has held that the exercise undertaken between September 2007 and March 2008 was wholly arbitrary, capricious and contrary to public interest apart from being violative of doctrine of equality.**The Hon'ble Court further held that the material produced before the Court shows that the Minister of C&IT wanted to favour some companies at the cost of the Public Exchequer.
 - ii. Further, **various other actions and inactions of DoT which have been held to be arbitrary and capricious by the Hon'ble Supreme Court** in its judgment dated 02.02.2012 **are also the common actions / inactions in the matter of taking of the impugned decision of 18/19.10.2007.**
 - iii. **If the exercise undertaken was bad in law in general and in particular** for the grant of LOIs / License / license amendment and subsequent **allocation of GSM Spectrum to new UAS applicants/Tata Teleservices** on / after 10.01.2008, **it was equally bad for the decision to grant of LOIs / License amendments and subsequent allocation of GSM Spectrum to other CDMA operators** on / after 18.10.2007 also **because it was, inter alia, based on the said similar actions / inactions of DoT.**
- u. Accordingly, **it has been prayed by COAI that the Hon'ble Supreme Court may kindly**
 - i. **Allow Civil Appeal No. 3472 of 2009 in terms of judgment and order dated 02.02.2012** passed by this Hon'ble Court in Writ Petition (Civil) No. 423 of 2010;
 - ii. **Quash and set aside the decision taken by the Respondent No. 1 allotting GSM Spectrum to the CDMA Licensees;**
 - iii. **Direct that the GSM spectrum allocated to Respondents 3 to 5 be taken back and allocated through auctions** as was done for allocation of spectrum in the 3G band.
- v. Based on the above, **it is our contention that the spectrum to be taken back and allocated through auctions will** not only include the spectrum taken back from the 122 licenses allocated in January 2008 but **also include the GSM spectrum allocated to the CDMA operators.**
- w. We further understand from media reports⁸ that the **DoT plans to include 110 MHz of spectrum to be vacated by Defence in the forthcoming auction of 2G spectrum.**
- x. It is thus our **understanding that there will be around an average 35MHz per service area available for auction.** We reiterate that the same should be put into use at the earliest so that it can immediately start delivering on the connectivity and broadband objectives of the country and delivering both economic and social benefits to the consumers.

Clear Future roadmap should also be publicly available

⁸ Business Standard, 14 March 2012

- y. In addition to the auction of all available spectrum, we believe that the **Government should make publicly available a clear roadmap for future availability of spectrum in different bands**. A first step has already been taken in this regard with the availability of 1800MHz spectrum being made available on the DoT website. This initiative needs to be carried forward with availability of spectrum in other bands also being put up in the public domain along with the likely timing of auctions in various bands. **This will allow operators to plan their investment and growth and also lead to informed participation in the auctions, thus delivering more robust and efficient results.**

Q4. Should the spectrum be liberalised before it is put to auction?

- a. We submit that **this is an incorrect issue that has been raised by TRAI as it presumes that presently the use of spectrum is not liberalized, which, it is respectfully submitted, is not the case**. It is a well settled principle that framing a wrong issue, it is trite, will lead to a wrong answer
- b. The **mobile licenses have been technology neutral since 1999** when the embargo that only GSM technology could be used was lifted through
- NTP-99 which stipulated that the Cellular mobile service provider (CMSP) shall be free to provide all types of mobile services utilizing any type of network equipment that meet the relevant International Telecommunication Union (ITU) / Telecommunication Engineering Center (TEC) standards.(Clause 3.1.1)
 - DoT Press Release dated 13 September 1999 that was issued pursuant to NTP-99, stipulating that all cellular licenses would be technology wise neutral.
- c. The **Government's commitment to technology neutrality was continued in the Unified Access Licensing regime introduced in 2003** through:
- An addendum to NTP-99 which permitted a Unified access Licensee to provide Basic and /or Cellular Services using any technology in a defined service area.
 - The DoT guidelines for UASL dated 11 November 2003 which stipulated that Unified Access service providers are free to use any technology without any restriction.
- d. The **right to technology neutrality is thus enshrined in the UAS license** which
- i. permits the licensee to offer all types of access services (Clause 2.2(a);
 - ii. using any technology based on standards issued by ITU/TEC or any other International Standards Organization/ Body/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 treated as established technology and will be permissible for use regardless of its changed versions (Clause 23.1) and further
 - iii. provide additional facilities in case of any value addition/ upgrade that the technology permits at later date with prior intimation to Licensor and TRAI (Clause 23.6).
- e. Similarly **when the 3G and BWA auctions were conducted, it was clear that what was being auctioned was only the spectrum and that the scope of service will be determined by the underlying license**. This is evident from the fact that the NIA clearly and explicitly stated that:

- o The spectrum shall not be used for any activity other than the activities for which the operator has a licence. The award of spectrum by itself does not confer the right to provide services. (Section 2.1)
 - o Services can only be offered subject to the terms and conditions of the licence obtained by the operator. Award of spectrum does not confer a right to provide any telecom services, and these are governed by the terms and conditions of the licence obtained by the operator. (Section 3.1)
- f. Further even the **amendment to the license for the successful bidders in the 3G** auctions stated that **the amendment was for the use of 3G spectrum to provide telecom services as defined in Condition 2 of the license** agreement (See Clause 23.7)
- g. **In view of the above submissions, we submit that that spectrum is already liberalized since technology neutrality is enshrined in our policy and licensing framework.**

C. SPECTRUM REFARMING (Paras 3.19-3.33)

- Q5. For the refarming of 800 and 900 MHz bands from the existing licensees, which of the three options given above should be adopted? Please elaborate with full justification.
- Q6. What are the issues that may arise in the above mentioned refarming process?
- Q7. For new technologies e.g. UMTS/LTE, 5 MHz is the minimum amount of spectrum required. Certain licensees have only 4.4 MHz spectrum in 900 MHz band and 2.5 MHz spectrum in 800 MHz band. What are the possible options in case of such licensees?
- Q8. Some GSM spectrum allocations may be interleaved between operators; to avoid fragmentation, reconfiguration between operators may be required. Whether frequency reconfiguration is required and what are the challenges and possible solutions?
- Q9. Should the refarming of spectrum in 800/900 MHz bands be dealt independently or should a comprehensive approach be adopted linking it with the availability and auctioning of 700 MHz band?

No nexus between 'refarming' and spectrum availability after license cancellation

- a. It may first be noted that the **TRAI's recommendations and DoT decision that there should be a consultation process on refarming was prior to the Supreme Court judgment** of 2 February 2012. Thus any **issues pertaining to 'refarming' do not flow out of the Supreme Court judgment pursuant to which the TRAI is carrying out the present consultation.**
- b. We therefore submit that the **availability of spectrum or the Supreme Court judgment have no nexus with "refarming"** and the **Authority cannot adjust the spectrum made available pursuant to the Supreme Court judgment to further its "refarming objectives.**

License provides for extension, no change in basic structure of license

- c. We would like to point out that our license provides for "extension" and not "renewal" as is being incorrectly applied/used by TRAI. This fact that has been repeatedly pointed out by DoT which has advised that the term "renewal" as used by TRAI should be replaced with "extension"

- d. It is submitted that the terms "extension" **means to enlarge, expand, lengthen, prolong, to carry out further than its original limit.** Extension, according to Black's Law Dictionary, means enlargement of the main body; addition of something smaller than that to which it is attached; to lengthen or prolong. Thus **extension implies the continued existence of something to be extended.**
- e. In view of the above, we submit that 'extension' **means that there is no change in the basic structure of the license, especially with respect to the spectrum allocations which are the electromagnetic lifeblood of the license,** without with a license is only a piece of paper. Thus an extension of license without the extension of the spectrum allocations which are intrinsic to the license would be a meaningless exercise. **This would also be against the very concept of "continuity" that is enshrined in the license.**
- f. **We also do not agree with the TRAI's reasoning that 900MHz spectrum can be redistributed since the license provides that extension is 'if deemed expedient' and 'on terms to be mutually agreed upon' effectively renders the extension to be a renewal** even if the term 'extension' is used.
- g. In view of the above, we submit that **the proposal that 900MHz spectrum will be "refarmed" upon expiry of current license is not in consonance with existing license provisions** as explained above.
- h. Under these circumstances, we believe that **the issue of dealing with "refarming" of spectrum in 800/900 MHz bands whether independently or otherwise does not arise.**
- i. We would also like to draw the attention of TRAI to a landmark study by the World Bank (Mobile License Renewal, World Bank, June 2005) which concluded: "***most legal and regulatory frameworks adopted a regime based on the "presumption of renewal" or "renewal expectancy."... Providing details for license renewal or reissue is an important guarantee for regulatory certainty, which is a prerequisite for attracting potential investors entering the market of developing and emerging economies... For the sake of regulatory certainty, the discretion offered to the licensing body should be curtailed by conditions set in the regulatory framework or in the license itself, and be subject to checks and balances. The conditions requested for renewal and the methods for specifying them become minimum guarantees to ease investors concerns over arbitrary refusal to renew. They give a positive signal for operators to continue to invest in their networks and to fulfill their obligations, at least until the end of the license term. Prospects for license renewal also offer needed assurance to operators to engage long-term financing for their network.***"

Rationale given for 'refarming' is misplaced

- j. **We also note that the rationale given by TRAI for refarming** is that spectrum in the 900MHz band needs to be refarmed for assignment for 3G services. In this regard, it may first be noted that globally, the term 'refarming' is commonly used to describe technology refarming, but could also be applied to 'spectrum clearing'.

- **'Spectrum clearing** refers to the change of spectrum from one use, such as defense, to another use, such as mobile services and involves a change of owner of the spectrum. It can also involve changing the existing level of spectrum holding between users within the same use (i.e. mobile services).
 - **'Technology refarming'** refers to the change in the nature of the service from say GSM to UMTS, by the existing owner of the spectrum. Technology refarming is needed in regimes where there are legal rules/ license restrictions that define the specific technology that can be used in specific bands (e.g., dictating that 900MHz can only be used for GSM).
- k. It is submitted that **Technology refarming is not relevant within technology-neutral regimes such as India**. Where there are no legal impediments to the use of any mobile technology in any given mobile spectrum range, the concept and rights of licensees with respect to technology refarming are enshrined in the license.
- l. It is thus **our respectful submission that TRAI has inadvertently erred in its understanding of both the existing policy and the licensing regime**, which explicitly allows the licensee to offer all types of mobile services Reference in this regard is drawn specifically to Clause 2.2 (a) (iii) of the UAS License that states "*The access service providers can provide Broadband services including triple play i.e voice, video and data.*" Thus, the 900MHz spectrum allocated to service providers can already be used to offer "all types" of mobile/access services and therefore there is no basis for the Authority to recommend "refarming" of this spectrum to allow it to be allocated for 3G services.
- m. **What the Authority is describing is not refarming as it is understood internationally but a very different, novel and disruptive concept - the forcible confiscation and redistribution of 900MHz spectrum**, which represents a most intrusive elimination of the existing rights of licensees. This would also be **extremely harmful to interests of consumers and investors**.

Redistribution of spectrum is against public interest

- n. Given the critical importance of spectrum for mobile services, any contemplation of redistribution of spectrum besides being in violation of license provisions carries significant risks and could cause irreparable harm to the sector. The **implications of such forcible redistribution have not been considered by TRAI**. TRAI has not considered:
- i. Withdrawal of 900MHz will **severely and immediately affect the growth and penetration of services in semi-urban, rural and remote areas where 900MHz plays a crucial role in providing coverage and service**.
 - ii. The most severely impacted stakeholder in this entire exercise will be the **rural consumers** who are being served predominantly by the 900MHz operators. These consumers **will be left completely stranded** as his existing service provider will be deprived of the spectrum used to serve the rural consumers whilst the new operator will have no network /presence and will take years to build up to the level of investments and presence of an existing 900MHz operator

- iii. A decision to withdraw and redistribute existing allocated 900MHz spectrum is likely to result in an **immediate freezing of any further investments in the 900MHz network by existing operators.**
- iv. Given that the average life of equipment is between 8-10 years, operators will stop augmenting their networks **leading to a slowdown in investment in the 900MHz infrastructure well in advance of license expiry.**
- v. Existing **operators which have already invested in the 900MHz** networks based on the promise/expectation of extension as provided in the licensee will **not be in a position to fully recover the costs already incurred by and investments already made.**
- vi. The existing **900MHz network will be left stranded leading to wastage of existing investments.**
- vii. There will be **unnecessary/wasteful capital expenditure as a costly duplicate network** will have to be rolled out **by both the licensee gaining the re-distributed 900MHz spectrum and the licensee losing the 900MHz spectrum**, which will then have to set up an infrastructure/build coverage using an alternate spectrum (almost certainly requiring additional base stations).
- viii. This **investment could have instead been used to further rollout and expand networks to reach out to new consumers and geographies** which is a crucial national objective, instead of re-building a network to serve existing consumers
- ix. There are **several problems and complexities involved in migrating to a new /alternate frequency such as:**
 - **Substantial changes in site locations**
 - **Alternate sites may not be readily available.**
 - **Electronic equipment and vital radio components** in BTS, BSC's and MSCs telecom equipment **will need to be changed /re-engineered** for emission and reception of the changed frequencies.
 - **Fresh clearances from SACFA** will be needed for the **new BTSs as well as for the old BTSs for new frequencies**
 - **Relaying/ re-arranging the fiber to sites** which are connected by fiber and **also re-engineering the microwave systems** which are connecting the BTS sites with BSC and MSC in case the same are not connected by fiber, etc
- x. There will be a **severe disruption of services to consumers who will have to be migrated to a new network. It may be appreciated that the 900MHz networks would be serving around 400-500 million subscribers by the time these come up for extension in 2014-2014. Withdrawal of 900MHz spectrum could well disrupt the network to a level from which normal operations may not be possible to retrieve.**
- o. It is also our view that **TRAI, while making this recommendation to withdraw 900MHz spectrum has placed the interests of operators (who despite having an equal opportunity, consciously chose not to bid for 900 MHz spectrum in 1995 and now regret that decision) above the interests of consumers** and the operators who took risks, invested early and built the networks which provide critical coverage and services particularly in rural areas.

The **TRAI has not considered the important public interest issues** elaborated above such as disruption of service, wastage of existing investments, impact of rural consumers, bridging the digital divide, etc. TRAI has also not appreciated that attempting to re-assign spectrum which is

being used by operators to sustain a very substantial customer base would impose a high degree of uncertainty on operators and end-users. Any attempt to replace spectrum in one band with spectrum in another would impose massive disruption and costs upon the industry and consumers.

- p. It is also our view that **redistribution of 900MHz will be against principles enunciated by the Hon'ble Supreme Court and the objectives of NTP-2011.**

TRAI recommendation that 800 and 900MHz will be withdrawn at license expiry and replaced with equal amount of 450/1900 MHz and 1800MHz spectrum respectively stands nullified in the light of the Hon'ble Supreme Court's judgment dated 2 February 2012; once spectrum is being allocated through auctions there is no basis to recommend that one band be administratively replaced with another band.

- q. It may also be pointed out that **any 1900MHz allocation will overlap and clash with the 2.1 GHz band creating interference and impairing the provision of services in the 2.1GHz spectrum that was allocated through auctions in 2010.** The undesirability of such a mixed band plan was recognized by TRAI itself in 2005 recommendations where it stated that "Authority after considering various options has come to the conclusion that it is not desirable to allocate spectrum both in IMT-2000 2 GHz band and 1900 MHz USPCS band in a mixed manner"

It may be noted that there is no further development or evidence thereafter to demonstrate the feasibility of a mixed band plan or reconsider the above conclusion of the TRAI.

- r. Without prejudice to the above, we believe that any discussion on 900MHz spectrum should also include re-assignment of the 880-890MHz/w 925-935MHz band as a part of the basic 900 MHz band.

Costs of even modest redistributions far outweighed the possible advantages

- s. It is also important to be clear on the international consideration of redistribution of 900 MHz spectrum. Regulators have only considered any such drastic interventions in a very limited set of special circumstances that are simply not relevant to India.
- t. While several international policy-makers have considered re-distribution of 900MHz spectrum, most have chosen not to do so as it has **been frequently concluded that the costs of even modest redistributions far outweighed the possible advantages**
- u. **Only a few regulators have pursued this path, in very few cases and only in very specific circumstances** – to create one additional 900 MHz block for a 4th operator. In the very few cases where redistribution has taken place, the **three existing operators held far more spectrum than is the case in India and therefore each retained 2x10MHz 900 MHz spectrum even after redistribution**⁹.

⁹ This was the case in France, Spain and Italy

- v. **In the UK**, this has been under consideration for several years where **after following a lengthy review process it was found that there was no case to retrocede spectrum from either of the operators holding 2x17.5MHz in the 900MHz band**. Other operators have spectrum in the 1800MHz/2.1GHz bands and the opportunity to compete for spectrum in the upcoming 800MHz/2.6GHz auction. **There has been no 'redistribution' of 900MHz spectrum in the UK.**
- w. The situation in India is completely different with operators already holding much smaller amounts of 900MHz spectrum and no **redistribution of spectrum can be undertaken without significantly compromising the operations** of existing operators.

Block requirement for new technologies

- x. As regards the **different block requirements for various technologies**, we believe that this issue **can be addressed by ensuring contiguous allocations to the operators**. Besides giving the **obvious advantage of more efficient spectrum use**, this **will also allow operators to opt for a block size to facilitate deployment of advanced technologies as per the choice** of the licensee.
- y. It may be noted that the **license already states that efforts would be made to make available larger chunks to the extent feasible** (Clause 23.5) and further **also permits the licensees to provide** additional facilities in case of any value addition/ **upgrade that the technology permits** at later date (Clause 23.6) and therefore contiguous allocations of spectrum to deploy technology of choice would be in consonance with existing license provisions.

Reconfiguration to avoid spectrum fragmentation

- z. We **support reconfiguration within the band to make spectrum allocations more contiguous** and thus ensure more efficient use.

D. 700 MHz BAND (Paras 3.34-3.35)

- Q10. Which of the two approaches outlined above be adopted?**
- Q11. When should 700 MHz spectrum be auctioned?**
- Q12. Should the auction in 700 MHz band be linked with the granting permission for the liberalised use of 800/900 MHz band?**
- Q13. How much spectrum in 700 MHz band should be put to auction initially and what should be the amount of spectrum which a licensee should be allowed to win in that auction?**

700MHz should be auctioned at the earliest

- a. we believe that the **700MHz auctions should be conducted at the earliest** so as **to put the available spectrum to optimal use to deliver on the mobile broadband objectives** enunciated in the draft NTP-2012. We note from Para 1.13 of the Consultation Paper that as per information provided by WPC, the entire spectrum in the 698-806 band is likely to be available for assignment.

- b. The Authority has itself recognized that the foremost mission of Draft NTP-2011 is to “*establish a ubiquitous, robust, reliable, secure, affordable and efficient Converged telecommunication network capable of providing high speed broadband and seamless converged communication services, with special focus on rural and remote areas.*” We believe that early allocation of 700MHz spectrum through auctions will be a key driver for delivering on this end objective.
- c. The Authority has further, in Paras 1.47 to 1.61 of the May 2010 recommendations has dealt with the significance of the 700 MHz band as well as the issues involved. It has noted that India has lagged behind in the introduction of 3G and needs to catch up with the rest of the world in 4G/LTE for which the 700 MHz band offers immense potential. In its reconsidered recommendations submitted to DoT on 3 November 2011, it has stated that **there is adequate spectrum in this band that can be put to commercial use immediately.** We are in full agreement with this view of the Authority and submit that all efforts should be made to ensure the earliest possible auction/allocation of 700MHz spectrum.

Auctions should be open to participation by all operators

- d. **We firmly believe that all operators should be allowed to participate in the 700MHz auctions.** Any attempt to adopt a restrictive or exclusionary approach would not only be most incorrect and unfair but also legally untenable. It would also adversely impact the efficiency of the auction process and also the optimal utilization of the spectrum.
- e. We believe that the objectives of maintaining level playing field and of ensuring the efficient management/use of available spectrum would be better met by capping the total spectrum that can be held by a single entity in the sub 1 GHz bands. This practice has been adopted in many other countries and this cap has been set in the range of 25-30 MHz of paired spectrum. These caps have been linked to European auctions where only 30MHz of paired spectrum is available in the 790-862MHz band.

Liberalization of spectrum is not required

- f. We re-iterate that **there is no requirement for allowing liberalized spectrum use as the same is already a part of the existing licensing framework.**

The entire spectrum available in 700MHz should be auctioned

- g. In keeping with our fundamental approach that **no spectrum should be withheld from the market, we believe that the entire available spectrum in this band should be put to commercial use** immediately.

Auction could be in 5MHz blocks with flexibility to pick up multiple blocks

- h. We have in our response to the TRAI Consultation Paper on IMT Advanced vide our Letter No. TVR/VIL/155 dated 31 October 2011 suggested that the spectrum in the 700MHz band could be auctioned in blocks of 2x5MHz with operators allowed acquire multiple blocks in order to realise the full potential of a high capacity IMT/IMT-Advanced system with a bandwidth of 2x10-20MHz per operator so as to offer the best network capability.

Spectrum cap may be prescribed for spectrum in the sub 1GHz band

- i. Insofar as spectrum caps are concerned, we have in the above response also suggested that one option could be to cap the spectrum at say 25% of the total spectrum assigned in a service area irrespective of band and technology mix deployed or alternatively another approach could be to put an overall cap of 2x25MHz of sub-1GHz spectrum (25% of assigned sub-1GHz spectrum).

E. STRUCTURE OF AUCTION (Paras 3.36-3.41)

Q14. What should be the structure of the auction process?

Q15. Should auction be held in single stage or multi stage?

Q16. Should there be a simultaneous auction for spectrum in 800 and 1800 MHz bands?

Auctions objectives must be in consonance with Supreme Court principles & NTP-2011

- a. We believe that the **structure of the auction process will depend upon the objectives sought to be met through the auctions.**
- b. As submitted above, the **auctions must be in consonance with the principles and directions laid down by the Hon'ble Supreme Court** as well as the objectives of Draft NTP-2011.

Structure of the Auction Process

- c. We favour a **multi-round simultaneous ascending auction.**
- d. We **support the adoption of tried and tested designs following international best practice.**
- e. **Economic efficiency favours a process whereby if there are N lots available in a circle, then the auction process discovers the N+1th value**, and sets the prices on the basis of that discovered value. Any other structure favours non-straightforward bidding (tactical bidding/bid shading) and is likely to result in inefficiency.
- f. The **previous 3G and BWA auctions in India in 2010 had a unique ending rule** which meant that bidders had to increase their own bids, even in circles where supply equalled demand, in order to be certain of winning the circle. If they did not do so there was a possibility that a provisional winning bidder (PWB) could be knocked off their winning position and the auction close, without providing any opportunity to bid again on that circle even if they would have been prepared to pay more than the current clock price. This ending rule **has been shown to be inefficient if bidders are assumed to behave rationally and will lead to shading of bids**¹⁰. This **uncertainty could be removed by adopting either of these commonly used ending rules from other auction designs:**
 - i. **Clock auction** – The clock price for each category is set by auctioneer and rises in all categories (e.g. circles) that have excess demand. Clock price - for a category with N lots -

¹⁰Peter Cramton and Pacharasut Sujarittanonta. "Pricing Rule in a Clock Auction" *Decision Analysis* (2010) <http://works.bepress.com/cramton/154/>

stops rising when there are N or fewer bids. If there are more than N bids in a future round, then price starts rising again. The auction stops when all the clocks have stopped.

Activity rule: Bidders must keep bidding for their lots in every round (even rounds with a stopped clock price) or they lose the eligibility points.

Some variations: What if demand drops < N? It may be possible to wind a clock price back, or transfer unsold lots into a secondary auction.

- ii. **Individual abstract lot** – Each lot in a category has a unique identification number, and attracts separate bids. Each has a Provisional Winning Bidder. The auction stops when there are no new bids.

Activity rule: To maintain eligibility, bidders can either sit on their PWBs or make new bids at price increments above the PWB (usually determined by auctioneer e.g. 1%, 3%, 5%).

Some variations: Most auctions allow limited withdrawal of PWBs, and limited use of waivers. Auction stops when no-one withdraws or waivers, or makes a new bid.

- g. There is also a potential issue for new entrants or operators with no existing spectrum to win a small amount of spectrum, say 2MHz, which is not sufficient to deploy a network. Either of the proposed ending rules below would reduce the risk of a new entrant being left with an incomplete package, assuming a suitable rule for a secondary auction/reversing clocks or a suitable withdrawal rule.

Concurrent auctions for all spectrum bands

- h. We are also of the view that there should be simultaneous /concurrent auctions for all the spectrum intended to be put up for auction as there are significant complementarities in the bands that are proposed to be allocated through the auction.

Auctions should be open to all, new entrants as well as existing operators

- i. **Further, all eligible participants should be allowed to take part.** Any attempt to hold **separate auctions by creating artificial classifications** of new entrants, existing operators, etc would **not only be against the judgment of the Hon'ble Supreme Court but would also defeat the purpose of the auctions.** It may be noted that even in the case of the 3G and BWA auctions, both existing licensees and eligible new applicants were allowed to participate.
- j. The Hon'ble SC has clearly stated that:
 - o there should be a transparent and fair method for making selections so that all eligible persons get a fair opportunity of competition.
 - o the State and its agencies/instrumentalities must always adopt a rational method for disposal of public property
 - o no attempt should be made to scuttle the claim of worthy applicants.
- k. **A well-designed auction discovers the most efficient users of the spectrum,** those which expect to generate the highest returns from operations and awarding licenses to high bidders

tends to increase social efficiency. Needless to say, **a fair market price cannot be determined if the opportunity is denied to the existing licensees who are worthy applicants.** Also, **in case only new entrants are allowed to participate, the result will be no different from an administered price regime and will make the auction irrelevant.** Thus, the auction should be open to all existing operators, as well as new eligible applicants.

F. BLOCK SIZE & CAP (Paras 3.42-3.45)

- Q17. What should be the block size of the spectrum?**
- Q18. Should the block size be dependent on the frequency? If so, what should be the block size in each band?**
- Q19. Should there be a cap on amount of spectrum one can bid? If so, what should it be?**
- Q20. Should there be a separate cap on the total amount of spectrum one can hold; if so, what amount should it be?**
- Q21. Should there be a cap on the amount of spectrum one can hold in respect of sub-GHz spectrum? If so, what should it be?**

- a. We believe that the **block sizes may be set so as to suit both new entrants as well as existing licensees.**
- b. We suggest that the **block size could be 2x1MHz for 1800MHz band; 2x1.25MHz for 800MHz band and 2x5MHz for 700MHz band.** As submitted above, **bidders should be allowed to pick up multiple blocks subject to a cap on the number of blocks** that can be picked up in each band.
- c. In case of **new entrants**, it is submitted that they **should be required to bid for minimum 2x4-5MHz;** Further **TRAI should put in place additional safeguards to avoid possibility of price being driven up by vested interests.**
- d. We further suggest that the **bidding be subject to an overall cap, which may be set at 25% of total assigned spectrum in a service areas irrespective of service and technology mix deployed.**
- e. We also suggest that **a separate cap may also be prescribed by the Regulator for holdings in the sub-1GHz band,** which could be **2x25MHz of sub 1GHz spectrum** in a service area irrespective of service & technology mix deployed.

G. ELIGIBILITY CRITERIA (Paras 3.46-3.51)

- Q22. Who all should be eligible to participate in the auction?**
- a. **Only licensees whose licences have been cancelled;**
 - b. **Only eligible applicants as on 10.01.2008;**
 - c. **Only licensees whose licences have been cancelled and all new eligible entrants at the time of auction; or**
 - d. **Open to all including the existing Licensees.**

- a. We reiterate that the auctions have to be open to all, both new entrants as well as existing licensees. If they are restricted only to new entrants, then demand is highly likely to be equal to or less than supply of spectrum, meaning that the auction will close at the reserve price. This would not be a genuine auction process, but effectively an offer of spectrum at an administratively-determined (reserve) price. This would therefore not fulfil the requirements of the Supreme Court order.
- b. The TRAI has correctly recorded the cogent and meritorious arguments against a restricted auction. We are in agreement with these arguments and submit that any attempt to exclude existing operators from the auction will:
 - o Lead to a situation where supply of spectrum will be equal to or more than demand, especially since some of the new operators (such as Etisalat and STel) have already indicated their intention to exit from the market). This will make the auction process irrelevant and result in an outcome that is no different from an administered price regime.
 - o Block /inhibit the deployment of advanced mobile data networks thus limiting the ability of operators who are best placed to deliver on the mobile broadband objectives of the Government.
 - o Most importantly, such a restrictive approach will raise the issues of fair process, transparency and equal opportunity and will be against the judgment / findings of the Hon'ble Supreme Court which has clearly held that the auction process should be non-discriminatory and non-arbitrary and not attempt should be made to scuttle the claim of worth applicants.
 - o Be in violation of the DoT press release dated 29 January 2011 which has been relied upon by the Hon'ble Supreme Court in its judgment dated 2 February 2012.
 - o The said Press release states that in future, the spectrum will not be bundled with licence. The licence to be issued to telecom operators will be in the nature of 'unified licence' and the licence holder will be free to offer any of the multifarious telecom services. In the event the licence holder would like to offer wireless services, it will have to obtain spectrum through a market driven process. In future, there will be no concept of contracted spectrum and, therefore, no concept of initial or start-up spectrum. Spectrum will be made available only through market driven process.
 - o This has been reiterated by the Hon'ble MoC in his Press Statement dated 15 February 2012 which states that the Government has decided that no more UAS licenses linked with spectrum will be awarded. All future licensees will be Unified Licensees and allocation of spectrum will be delinked from the license. Spectrum, if required, will have to be obtained separately.
- c. In view of the above it is amply clear that the new regime as announced by the Government and as relied upon by the Hon'ble Supreme Court in its judgment dated 2 February 2012, does not envisage any restriction in participation in the spectrum auctions and the same is to be open to all license holders. It may be noted that even whilst "revenue maximization" ought not to be the primary objective, limiting eligibility will not only reduce proceeds but also preclude fair price discovery.

H. RESERVE PRICE (Paras 3.52-3.57)

Q23. What should be reserve price per MHz of spectrum in the year 2012 for 1800 MHz band?

Q24. What should be the reserve price per MHz of spectrum in the 700/800/900 MHz bands.

Q25. Whether the reserve price should be uniform across the country or service area wise?

- a. It is first submitted that the **all India Price per MHz given by the TRAI pertain to the final "value" of spectrum as per various administrative methodologies and NOT the reserve price.**
- b. **We are also not in agreement with these "values" as they represent a theoretical /academic exercise,** which is also evident from the fact that the 2010 "value" varies from Rs. 620 crores per MHz to Rs. 4,500 crores per MHz.
- c. We also submit that **there are serious flaws in the assumptions and computation of the administered prices recommended by TRAI in February 2011,** which have already been pointed out to the Authority vide our submissions vide our Letters No. TVR/VEL/149 dated 24 October 2011.
- d. It is further submitted that **reserve prices are generally significantly lower than final prices,** otherwise there is a risk that spectrum will remain un-sold. **A lower reserve price also ensures greater participation thus delivering a more robust auction result.**
- e. In this context we note that in paragraph 2.10 of the Consultation paper, TRAI has itself stated that *"it is generally not optimal for the seller to choose the highest possible valuation that the seller believes that a buyer may have"*. Under these circumstances we believe that the "values" given by TRAI cannot be used as a reserve price in the proposed auctions.
- f. It is also **important that the Government and TRAI are clear about the objectives of the auction.** As pointed out above the **clear objectives enunciated in draft NTP-2011 is on maximizing public good by making available affordable, reliable and secure telecommunication and broadband services across the entire country; the multiplier effect and transformational impact of such services on the overall economy; the role of telecom services in furthering the national development agenda** while enhancing equity and inclusiveness. It has been **clearly stated that direct revenue generation would be a secondary objective.**
- g. It is our view that the **auction must be designed based on these objectives and reserve price should be fixed accordingly.** The reserve price should be set only to deter frivolous bidders.
- h. We believe that the **reserve prices applied in the 3G/BWA auctions were high, but not unreasonable and suggest that these may be recommended as the reserve price for spectrum auctions in the 1800MHz band.** Reserve price of 700MHz may also be set at reserve price applied in the 3G/BWA auctions.

I. ROLL OUT OBLIGATIONS (Paras 3.58-3.61)

Q26. What should be the roll out obligations linked to the auctioned spectrum?

- a. We believe that **rollout obligations are an important tool in the hands of the Government to ensure that the allocated spectrum to a new entrant is used to further national end objectives** of improved rural connectivity and service and the delivery of broadband in the rural areas.
- b. Thus, it is our views that **rollout obligations must be prescribed for new entrants.**

J. SPECTRUM USAGE CHARGES (Paras 3.62-3.71)

Q27. What should be the annual spectrum usage charge for the spectrum being auctioned?
Q28. Should the spectrum usage charge be in line with present criteria of escalating charge with the amount of spectrum holding or a fix percentage as was done for 3G and BWA spectrum?

Current spectrum usage charge regime is discriminatory & penalizes performing operators

- a. We firmly believe that the current spectrum usage charges regime should be reviewed before the auction design is finalized.
- b. The current regime of spectrum usage charges not only discriminates between new entrants and existing operators, but also between the pure play and dual spectrum operators.
- c. The escalating price approach results in different operators facing very different marginal pricing of the same increment of spectrum as the **operators with higher allotments of spectrum and consequently more customers facing a higher charge** (see Table above) than the operators with lower spectrum/less customers.

Spectrum allocation (MHz)	Spectrum fee (%of AGR)	Marginal spectrum fee for increment* (%)
2x 4.4	2	
2x6.2	3	5.4
2x 8.0	4	7.4
2x 10	4	4.0
2x 12.5	5	9.0
2x 15	6	11.0

* Assuming that traffic/revenues increases proportionately with spectrum allocation

- d. **The escalating fee structure penalizes the successful (larger) operators** who are utilizing spectrum more efficiently and generating higher revenues as it results in a double whammy of paying a higher rate on the higher revenues that accrue from the deployment of the incremental spectrum.

Continuing with existing regime will compromise the auction process

- e. An escalating charge may have been justified at a time when spectrum was being allocated administratively. However **once the spectrum is to be allocated through an auction** and an upfront fee will be collected by way of auction proceeds, **continuing with the current approach**

of applying a higher spectrum usage charge on additional allocations **would not only be unfair but would also lead to anomalies** and would in fact **compromise the integrity of the auction process** as the winning bidder is chosen based on the highest up-front fee without taking into account the recurring charges paid over the tenure of the license.

- f. We thus believe that **once spectrum is allocated through auctions, continuing with the current escalating charge approach will be detrimental** to consumers and operators as it will work as an inverted duty structure which increases the input cost of the spectrum leading to excessive burden on operating margins and revenues for the spectrum holders, leading to imposition of stringent barriers for the operators to invest in superior quality of services to the consumers.

Continuing with existing regime will create problems in monitoring & enforcement

- g. We also believe that the **current approach of applying spectrum charges separately on GSM and CDMA spectrum not only discriminates between similarly placed** operators holding similar amounts of spectrum and offering the same mobile services, **but also creates a window of opportunity for operators to divert/misreport revenues** and pay lower charges which will be very difficult for the Government to monitor and enforce to avoid loss to the exchequer.
- h. It is submitted that **this problem will be further aggravated as more and more spectrum from different bands is auctioned** creating severe and serious problems for the Government leaving the Government vulnerable to allegations that the regime was created to benefit select operators at the cost of the exchequer.

Spectrum charges should be the same for all operators

- i. We are firmly of the view that the **price of spectrum in a given band should be established to be the same for all operators irrespective of the amount of spectrum** that they have and should not penalize operators who have been able to use the spectrum more efficiently.
- j. We thus believe that it is **timely and opportune for TRAI to correct all existing anomalies in the spectrum usage charges regime** and recommend that **spectrum usage charges on revenue share basis should be uniform for all players**. This will ensure an efficient auction which is fair and non-discriminatory. This will also result in a simple, fair and transparent spectrum usage charges regime that is easy to administer and enforce and will help avoid arbitrage opportunities.
- k. We suggest that **as spectrum will be allocated through auctions, the spectrum usage charges should cover only the cost of administration and regulation** of this sector. We verily believe that this was **estimated by TRAI in around 1998 to be pegged at 0.18% of the then revenues**.
- l. **In the alternative, we suggest that the uniform spectrum usage charges may be prescribed at a uniform 1% of AGR in line with what has been done for BWA.**

- m. Alternatively, we suggest that the **TRAI could also look at the option of recommending a uniform fixed price per MHz as spectrum usage charge**. This, if agreed, would not only address the present issues of discriminatory annual spectrum charges and will set equal rules at the time of auction for all eligible players, but most importantly, it will also incentivize all players to use their spectrum most efficiently.

Duration of Spectrum Rights & Payment plan

- Q29. What should be the period of validity of spectrum?**
Q30. What should be the period of price of spectrum?
Q31. Should the government allow deferred payment schedule of the spectrum auction fee, or should the payment be upfront in nature?

- a. We believe that **the spectrum should be auctioned for 20 years and the underlying UAS License/Unified License as the case may be, should be extended to be co-terminous qua the auctioned spectrum**. This was the approach followed in the case of 2.1GHz auctions (See Section 3.6 of Notice Inviting Application) and we believe that it should be continued with in the proposed auctions as well.
- b. We believe that the **entire payment of the auction proceeds should be made upfront** as was done in the case of 3G and BWA. Any **deferred payments schedule would not only create uncertainty regarding Government revenues, but may also lead to ambitious bidding by new entrants**, which they may not be able to deliver upon in subsequent years.
- c. We do not understand the option given by TRAI in Para 3.71 that "Another way for payment of spectrum could be that while the bidder can hold the spectrum for 20 years, but the payment is for a shorter period" or the issue raised in Q 30. Above as to "what should be the period of price for spectrum". The option suggested and issue raised is very ambiguous and open ended making it difficult to respond substantively to the same.
- d. Notwithstanding the above, **we would like to unambiguously submit that the payment of the auction proceeds should be done upfront for reasons given in pre-paras**.

K. SPECTRUM TRADING & POSSIBLE MODEL (Paras 3.72-3.84)

- Q32. Should Spectrum trading be allowed in India?**
Q33. (a) Among the various models discussed above, in your opinion which model of spectrum trading is best suited for India?
(b) In your opinion is there any other model which can be implemented in India? If yes, please describe.
Q34. What should be the eligibility criteria to trade the spectrum?
Q35. Whether the spectrum assigned for 3G and BWA services be allowed to trade? If yes, give reasons.

- a. **Vodafone fully support the introduction of spectrum trading** in India.

- b. As regards the models for spectrum trading discussed by TRAI, we assume that
 - i. Changing assignment right means one party selling its rights to use a block of spectrum to another party.
 - ii. Changing allocation right refers to the situation where the party acquiring the spectrum would then put it to a different use.
- c. Assuming these definitions are correct, we believe **that ideally, a trading regime which allowed changing both allocation and assignment rights** would be most beneficial in terms of promoting an economically efficient outcome. This is because otherwise, if only assignment right can be changed, then spectrum allocations could only be made more allocatively efficient within use, but not across uses. We believe that allowing change of allocation rights would also be more in line with the policy of technology neutrality.
- d. **As a first step however, the TRAI may recommend trading of assignment rights** including for the spectrum assigned in the 3G and BWA auctions.
- e. In any event, **any concerns with regarding spectrum trading** (for example, that it could **lead to significant concentration of spectrum** in a few hands), we believe that this concern **could be addressed through setting spectrum caps on overall spectrum** that are both technology as well as service neutral as submitted in pre-paras. This would mean that no operator would be able to gain, through trading, more spectrum than allowed under the caps.

L. MISCELLANEOUS ISSUES (Paras 3.85)

Q36. Can spectrum be allowed to be mortgaged for raising capital for telecom purposes?

- a. **We do not agree with this proposal as it has several practical implications that would make it difficult to implement.**



Best practice principles for the auction of spectrum in India

A REPORT PREPARED FOR VODAFONE INDIA

March 2012

Best practice principles for the auction of spectrum in India

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1 Introduction and summary of our findings

Frontier Economics Limited (“Frontier”) has been retained by Vodafone to provide an economic assessment of the issues raised by the Telecommunications Regulatory Authority of India (“TRAI”) in its recent consultation document, “*Consultation Paper on Auction of Spectrum*”. In particular, we have been asked to:

- develop a report considering, from “first principles” some of the issues set out by TRAI in its recent consultation on spectrum auctions; and
- consider these issues in the context of the Indian mobile market and set out the economic implications of different approaches to the matters set out by TRAI.

Frontier Economics is one of the largest economic consultancies in Europe, employing around 100 economists and associates in London, Brussels, Cologne, Dublin and Madrid. We advise senior decision makers in government and business around the world, applying economic principles and tools to provide practical solutions to complex problems. We have worked for a number of regulators and private clients across the main regulated sectors including telecommunications in the UK, Europe and a number of other developed and developing states, where members of our team have been at the forefront of regulatory developments for more than ten years.

This report sets out the findings from our review. In preparing this we have based our understanding of TRAI’s position from what is set out in its consultation, and reflected this together with our understanding of the local market. However, we do not provide detailed comments and proposals on the specific detail of spectrum assignment and management in India.

The remainder of this report is structured as follows:

- Section 2 provides an overview of the general principles which should govern any process for allocating spectrum between uses (and parties) and for ensuring that spectrum allocation remains optimal following that allocation;
- Section 3 considers how the principles identified in the previous section could be applied in the context of forthcoming spectrum awards in India, in particular considering:
 - The actual spectrum to be auctioned (i.e., the extent to which all available spectrum should be included in an auction);
 - The importance of maintaining a technologically neutral approach to spectrum licensing

- The TRAI's proposals for spectrum "refarming";
 - Rules governing participation in the auction;
 - Possible steps for ensuring the auction promotes the development of an efficient, competitive market place for mobile services; and
 - How reserve prices for the auction could be determined.
- Section 4 then considers two other issues relevant to the spectrum pricing regime in India, namely:
 - The potential impact of the current system of spectrum usage charges on both the auction and the development of competition in the market; and
 - The possibility of relying on benchmarks from these auctions to determine an appropriate price for operators to extend existing 2G spectrum licences.

Summary of our findings

Our report shows that:

- Efficient spectrum allocation, both between uses and users, is an increasingly important factor in driving economic and social development. The deployment of new, high speed mobile broadband services will require continually increasing availability of spectrum for mobile services. The availability of spectrum for the mobile industry at an appropriate price will be more important in countries with comparatively low fixed line penetration such as India.
- Given the already fragmented nature of the Indian mobile market, restricting the availability of spectrum can be expected to reduce economic efficiency as it would result in higher costs of offering mobile services in India. This could restrict the ability of operators to roll out new services.
- In the absence of externalities, and provided the terms of accessing spectrum are not skewed between different bidders, auctions can be expected to lead to an allocation of spectrum that is economically (allocatively) efficient, with a given block of spectrum awarded to that party who values the spectrum block most highly. This is also expected to lead to the maximum level of economic efficiency for society.
- Economic efficiency is maximised where spectrum is liberalised, so that licensees are in a position to decide the most appropriate technology to deploy in their spectrum blocks. India appears to have taken a forward-looking approach to this, liberalising the usage of spectrum well ahead of many international counterparts.
- Potential participation in the spectrum auction should not be limited by regulation, other than generally applicable rules on a maximum amount of spectrum that can be held by any provider to ensure that competition in the (retail) mobile/communications market is protected. Restrictions on participation limit the extent to which auctions will result in an efficient allocation of spectrum, and may also reduce government proceeds. Regulatory authorities occasionally consider specific rules to seek to ensure competition is protected (e.g. reserving a block of spectrum for new entrants). This consideration arises in countries where there are concerns about the level of competition and/or a limited number of competitors present. However, it is not clear that these concerns should be present in India, given the level of competition with more than nine network operators typically competing in a given area which is well beyond those normally

found in wireless markets, even after the cancellation of the 2008 licences.

- Redistributing 900MHz spectrum already used by licensees is very likely to cause significant disruption to consumers, particularly in rural areas where coverage is provided using the 900MHz band.
- Reserve prices should be set to limit the scope for frivolous bidders entering the auction, but must not deter serious bidders from entering. Given the scope for misestimating values, setting a reserve price according to the expected value of the spectrum risks leaving spectrum unallocated, even though it would be economically efficient for that spectrum to be allocated.
- Spectrum usage fees should not discriminate between operators using the same bands of spectrum or operators using spectrum to produce outputs which are close substitutes in the retail market (e.g. CDMA 800 and GSM 900). The current spectrum fee regime is likely to lead to operators facing very different marginal costs for spectrum and such discrimination could serve to distort the results of spectrum auctions.

2 Allocating radio spectrum to maximise economic efficiency

This section of our report sets out the principles that should govern the allocation and management of radio spectrum to promote economically efficient outcomes. Although much of this material builds on well-established principles, it is important that these are to the fore when specific proposals are made concerning spectrum auctions and the management of radio spectrum.

2.1 Why the allocation of radio spectrum is so important

Radio spectrum is an essential input to the provision of wireless communication services, whether for mobile voice and broadband services, broadcasting, private radio systems or other services. However, interference between users of radio frequency mean that a given band can only support a finite amount of demand and some frequency bands are more suited to particular uses than others.

Wireless communication services have experienced rapid development in recent decades, utilising the on-going innovation and progress in information technologies. New technologies have extended the usable spectrum into higher frequency bands and enabled more efficient use of existing frequency bands, whilst advanced wireless services (e.g. mobile telephony and broadband services) have become available to consumers and industry, leading to increasing demands for access to spectrum for commercial applications.

This is the case in India as well as elsewhere. For example, India is experiencing rapid growth of the mobile services industry. In the period December 1998 to May 2011, the number of mobile connections in India has grown from 1 million to 840 million, with mobile teledensity increasing from only 0.1% to 70%. Whilst mobile broadband services in India are in an early stage, they are expected to develop rapidly in the upcoming years. A recent study¹ forecasts the number of 3G subscribers in India to reach 142 million by 2015 and more than 300 million by 2020, accounting for 12%, respectively 20%, of the total wireless subscriber base.

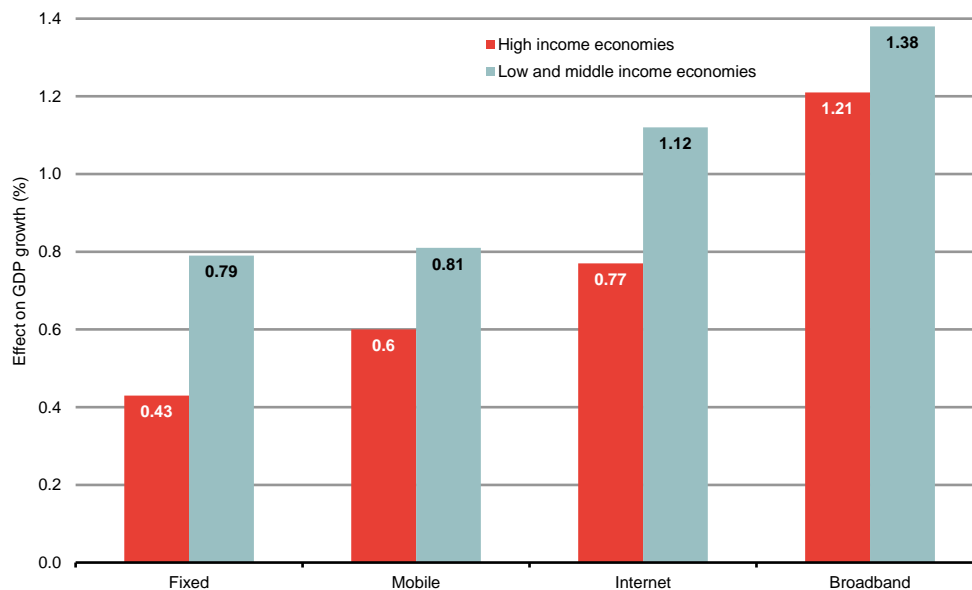
¹ Ernst & Young (2011) "Enabling the next wave of telecom growth in India - Industry inputs for National Telecom Policy 2011", a study commissioned by The Federation of Indian Chambers of Commerce and Industry (FICCI)

Mobile communications can have a significant effect on the wider economy

Information and communication technologies (ICT) in general and mobile services in particular, have become one of the most important drivers of economic growth in the last two decades. Global proliferation of mobile services has led to increased economic activity, employment and growth in income levels for both individuals and companies. This positive trend is likely to continue in the future.

For example, the importance of the mobile service sector for emerging economies is illustrated by a recent World Bank study, which estimates that a 10% increase in mobile penetration leads to additional GDP growth of 0.81% in low and middle income economies. This is replicated in **Figure 1** below.

Figure 1. Effect of 10% increase in ICT penetration on GDP Growth (incremental percentage points)



Source: Qiang, C.Z.W. (2009) "Telecommunications and Economic Growth", World Bank

Indeed, a further study conducted by ICRIER² shows an even stronger relationship between State Domestic Product (SDP) and mobile teledensity in India. It estimated that Indian states with higher mobile penetration are expected to grow faster, with the growth rate being 1.2% points higher for every 10% increase in mobile penetration.

² ICRIER (2009) "India: The Impact of Mobile Phones" The Policy Paper Series

The demand for radio spectrum is likely to increase further

As the demand for communication services increases and technology evolves, so the demand for access to certain bands of spectrum for telecommunications has increased. In the short term, governments can respond to the increasing demand by releasing more spectrum to the market (by awarding rights to previously unused spectrum) and by changing the use of specific frequency bands³ in cases where restrictions exist on the use of spectrum. In addition, technological improvements lead to communications providers using spectrum more efficiently, so offsetting increases in demand for spectrum. However, the dynamic relationship between end user demand and technological developments means that it is likely that there will continue to be excess demand (i.e., demand in excess of supply) for certain spectrum bands.

Against this backdrop, governments, international bodies and operators around the world have recognized the need to make additional spectrum available for new wireless services, in particular mobile broadband.⁴ For example:

- In 2006, the ITU forecast that the total amount of spectrum needed to support mobile broadband in developed countries, such as US or the EU, would be 1,300 MHz by 2015 and 1,720 MHz by 2020.⁵
- The European Commission currently considers that at least 1,200 MHz spectrum needs to be identified by 2015 to address the increasing demand for wireless data traffic.⁶
- According to TRAI's estimate, the bandwidth required for mobile services by 2014 may be even as high as 800MHz and the major part of this bandwidth may arise from 3G services.⁷ According to the recent publication

³ For example, spectrum previously used for analogue TV services is being freed as a result of the digital switchover and being made available for mobile communications.

⁴ According to the latest National Broadband Plan published by Federal Communications Commission (FCC), p. 77: "*the growth of wireless broadband in the US will be constrained if government does not make spectrum available to enable network expansion and technology upgrades*" available at <http://www.broadband.gov/download-plan/>

⁵ ITU (2006) "Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced", Report ITU-R M.2078

⁶ Based on the policy objectives as defined in the first Radio Spectrum Policy Programme, approved by the European Parliament and Council on 15 February 2012, see http://ec.europa.eu/information_society/policy/ecomm/radio_spectrum/eu_policy/rspp/index_en.htm

⁷ TRAI (2010) "Spectrum Management and Licensing Framework", p. 18-19, available at <http://tra1.gov.in/WriteReadData/Recommendation/Documents/FINALRECOMENDATIONS.pdf>

by Ministry of Communications and Information Technologies⁸, the Indian government intends to ‘*make available additional 300 MHz spectrum for IMT services by the year 2017 and another 200 MHz by 2020*’.

There are likely to be significant challenges in meeting spectrum demands of the rapidly evolving mobile service industry. Ensuring the efficient allocation of scarce spectrum must therefore be a key goal for spectrum regulators.

2.2 Ensuring an efficient allocation of spectrum

Taking into account any technical limitations on the use of different spectrum bands, an efficient allocation of spectrum is generally taken to mean one where the spectrum is allocated between uses and users in such a way that it would not be possible to reallocate the spectrum in a way that would increase overall welfare arising from the production of the goods or services where access to the spectrum is used as an input. This is known as allocative efficiency.

2.2.1 Market mechanisms can facilitate an efficient allocation of spectrum when there is excess demand

Broadly speaking, there are two common approaches used by governments to facilitate an allocation of spectrum, the so called ‘command and control’ approach and market based approaches.

- Under the ‘command and control’ mechanism the allocation of spectrum is decided centrally, with little flexibility for spectrum users.⁹
- Under market mechanisms, the allocation of spectrum is managed by the market, subject to licence terms set by the spectrum regulator.

The ‘command and control’ mechanism is often criticised for its inflexibility and inability to cope with the increasing demand for spectrum.¹⁰ This is because it is becoming increasingly difficult for regulators to acquire and maintain a sufficient level of information about supply and demand trends, technology developments, and the relative value to society of alternative services.¹¹

⁸ See the draft National Telecommunication Policy (NTP) 2011 study, p. 13, available at <http://www.dot.gov.in/NTP-2011/final-10.10.2011.pdf>

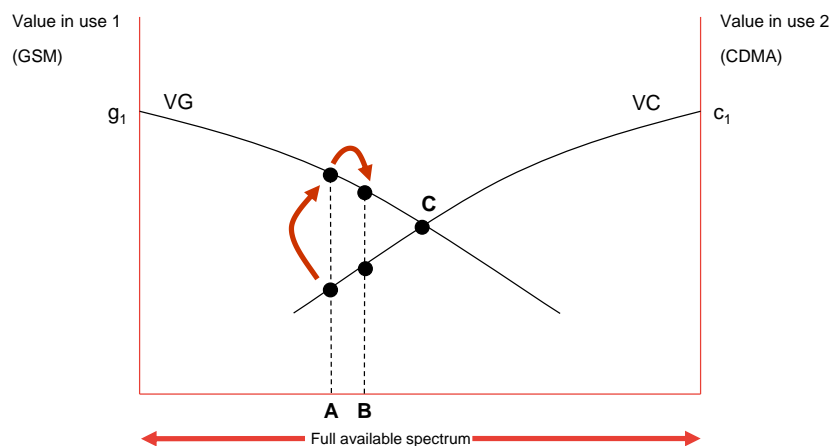
⁹ Note that India is a somehow specific case: while spectrum was generally allocated through an administrative process, the early liberalisation of the use of spectrum for different technologies allowed more flexibility for spectrum users.

¹⁰ Cave, M. (2002) “Radio Spectrum Management: An Independent Review for the UK Department of Trade and Industry and HM Treasury”, Ofcom, London

¹¹ According to ITU (2007) “Radio Spectrum Management: ICT Regulation Toolkit”, p.1: ‘*there is now a growing consensus that past and current regulatory practices have delayed the introduction and growth of beneficial technologies and services or have artificially increased costs.*’, available at www.ictregulationtoolkit.org/en/Document.3729.pdf

Market mechanisms, on the other hand, can result in an allocation of resources which is allocatively efficient, as long as there is sufficient competition in the market and there are no externalities.¹² **Figure 2** illustrates this by considering the allocation of spectrum between two possible users, in this case a provider of GSM based services and a provider of CDMA based services.

Figure 2. Allocative efficiency - an illustration¹³



Source: Frontier Economics

In this illustrative example, the marginal value of spectrum to each use declines as the total amount of spectrum held increases. The efficient allocation is at Point C, where the marginal value to each user is the same. At this point, it is not possible to reallocate a unit of spectrum between the uses without reducing overall welfare. If the existing allocation was actually at Point A (so that the marginal value of that unit to the GSM use was greater than the marginal value of that unit to the CDMA use), it would be possible to increase overall welfare by switching the marginal unit from CDMA to GSM. Assuming there is an effective market for the resource (either in the form of a secondary market if the CDMA user already has the right to that block, or an auction to allocate that block initially), this trade would take place because a GSM based operator would be

¹² An externality refers to a cost or benefit to society arising from resource consumption which consumers and producers do not take into account when making their production or consumption decision. In the presence of externalities, market forces might fail to deliver efficient allocation of scarce resources. Within the context of radio spectrum, such externalities could mean that pure market mechanisms under-allocate the spectrum to services such as public safety and emergency services. A feasible way for governments and regulators to improve market allocation in these cases is by reserving a share of spectrum for public safety and emergency services.

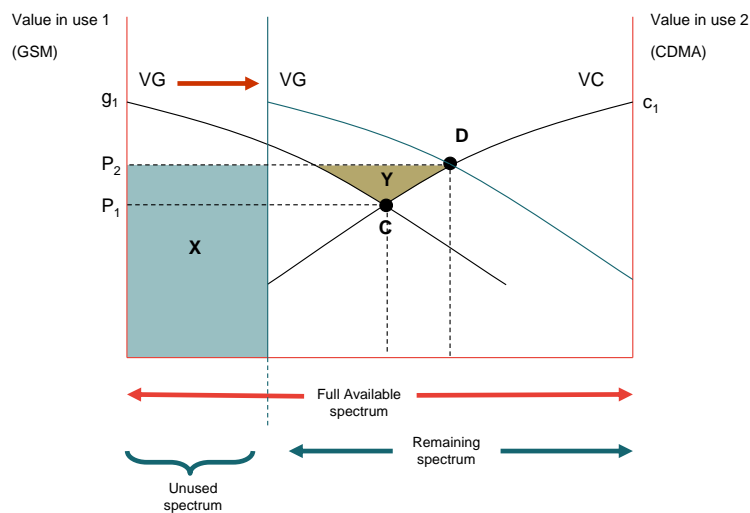
¹³ In reality, identifying the efficient outcome may not be as straightforward as shown in this diagram. The curves may not be continuous, and may not intersect as shown. There will also often be more than two possible spectrum uses or users.

prepared to pay more for the resource than it is worth to a CDMA based operator. Such trades would continue until the spectrum allocation shifted from Point A to Point C.¹⁴

2.2.2 Supply of spectrum should not be artificially restricted as this could reduce economic welfare

If there is demand for spectrum that can be put to some productive use there appears to be no reason for the government to leave this valuable resource unused.¹⁵ In fact, by artificially limiting supply of spectrum, the government distorts the market mechanism and can generate socially sub-optimal outcomes.

Figure 3. The impact of government not releasing all available spectrum



Source: Frontier Economics

As shown in **Figure 3** above, by restricting the amount of spectrum available to GSM services, both uses are now competing for access to less spectrum, and the reduction in supply drives prices higher than would be the case if the entire spectrum band was available. The new optimal allocation is at Point D, where the

¹⁴ This analysis does not take into account the time dimension. Spectrum leasing could enable further efficiencies by allowing more flexibility to vary usage over time.

¹⁵ A possible reason for leaving spectrum unused today is if the government expect spectrum can be put to better use in the future. Nevertheless, by assuring service and technology neutral use of spectrum, the government can effectively let spectrum licence holders identify the market opportunities arising from changes in demand and technology. In addition, if the government assumes there might be a new technology that will not be available to the current spectrum holders, it could introduce secondary spectrum trading that will assure spectrum can be re-allocated via secondary trades.

marginal value to each user is the same. Nevertheless, the overall welfare change, illustrated as a difference between Y and X, is negative, as the net increase in revenues from spectrum sold is lower than the welfare loss arising from the lower amount of spectrum available for GSM or CDMA use (see **Annexe 1**). Note also that although in equilibrium (Point D) both users are willing to pay a higher price for spectrum than before, this does not necessarily result in higher revenues for government, i.e. the price increase might not be sufficiently large to outweigh the revenue loss from the lower amount of spectrum sold.

It is therefore generally more efficient for spectrum to be allocated to some productive use than left with the government to be allocated at a later date or not used at all. Failing to secure enough spectrum to meet current and future demand can be expected to result in higher prices, lower quality of service, lost productivity and could also lead to a lack of competition and innovation, with consequent effects for the overall economy.¹⁶

2.2.3 Auctions are the most appropriate market mechanism for efficient spectrum allocation

There are a number of different mechanisms used to allocate radio spectrum:

- comparative selection processes (“beauty contests”);
- lotteries;
- ‘first come first served’; and
- auctions.

Lotteries and ‘first come first served’ approaches have been applied occasionally, but these methods are unlikely to deliver an efficient allocation where there is excess demand for spectrum.¹⁷ ‘Beauty contests’ were regularly used in the past to allocate mobile spectrum, but there appears to be a clear shift toward auctions as the preferred format for the allocation of spectrum. This is because the increasing complexity of spectrum allocation makes it difficult to define measurable criteria against which the participants of the beauty contest could be assessed. As a result this can lead to lack of transparency in the contest and inefficient outcomes. Beauty contests may also result in lower proceeds being generated for the licensing authority than might auctions.

¹⁶ FCC (2011) “National Broadband Plan”, Chapter 5, p. 85, available at <http://www.broadband.gov/download-plan/>

¹⁷ Even when there is secondary trading in place, which could in theory lead to subsequent efficient allocation of spectrum, there are likely to be transaction cost as well as windfall gains to companies who intend to trade rather than utilise the spectrum. It might therefore in practice be preferable to apply market mechanism when allocating spectrum initially, rather than relying on a secondary trading to deliver an efficient spectrum allocation.

Auctions aim to recover some of rents attached to the licence, and to allocate the licence to the bidder who will make most efficient use of the licence and is therefore willing to pay the most for the licence. Under some general conditions, auctions can deliver an efficient allocation of spectrum, while at the same time maximising the revenues of licensing authorities. In addition, well designed auctions are perceived as transparent and fair by participants, they assign licences to firms quickly and economically; and can be designed to incorporate a wide range of public-policy goals.¹⁸

2.3 The key characteristics of an efficient spectrum auction

There are a number of different auction mechanisms which may be used to auction spectrum rights. Choosing an auction format that is consistent with the auction goals and market realities is a prerequisite of an efficient spectrum auction. Nevertheless, there are a range of additional factors that need to be considered by a regulator in order to ensure the efficient allocation of an auctioned spectrum.

2.3.1 The auction format needs to be selected carefully

The most common forms of auctions are single-round “sealed bid” auctions and multi-round ascending auctions. Multi-round auctions should, in principle, be more efficient, due to the legitimate exchange of information between bidders in the form of the bid history during the auction. This should allow operators to estimate more accurately the value of the licence and thus bid more efficiently.

In recent years, advances in auction design have focused on improving the ways in which the assignment of spectrum licences across bidders is coordinated, particularly where the price for one spectrum block affects demand for other spectrum blocks also being auctioned, with blocks potentially being substitutes or complements for bidders.

- Two blocks are *substitutes* when obtaining one makes it less valuable to obtain the other, so that increasing the price of one raises demand for the other. This may occur, for example, when either of two blocks share similar characteristics can be utilized to deliver some service to a group of customers.
- Two blocks are *complements* when the reverse economic relation is true: acquiring the first makes it more valuable to obtain the second, so increasing the price of one block can reduce demand for the other. This might occur

¹⁸ McMillan, J. (1994) “Why auction the spectrum?”, *Telecommunications Policy*, 19(3), 191-99

when there are economies of scale and scope or when providing a service requires pairing two spectrum blocks that are controlled by separate licences.

2.3.2 Additional factors need to be considered

Selecting an appropriate auction format is a necessary but not sufficient condition for facilitating an efficient allocation of spectrum. There are a number of additional factors that need to be considered by a regulator in order to facilitate efficient spectrum allocation. In particular, these include ensuring there are sufficient levels of competition within the auction and making sure the auctioned spectrum will be used efficiently. We discuss these in more detail below.

Ensuring competition among bidders during the auction

Generally, regulators need to ensure the auction is run in a transparent manner and that all participants have certainty regarding the process. In addition, there should be no unnecessary restrictions on the number and range of eligible bidders.

Potential participation in the spectrum auction should not be limited by regulation, other than generally applicable rules on maximum amount of spectrum that can be held by any provider to ensure that competition in the (retail) mobile/communications market is protected. Restrictions on participation limit the extent to which auctions will result in an efficient allocation of spectrum, and may also reduce government proceeds.

The larger number of auction participants is likely to lead to greater competition among bidders. In a multi-round auction this should allow operators to estimate more accurately the value of the licence and is likely to lead to higher auction revenues. A large number of bidders would also make collusion more difficult.

Ensuring efficient use of spectrum

Regulators should make sure that all features of the auction process encourage an efficient use of spectrum by winning parties.

Firstly, reserve prices need to be set carefully in order not to artificially restrict demand for spectrum. Generally, reserve prices should be set at the level that ensures only serious/eligible bidders participate in the auction, while at the same time allowing auction mechanisms to reveal the actual valuation of spectrum. Reserve prices that are set too high might lead to inefficient outcomes if some of spectrum remains unallocated as a result.

Secondly, spectrum licences should enable winners to roll-out and provide mobile services as demanded by the market. Therefore, regulators need to ensure that (unnecessary) restrictions are not imposed on the use of spectrum by

winning bidders. That is, technical and service neutrality should be guaranteed. We understand that in India, licences are currently technologically neutral.

Lastly, spectrum trading should be enabled after the auction to allow market forces to re-allocate spectrum in the event that demand for technologies and services changes over time.

3 Applying the best practice principles to forthcoming spectrum auctions in India

In this section we consider how the principles outlined in the preceding section can be applied to some of the issues considered by TRAI in its consultation paper. We begin by describing the key characteristics of the mobile market in India and then, reflecting on these, consider:

- the rules governing the spectrum auction (i.e., the extent to which all available spectrum should be included in an auction and the size of spectrum blocks which should be auctioned);
- the extent to which licensees should be free to choose the technology to deploy in a given spectrum band;
- the impact of a requirement for holders of 900MHz to surrender their holding and have it replaced with 1800MHz spectrum;
- rules governing participation in the auction;
- possible steps for ensuring the auction promotes the development of an efficient, competitive market place for mobile services;
- minimum restrictions on spectrum bids; and
- how reserve prices for the auction could be determined.

3.1 The mobile market in India is highly competitive but fragmented

The mobile market in India is one of the most competitive in the world. However, the market is also fragmented which creates an uncertain investment environment in a sector where significant investments are required to roll out fast mobile voice and broadband services. Furthermore, many operators are constrained by (lack of) spectrum availability which increases costs and either leads to unprofitability or higher retail prices.

3.1.1 The mobile market in India is highly competitive

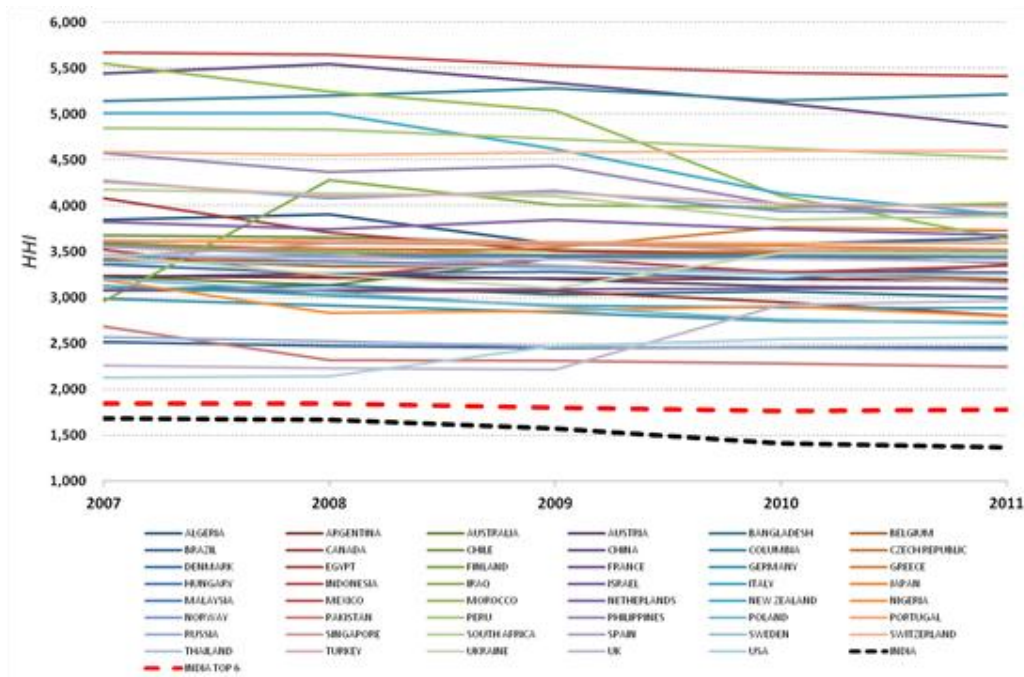
The competitiveness of India's markets is clearly demonstrated by a number of indicators, for example HHI, retail prices and low barriers to entry¹⁹.

¹⁹ Parsons S and van Hooft L "Evaluating Whether Effective Competition Exists in Indian Retail Mobile Markets"

India has an exceptionally low HHI

HHIs measure industry concentration. As can be seen in **Figure 4** India's HHI is among the lowest (if not the lowest) in the major developed and emerging economies. **India's HHI at December 2011 was 1,368**, the lowest HHI for a mobile market anywhere in the world²⁰. According to the BoAML global matrix, no other market worldwide that has a HHI below 2,000. The low HHI is clearly indicative of a very competitive market for mobile services in India.

Figure 4 Comparison of HHI across global markets



Taken from Parsons S and van Hooff L "Evaluating Whether Effective Competition Exists in Indian Retail Mobile Markets". Source: BoAML Global Wireless Matrix, 3Q2011, TRAI Quarterly Performance Indicator Reports.

By contrast the average HHI of the other BRIC nations is more than double the Indian HHI. The average HHI for Asian and developing markets is 3,418 and 3,721 respectively.

Consumer prices for mobile services are low in India

The significant level of competition in mobile markets in India means that consumers benefit from low retail prices, which have fallen substantially in recent years. International comparisons of outgoing RPM (revenue per minute) show

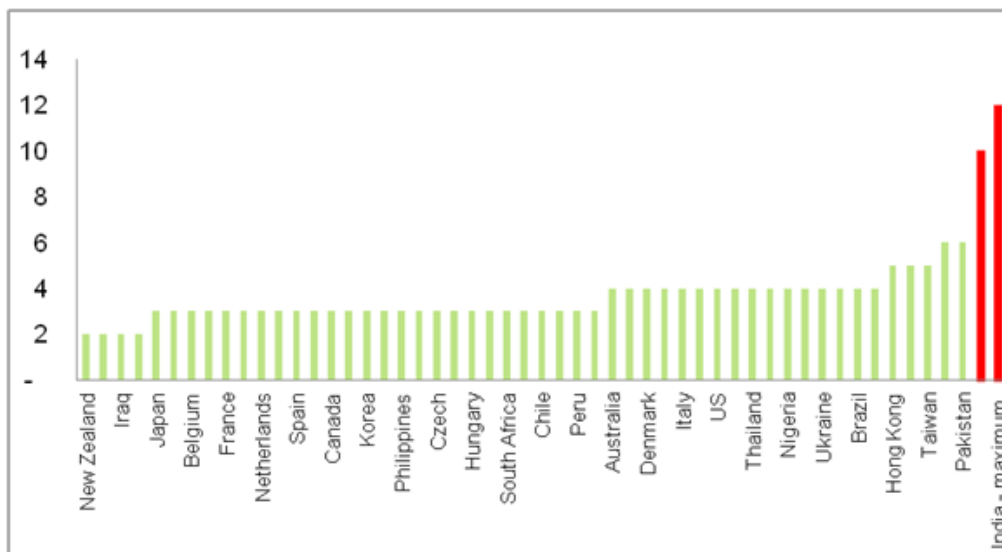
²⁰ Even restricting the estimate of the HHI to the top six operators the HHI is still only 1,800. This can therefore be considered an upper bound for the HHI.

that the levels in India are amongst the lowest in the world. The BoAML (Bank of America-Merrill Lynch) Global Mobile Matrix estimates the outgoing RPM for the 48 markets in the matrix. Irrespective of the adjustment method adopted, it shows that India has the lowest or second lowest outgoing RPM in the 48 markets. The average RPM for all 48 markets was between 7 and 12 times higher than India.

Barriers to entry and switching costs are low

Once an operator has acquired spectrum and the necessary licence it appears that there are low barriers to entry into the Indian Market. This is partly evidenced by the high number of network operators in the Indian market compared to other markets. As can be seen in **Figure 5** below India is represented by the two red bars showing the average number of operators per circle and the highest number of operators in a circle. It has a significantly more fragmented market than any other country in the survey. Though, as we set out below, the fragmented nature of spectrum in India increases costs and creates inefficiencies.

Figure 5. Comparison of number of network operators



Taken from Parsons S and van Hooft L "Evaluating Whether Effective Competition Exists in Indian Retail Mobile Markets".

Further, customer switching costs are very limited, due to the high proportion of pre-pay users. Prepaid customers do not have any long term commitments to an operator and are able to easily switch between operators. The proportion of prepaid customers is much higher in India than other markets. A comparison of the percentage of prepaid customers is shown below in **Table 1**. India has among the highest percentage of prepaid customers – with almost the whole market

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Applying the best practice principles to forthcoming spectrum auctions in India

comprising prepaid market. This is much greater than markets in Europe (53%), Australia (41%) or North America (25%).²¹

Table 1. Percentage of prepay customers

	INDIA	BRICS	NTH AMERICA	EUROPE	EMERG' MARKET	AUSTRALIA	UK
Prepaid Percentage	97%	82%	25%	53%	84%	41%	52%

Source: BoAML Global Mobile Matrix, Q32011. Note the headline rate of prepay penetration masks the fact that a significant proportion of consumers use multiple SIMs.

3.1.2 The mobile market in India is fragmented

While the high numbers of market participants plays a role in ensuring that India's mobile market is competitive, the highly fragmented allocation of spectrum leads to a fragmented market. This can inhibit supply of services, reduce incentives to invest, increase costs and either result in unprofitability or increased prices. For example, this is illustrated by:

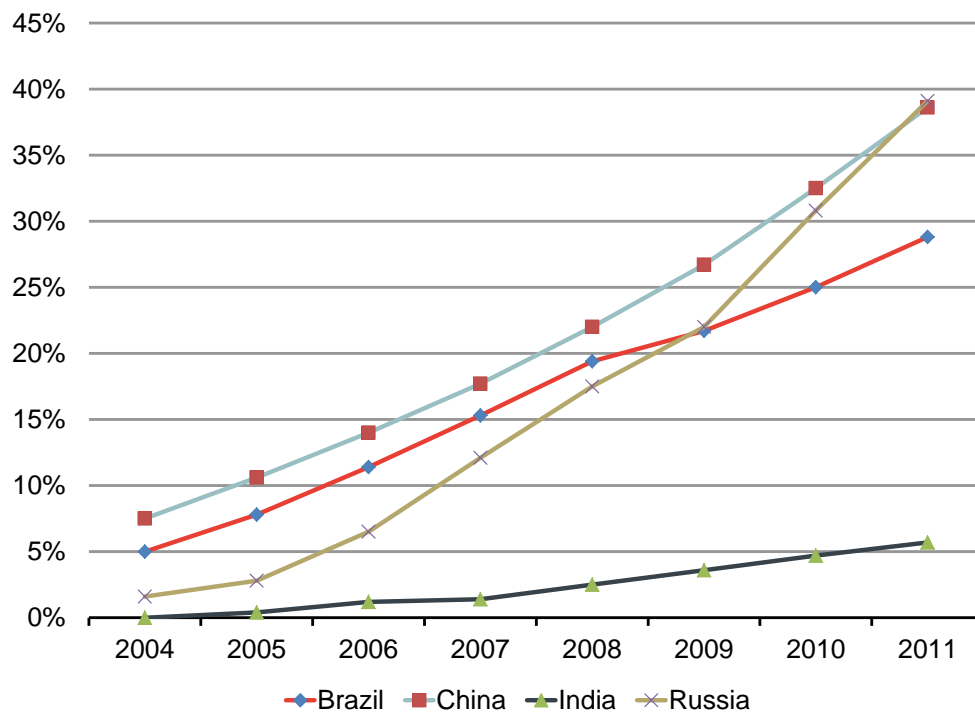
- Lower supply and lower take up of mobile broadband / data services in India than other comparable markets, as operators have to focus on ensuring network capacity is available for voice services; and
- The relatively high network costs of operators in India, as the lack of spectrum requires operators to deploy more sites and incur greater power costs.

Take up of mobile broadband services

Mobile broadband services can be important drivers and enablers of economic growth. However, the fragmented nature of India's mobile market inhibits penetration of mobile broadband services²². The low take up of mobile broadband in India is seen in **Figure 6**. Broadband penetration in India is significantly lower than other BRIC countries and has increased at a significantly slower rate.

²¹ See IT Facts, *17% of US Wireless Subscribers are Prepaid Customers*, October 23, 2008, available at <http://www.itfacts.biz/17-of-us-wireless-subscribers-are-prepaid-customers/11786> (showing 17% as the value). The weaker U.S. economy has likely pushed this value higher since 2008.

²² See also the Vodafone's response of 15 February to TRAI's pre consultation.

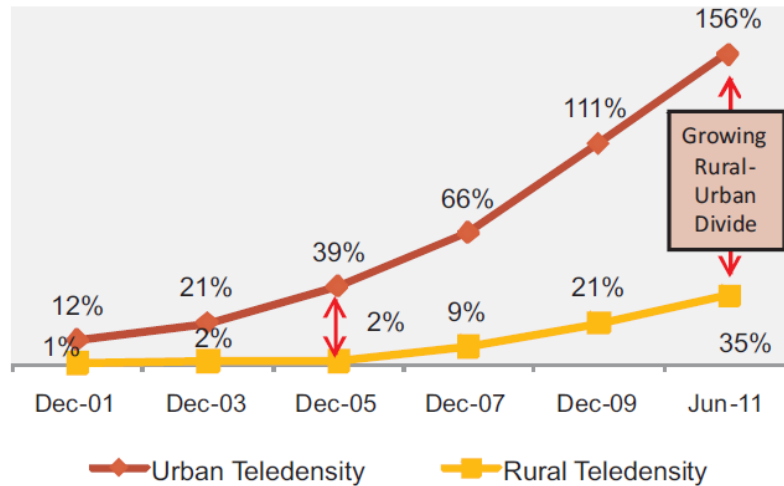
Figure 6. Broadband Penetration in BRIC Countries (December each year)

Source: Telegeography, GlobalComms database

The fragmented nature of the mobile market in India inhibits growth of mobile broadband services in two ways.

The fragmented market inhibits rollout of mobile in rural areas. The lack of mobile services in rural areas is illustrated in **Figure 7** which shows the penetration of mobile in rural and urban areas.

Figure 7. Evolution of Urban and Rural Mobile Teledensities, December 2001 – Jun 2011



Source: TRAI. PwC Mobile Broadband Outlook 2010. PwC Analysis.

The fragmented nature of spectrum allocation in India increases the costs of providing mobile services. Costs, and therefore ultimately prices, of mobile broadband services are higher. Due to fragmented supply of spectrum in India more towers are required by each operator to reach a given level of population. This in turn means that greater levels of power are required for a given number of consumers than would be the case in a less concentrated market which increases the costs of providing mobile services.

3.1.3 TRAI policy on spectrum allocation should balance the benefits of competition while avoiding the costs of excessive fragmentation

Given the market situation, it seems clear that future spectrum auctions should look to, as a minimum:

- Continue to ensure competition between mobile providers
- Prevent further fragmentation of the sector and ensure that operators have sufficient spectrum to run networks efficiently and continue to invest in those networks
- Promote the take-up of mobile broadband services.

In the remainder of this section we examine how these objectives can be promoted in the forthcoming spectrum auctions, taking account also of the best practice principles described in the previous sections.

3.2 Promoting an efficient outcome in forthcoming spectrum auctions

3.2.1 The spectrum available for auction

As set out above, broadband can generate significant economic gains. Mobile broadband is particularly important where the existing fixed infrastructure is not able to support broadband services. In India, where the penetration of broadband is currently very low, mobile services have a key role in deepening penetration of this important service.

However, these gains can only be realised where mobile services are offered in a competitive environment, where there is a supportive investment environment and where unnecessary costs of provision are minimised. Therefore in order to support the gains to society that wider penetration of broadband services brings, all available spectrum (i.e., spectrum which is not already allocated to productive use²³) should be made available for use.

Withholding spectrum from use imposes welfare losses on society

Artificially restricting the supply of spectrum will create a scarcity of supply which could:

- **Affect the ability of operators to deploy new services and increase coverage in rural areas.** Where spectrum is scarce, operators must use more towers to reach a given population. This increases the operators' costs both of investing in building towers and in the power costs of running more towers.
- **An artificial scarcity will tend to drive up spectrum prices.** This in turn could impact on retail prices (depending on how the price is levied), will restrict operator's incentive to invest and could lessen choice.

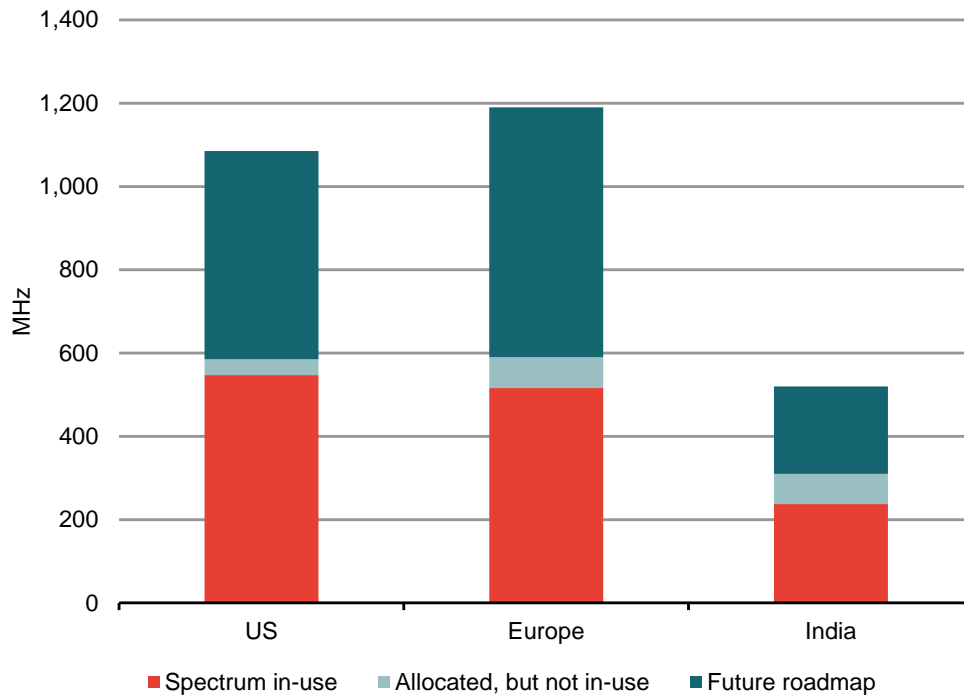
Spectrum should therefore only be held by the government in a non-productive capacity if the option value of doing so is significant and outweighs the loss to society from not awarding the spectrum now. Given the importance of the mobile sector, it may be unlikely that the option value outweighs this.

Furthermore there are strong justifications for increasing the amount of available spectrum for mobile use. Comparatively the amount of spectrum used for mobile services in India is low. This can be seen in **Figure 8** below where the amount of

²³ Note, however, this excludes spectrum currently used by licensees and which TRAI has identified as potentially being available due to "refarming" (i.e., due to the potential disruption from including in the auction spectrum already used by operators).

spectrum either used, allocated but currently unused or assigned for potential future use is significantly lower in India than the US or Europe.

Figure 8. Spectrum use in Europe, the US and India



Source: Vodafone

The lack of spectrum has a measureable effect on economic output and causes consumer harm. In some areas additional spectrum is necessary in order to relieve congestion and improve quality of service. Traffic varies geographically and sites need to be built in the areas where traffic is generated. However, in traffic hot spots we understand site density is already more than 100 sites/km² and cannot be increased due to physical limitations on rooftop space. Offering a greater amount of spectrum would alleviate some of the physical congestion and offer welfare enhancing benefits for consumers.

The average operator in India had been assigned 5.5 MHz of spectrum in 2008 with which to serve customers²⁴. However, Vodafone estimates that even in areas with high density of cell sites, at least 10 MHz is required for it operate its network efficiently today, given the volumes of traffic it is supporting on its network.

²⁴ Plum (2008) An assessment of spectrum management policy in India, A final report to the GSMA. Paragraph 3.3.

Further, where licences are technologically neutral, this problem will be avoided as operators are able to adapt to new technologies.

3.2.2 Ensuring continued technological neutrality in spectrum licensing

The mobile sector is characterised by rapid change as consumer tastes and technological capabilities evolve. In order that India is able to fully capture potential benefits of technological advances the principle of technological neutrality is already laid out in its licences: society benefits if holders of spectrum are not restricted in how they use spectrum.

We believe it is important to maintain this technology neutral approach.²⁵ This is because decisions over how firms should invest in the context of rapidly changing technology are inherently uncertain and risky. In choosing the efficient time, scale, speed and location of investments, firms have to consider uncertain costs of new technology and uncertain demand from consumers for new services. Government or regulatory restrictions which prevent firms from choosing how to invest are likely to impose high regulatory costs as regulators do not have the information to be able to efficiently choose the right level, timing and location of investment in new technology.

India's technologically neutral approach to spectrum ensures that spectrum is used in the most efficient way as technology or consumer demand changes over time. Firms are incentivised to make the investments in new technologies when it is efficient to do so, rather than being tied to legacy technologies, when more efficient alternatives exist.

A technology neutral approach to spectrum is a critical element of the licensing of spectrum in India. Moving away from technological neutrality would risk frustrating technological innovation and the efficient use of spectrum, as it forces government to "pick winners". However, while it may be efficient to "refarm" spectrum, in the sense of using spectrum which was previously used for 2G purposes for 3G or indeed LTE services, "refarming" does not mean that 900MHz spectrum should be taken from existing users of that spectrum and reallocated, even in return for spectrum blocks in other bands.²⁶

3.2.3 Redistributing 900MHz spectrum will impose significant costs

The TRAI is considering redistributing 900MHz spectrum when licenses come up for extension with existing users of that 900MHz spectrum having to build

²⁵ Technology neutrality does not mean that an owner of spectrum has an unfettered ability to exploit it even to the detriment of others.

²⁶ In other jurisdictions, "refarming" has been used to describe spectrum liberalisation, where licensing restrictions preventing operators using 900MHz spectrum for 3G have been removed and operators then allowed to use 900MHz spectrum (and other spectrum bands) for 3G. In India, we understand licences are already technologically neutral.

out a network using other bands. If implemented, such a policy will impose costs on operators and consumers.

This is because existing operators will have developed networks in a way which is specific to the type of spectrum that they hold. The “propagation” properties (i.e. the spectrum’s range and ability to penetrate inside buildings) of sub-1000MHz spectrum is different to higher bandwidth (indeed different bandwidths of sub 1MHz spectrum have different properties and may not be substitutable). This means that in order to reach a given population coverage holders of different types of spectrum will require different densities of masts. Therefore substituting 900MHz spectrum with a higher frequency spectrum such as 1800MHz will significantly alter the economics of provision of mobile services and increase costs. This is because mobile operators with 1800MHz will have to use a greater number of masts to offer a similar level of coverage to a holder of 900MHz.

Investing in new masts from which to transmit mobile services necessarily takes time. Until new masts have been built and fully commissioned there a significant risk of consumer disruption as significant number of subscribers would be left without mobile coverage as the existing sites would likely be insufficient for services using other bands.

The disruption and associated costs caused by arbitrarily allocating existing holders of 900MHz spectrum other frequencies, is likely to fall disproportionately on rural consumers. These consumers will be left completely stranded as existing service providers will be deprived of the spectrum used to serve the rural consumers whilst the new operator will have no network /presence and will take years to build up to the level of investments and presence of an existing 900MHz operator. The costs will reflect not just lost revenues from mobile operators by lost economic output as a result of consumers’ lack of access to mobile services.

3.2.4 Promoting auction participation

We understand that the TRAI is considering limiting the ability of existing operators to participate in the auction. It is not clear why this has been proposed as a possible option in the Indian context. This could only be a concern where letting existing operators participate could lead to consumer detriment, if for example it enabled holders of spectrum to exploit market power or otherwise limit the competitive process. However, we do not believe this is likely to be a concern in India given the highly competitive market, and in any case, restricting participation in the auction is likely to be a costly and inefficient way to mitigate this risk. It is important that participation in the auction is not unduly limited, either by excluding incumbent operators from the auction or limiting the auction to parties whose licences are being cancelled. This is for two reasons: first encouraging participation is likely to lead to a more efficient outcome; second, excluding incumbent operators could increase the costs related to the fragmented mobile market. While there might be technical reasons why the TRAI might

impose restrictions on the bidding process to ensure an efficient outcome and prevent gaming (for example regarding bidding for small blocks of spectrum as set out above), arbitrarily limiting the participation will tend to lead to inefficient outcomes. Furthermore, restrictions on the participation in auctions arbitrarily place the existing operators at a competitive disadvantage.

Encouraging participation leads to an efficient outcome

One of the purposes of using auctions to award spectrum is that auctions can reveal the value of the resource and result in an allocatively efficient spectrum allocation. The arbitrary exclusion of parties from participating in auction risks that the auction does not reveal the true value of the spectrum. This in turn leads to an inefficient outcome: as the spectrum is allocated and used sub-optimally, and revenues for the government from the auction are lower than would be the case if the participation was not restricted.

Excluding incumbents could increase fragmentation

We described above how the mobile market in India is highly fragmented by international standards. This has implications on the costs of providing mobile services and ultimately the prices that consumer pay for their services. Excluding incumbents from an auction could result in further fragmentation of the market, limiting incentives for operators to invest in high speed mobile broadband services and hindering take up of mobile services in rural areas.

Existing operators will be arbitrarily placed at a competitive disadvantage

Excluding incumbents from competing in the auction will mean that they will be arbitrarily limited in the amount of spectrum that they can hold relative to their rivals. This may offer rivals an unfair competitive advantage as they are able to build up larger blocks of spectrum at a lower cost than could be the case if it were open to all. This could lessen the scope for competition in the market which over the long term is likely to have negative consequences for consumers in terms of less choice, less innovation, and higher prices.

Furthermore, limiting the auction to those parties whose licences are being cancelled could, in effect, amount to an administrative allocation of spectrum. This would be counter to the requirements of the Supreme Court.

3.2.5 Ensuring the auction promotes the development of an efficient, competitive market place for mobile services

It is important that the auction promotes the continued development of competition in the Indian mobile market. Therefore, the auction should not enable mobile operators to acquire a sufficiently large proportion of available

spectrum which enables them to negatively affect competition. In some cases, such concerns have been mitigated by the use of “spectrum caps”²⁷.

Recent use of spectrum caps in auction design

In a number of jurisdictions, regulators have introduced the idea of “spectrum caps” to limit the amount of spectrum any operator can hold in particular bandwidths. Such a rule ensures that there is a sufficient (however defined) number of operators equipped to compete in the market. Examples of recent use of spectrum caps in auction design include²⁸:

- Germany’s recent spectrum auction of the 800MHz, 1800MHz, 2.1GHz and 2.6GHz bands, imposed caps which effectively limited two wholesalers (T-Mobile and Vodafone) to 2x22.4MHz and all other potential bidders to 2x20MHz of sub-1GHz spectrum. In contrast, the regulator did not impose any caps on the higher frequency spectrum in the auction, indicating their greater concerns regarding excessive concentration in the sub-1GHz bands.
- Sweden’s regulator cited the sub-1GHz spectrum as being “well suited for area coverage and indoor coverage” and imposed 2x10MHz caps in its recently completed 800MHz auction.
- In Ireland’s auction of the 800MHz, 900MHz and 1800MHz bands, the regulator has proposed a sub-1GHz cap of 2x20MHz. It identified sub-1GHz spectrum as “particularly important for competition in a service market such as this” and cited a technical study which identified the significantly fewer number of sites needed a 900MHz network needed to achieve the same service level as a network using higher frequency spectrum.
- In its auction of all mobile spectrum bands, Switzerland’s regulator has proposed a sub-1GHz cap of 2x30MHz, highlighting its relative importance by citing the bands’ “good propagation characteristics”. The 800MHz band is the only new spectrum band that has caps imposed on it, with the 2.6GHz band having no caps.
- Spain’s regulator has proposed a 2x20MHz sub-1GHz cap for its auction of all mobile spectrum bands.

²⁷ Alternatives might include “spectrum floor” where the number of holders of spectrum is limited to a number consistent with a competitive market.

²⁸ See Ofcom (2011) Consultation on assessment of future mobile competition and proposals for the award of 800MHz and 2.6GHz spectrum and related issues. Annex 6 paragraph 5.97. http://stakeholders.ofcom.org.uk/binaries/consultations/combined-award/annexes/Annex_6.pdf

Application of spectrum caps to India

It is possible that applying spectrum caps could also be appropriate in India, especially for sub 1GHz spectrum, where we understand most constraints exist. However, it would also be worth considering any alternatives which resolve the issue without the potential costs imposed by setting caps in a manner that turns out to be inefficient – e.g. making the “E-GSM” spectrum available in India. In designing a spectrum cap for India, it is important that operators are given sufficient ‘room’ to be able to gain enough spectrum to operate networks efficiently and roll out mobile data services (and services to more rural areas).

We therefore believe a reasonable compromise between these twin objectives could be to introduce a spectrum cap for sub 1GHz spectrum equal to 25% of the available spectrum in those bands. This will allow a minimum of four players in each circle and will (if all available spectrum is released for the forthcoming auction); enable players after that auction to have sufficient spectrum in sub 1GHz bands to run networks efficiently. In a large number of other jurisdictions, regulators have considered three to five participants to be sufficient to ensure competition consistent with competitive prices while enabling efficient investment in services and avoiding unnecessary costs. If necessary, spectrum caps could also be considered for other spectrum bands, although – as with any cap for sub 1GHz spectrum – such caps should only be introduced in the absence of any alternative measures seeking to limit spectrum scarcity and following a detailed analysis of the case for introducing a cap.

Such caps, by ensuring an even distribution of spectrum, will also remove the need for spectrum “refarming” (as defined by TRAI).

3.2.6 Minimum restrictions on spectrum bids

In addition to determining the amount of spectrum in the auction, TRAI will need to decide the appropriate size of spectrum blocks in the auction. The TRAI may also want to consider imposing minimum restrictions on the amount of spectrum that an individual bidder can bid for. This is because a small lot size in a clock auction where all winning bidders pay the same price could give an opportunity for an operator or new entrant to continue bidding only for one block of 1MHz, resulting in them paying a low absolute amount overall, but driving the per MHz cost artificially high across all the spectrum in the auction. This may be as a result of gaming behaviour designed to increase rival’s costs or may be an inefficient unintended consequence of the auction process. One way to mitigate this risk might be impose technical rule which only allowed bidding for small amounts of spectrum where the spectrum was intended to be used by the bidder, and to discourage, speculative bidding or bidding designed to raise rivals costs.

3.2.7 Setting an appropriate reserve price for the auction

In its consultation, the TRAI has set out various options for setting an appropriate reserve price. This included fixing the reserve price at the level of the final price for the 4th cellular licence, potentially adjusted for inflation. In support of this proposal, the consultation (paragraph 3.53) states that, “*the reserve price should be such that it enables a successful bidder to have an economically viable and bankable business plan within a reasonable period of time*”. A further proposal set out by TRAI is to set the reserve price according to the reserve price from the 3G auction, adjusted for the spectrum bandwidth to be auctioned.

For the reasons set out below, we do not believe it is appropriate to set the reserve price with reference to final auction prices, unless those final auction prices are discounted substantially first. This is because if a reserve price is set too high (by overestimating the value of the spectrum), spectrum will be left unallocated – a clearly inefficient outcome. One of the reasons for using an auction is the uncertainty around the value of the good for sale. It is therefore possible that setting a reserve price close to the expected value of the good will result in it not being sold, due to the estimate of the value of the good not being correct. Whilst a bidder’s final offer for a spectrum lot should enable it to have an economically viable business plan, the reserve price should not be set so that the bidder’s business plan becomes marginal at that reserve price. Rather, authorities should set a reserve price only to:

- deter frivolous bidders by setting a reserve price which deters non-serious bidders from entering the auction, thus enabling the auction to be concluded more quickly (and at lower cost);
- ensure that the final price of the auction will at least recover the administration costs of the award process;
- ensure that any social option value from awarding the spectrum later is reflected in the final auction price (i.e., ensuring that spectrum is not awarded now, if the social value of reserving the spectrum for future awards is greater than the private value of awarding the spectrum now); and
- limit collusion incentives between potential bidders (i.e., by limiting the potential gains from collusion).

None of these objectives points to setting such a price equal to the anticipated forward looking value of the spectrum. For example:

- Ensuring that the reserve price does not deter serious bidders from entering the auction points to using a relatively low reserve price, especially in conditions where the value of spectrum is uncertain. Any reserve price

which does deter a serious bidder from participating risks spectrum being left unallocated.

- The administration costs of any auction, whilst depending on the auction format, are likely to be low, especially when compared to the potential proceeds from the auction of spectrum used for mobile services. For example, these costs are likely to encompass primarily the costs of any auction software, any advisers hired to support the auction and the direct and indirect costs of the government and regulator's staff involved with the auction.²⁹ Although we do not have information on the costs of the 3G auction in India, these are likely to have been negligible, compared to the sums raised by the auction.
- Although it is not clear what level of reserve price would be required to deter bidders that a regulator may consider 'frivolous', any uncertainty in spectrum value should be reflected in setting a relatively low reserve price to meet this objective as well: an outcome where frivolous bidders and serious bidders are both deterred from entering the auction is clearly worse than an outcome where both participate. This is because in the first case, spectrum could remain unallocated, even though it would be welfare enhancing for that spectrum to be allocated to the serious bidder. Further, frivolous bidders may be expected to exit a multi-round auction early, whilst the marginal cost of an extra bidder participating in the auction is likely to be low. Finally, other auction rules (such as requirements for bid deposits, bank guarantees or pre-qualification) can also help to deter frivolous bidders.
- Any concerns over potential collusion can be addressed through the auction design, for example by limiting the potential for bidders to communicate, either directly, or indirectly through using pricing signals. Furthermore, given the highly complex and fragmented nature of the Indian mobile sector, it is not clear in this case that operators would anyway have either the incentives or the ability to collude. This is because collusion may be more likely to occur where bidders have similar incentives, as this would make it more possible for bidders to (tacitly or explicitly) "agree" an auction outcome. Lastly, collusion may be more likely to occur where there is only a limited number of participants in the auction. Therefore, not artificially constraining the number of eligible bidders will further help to reduce the possibility of collusion.

Finally, it is not the case that a higher reserve price should be used as an attempt to increase government revenues from an auction. TRAI sets out in Section 2

²⁹ It would be reasonable to expect that relatively more expensive formats would not be used to award less valuable spectrum rights.

(paragraphs 2.6 – 2.12) of its consultation a theoretical framework in which a relatively higher reserve price can maximise expected auction proceeds. However, this framework is a significant simplification of the real world situation in India and hence it is not clear it is applicable in this case. Indeed, TRAI acknowledges (in paragraph 2.10 of the consultation), “*that it is not generally optimal for the seller to choose the highest possible valuation that the seller believes a buyer may have*”. For the reasons set out above, we agree with this sentiment. But we note TRAI’s actual proposals would appear to run the risk of doing this, by potentially linking the reserve price to final prices achieved in other auctions. We do not believe this would be appropriate.

4 Other issues the TRAI should take into consideration

In this section we consider two other aspects which the TRAI should carefully consider before finalising its auction and spectrum allocation proposals. These are as follows:

- The potential impact of the current system of spectrum usage charges on both the auction and the development of competition in the market; and
- The possibility of relying on benchmarks from these auctions to determine an appropriate price for operators to extend existing 2G spectrum licences.³⁰

4.1 Spectrum usage charges in India

We have seen in Section 2 of this report that promoting the efficient use of radio spectrum is increasingly critical for an economy's development. In the pursuit of economic efficiency, and in the absence of spectrum auctions to determine an efficient allocation, some regulators have chosen to charge licensees on-going (normally annual) spectrum usage charges. Such charges have generally been applied for two reasons:

- Firstly, charges can be used to cover the costs associated with spectrum management.
- Secondly, in the absence of spectrum trading, usage charges, if set appropriately, can be used to promote an economically efficient use of spectrum (whereby a user may relinquish a marginal block of spectrum if the spectrum charge is greater than the value he attributes to that marginal block). Such charges could promote efficiency by setting the price according to the value of that block of spectrum to the marginal excluded user – if the current user of the spectrum values that block less, he will return it to the government, thus enabling the government to reallocate the spectrum to the user with the higher value.

In determining these charges it is important that regulators ensure that charges are not discriminatory (i.e., that they do not differentiate unfairly between licensees), that they do not distort competition and that they do not result in

³⁰ The list of topics covered in this report reflects the scope of our work agreed with Vodafone. Therefore, the exclusion of a topic from this report which had been covered by TRAI in its report should not be taken as Frontier concurring with TRAI's analysis.

spectrum being relinquished from its most productive use. Furthermore, where spectrum is acquired through an auction (with the fee payable upfront) there should be no requirement for further annual payments beyond administrative fees.³¹

In India, spectrum usage charges have also been applied to licensees. However, the level of charge differs between licensees and could potentially, if left in its current form, affect competition in the forthcoming auction and indeed in the market for mobile services more generally. The spectrum fee is calculated as a percentage of annual gross adjusted revenues, whereby that percentage varies according to the amount of spectrum held. Further the quantum of spectrum for GSM and CDMA is counted separately, allowing usage charges for operators holding both to be at lower rates. Further, 2.1GHz spectrum attracts usage charges based on the amount of “2G” spectrum held, thus resulting in operators who acquired the 2.1GHz spectrum through auctions paying different levels of spectrum usage charges. In the case of the BWA spectrum, these attract a usage charge of 1% of AGR with the BWA revenues being segregated and reported separately.

As set out in the table below, which takes Delhi as an example, taken altogether this means that, in effect, mobile operators are paying very different levels of spectrum fees.

³¹ Requiring operators to pay annual usage charges in addition to auction fees will also reduce the value of spectrum at auction, and hence reduce the initial revenues earned by the government at an auction.

Table 2. Average spectrum fees payable by national mobile operators in India

Operator	Spectrum holding (MHz)	Spectrum charge (as a % of AGR)	AGR, Quarter ended Dec 2010, Rs (in Crore)	Spectrum fee payable (Rs Crore) ³²
Bharti Airtel	10	6%	618.17	30.02
Reliance Communications	9.4MHz (4.4 GSM/5 CDMA)	3%	174.08	4.07
Vodafone Essar	10	6%	366.08	23.43
Idea	8	5%	137.02	6.16
MTNL	12.4	7%	79.85	3.54
New entrant	4.4	3%	N/A	N/A

Source: Frontier analysis, TRAI Financial Data pertaining to gross revenue, adjusted gross revenue, licence fee and spectrum charges in respect of the telecoms service providers for the quarter ending December 2010 of financial year 2010-11

Note the spectrum fees quoted in **Table 2** refer to the increased level of fees introduced after April 1st 2010. We understand these rates have been challenged by the operators and the matter is pending in appeal in the Supreme Court.

Unless this system is reformed, a situation is likely to arise where operators paying higher spectrum charges will attribute a lower value to available spectrum than other operators. This is because these operators will earn lower (net) revenue³³ from mobile services than new entrants who pay a lower spectrum fee and in a competitive market, such as that in India, will not be able to charge higher prices to compensate for this. Indeed, these differences are likely to be magnified as the higher level of spectrum fees payable under different spectrum 'slabs' are payable on all adjusted gross revenues of the operator – meaning the marginal fee rate from acquiring an additional block of spectrum could be significantly above the average rates quoted in the table above.

If such differences arose as a result of fundamental differences between the operators' business plans, an auction outcome which awarded the spectrum to the parties valuing it most highly would be efficient. However, where this outcome arises only from government pricing decisions it is not likely to be

³² Spectrum fees payable are as quoted by the TRAI document. We note that these do not necessarily equate to the AGR multiplied by the spectrum charge.

³³ Net of spectrum fees.

efficient. This is because the different spectrum valuations attributed to the parties are not related to the value that each party can create with the spectrum. In essence, therefore, without changing the pricing regime, the forthcoming auctions could unduly favour new entrants to the market. This would be counter to the need to run auctions which are fair and equal.

Further, the current fee structure could distort substantially the decisions of individual licensees in the forthcoming auction. Indeed, to the extent that operators acquire additional spectrum to support the expansion of their networks and services, this fee structure would appear to adversely affect operators with larger spectrum holdings and support the fragmentation of the market described above. (As we have set out above, if TRAI or the Government is concerned about the level of competition, post-auction, it could consider using spectrum caps to limit the amount of spectrum a licensee can hold.)

4.2 Using benchmarks to set spectrum prices

In a previous recommendation, TRAI recommended valuing spectrum in the 900MHz band at 1.5 times the value of spectrum in the 1800MHz band.³⁴ We understand this proposal was accepted by the Government of India. It is not clear from the current consultation if this position still stands. However, if it does, we presume it would mean that for operators wishing to extend their 900MHz spectrum licences, the extension price would be based on the outcome of the forthcoming auction for 1800MHz spectrum (with this price then also being paid by any operators who may be 'granted' 900MHz spectrum, if the TRAI's proposed refarming plan continues).

In this section we consider the potential merits of this approach and conclude that only in very specific circumstances will past auctions provide a useful indicator for spectrum values. In many cases the implied valuations from auctions will not be suitable for use as benchmarks of other spectrum values. Specifically, whether the auction price provides useful information will depend on:

- whether the spectrum that was auctioned provided entry opportunities, the ability to launch new technology or additional spectrum for existing networks;

³⁴ TRAI, "Recommendations on Spectrum Management and Licensing Framework", 11th May 2010

- whether the structure of the auctions and the spectrum being auctioned provides information on the valuation of the marginal excluded user;³⁵ and
- whether the market environment in which the auction took place closely matches the forward looking environment for prices.

These factors are addressed below.

4.2.1 Factors affecting whether an auction result can provide a reasonable benchmark of other spectrum values

Entry and new technology opportunities

Where auctions have been used to allocate spectrum in an unallocated band which allows the roll out of new technology (such as the auctions of IMT-2000 (3G) spectrum around 2000), valuations may reflect the high valuations placed on the ability to offer new applications. In this case, the average price paid for the spectrum may be considerably higher than the marginal valuation of this spectrum, reflecting the ability to enter the new market for the related applications (high speed packet data services in the case of the initial allocations of 3G spectrum). This means such auctions may not provide a benchmark of the value attributed to a marginal block of spectrum by an existing user and as such prices set according to this may be set too high – potentially leading to users relinquishing spectrum when it would be economically efficient for them to retain that spectrum in productive use.

There have been some cases of auctions used to allocate additional spectrum which does not directly allow the launch of new services and where the spectrum is not sufficient to allow new entry. Examples are auctions of additional 900 or 1800 spectrum where the only bidders are existing operators. In this case the price should reflect the value to the marginal excluded user, in this case mobile operators who do not acquire additional spectrum. Subsequent to the two further considerations set out below, the results of such auctions may therefore provide a more useful information source for determining spectrum charges.

Auction format

An auction will only give a reasonable indication of the value of a marginal block of spectrum if it is designed appropriately. Some auction formats may have been explicitly designed to allocate spectrum efficiently and have a structure which results in the bid level being a good approximation of the value of the marginal

³⁵ As set out in Section 1, the value of a block of spectrum is based on the value of that block to the marginal excluded user (i.e., the user with the next highest valuation of the spectrum, after all the available spectrum has been assigned to users with the highest valuations).

excluded user. However, even in this case the prices paid may not reflect the full value of the spectrum, or bidders may over-pay.

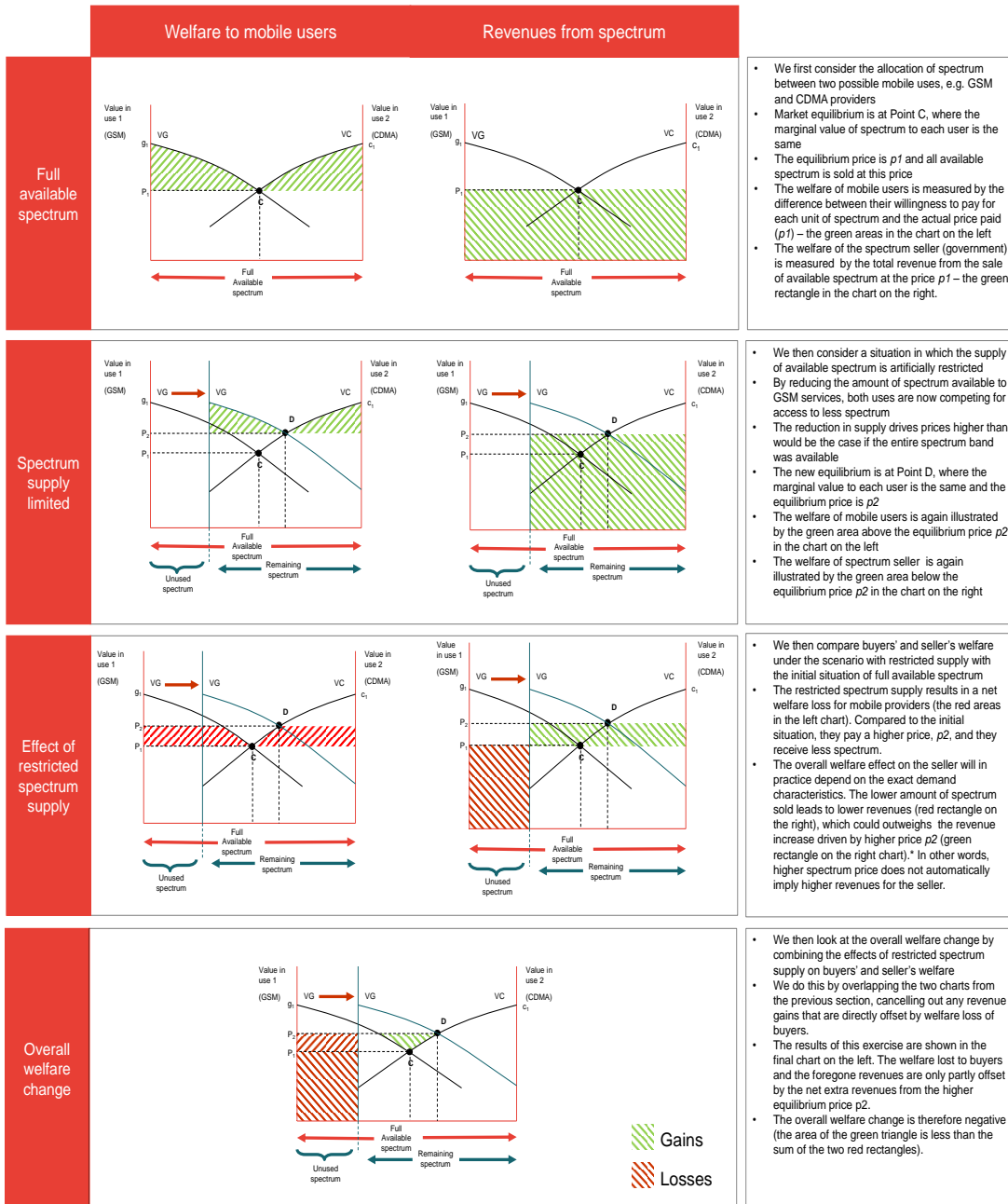
In other cases auction designs may be such that they are not likely to provide a reasonable estimate of the value of the marginal spectrum block. For example, some auctions may be designed to raise revenues or may have other features which inflate final spectrum prices. Potentially more significantly, auctions where the quantum of spectrum is artificially restricted may result in an inflated estimate of the true value of spectrum. In these cases it would not be reasonable to derive other spectrum charges on the basis of the auction results.

In other cases, auction rules could potentially limit the implied value of the spectrum, for example if the number of eligible participants in the auction is restrained artificially. Again in these circumstances an auction would not provide a true indicator of the economic value of the marginal spectrum block.

Market environment

Prices paid at auction for apparently similar spectrum, even when normalised (for example by converting prices to a cost per MHz per population), show great variation between jurisdictions and over time. For example, variations over time could reflect a range of factors such as the maturity of the market, stage in the technology lifecycle and the availability of funding. Given the difficulty of controlling for such factors, the most appropriate course may be to restrict any benchmarking to auctions which are recent and are for the same or similar frequency bands.

Annexe 1: Welfare effect from restricting supply of spectrum



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