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Kind attention: **Shri Sudhir Gupta, Advisor (MN)**

Subject: **Responses to TRAI Consultation paper No. 6/2009
(16th October, 2009) on “Overall Spectrum Management
and review of license terms and conditions”**

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Sir:

Kindly refer to TRAI Consultation paper No. 6/2009 (16th October, 2009) on “Overall Spectrum Management and review of license terms and conditions”. TRAI solicited comments on that paper and here is our response.

Preliminary Comments

As the consultation paper notes, “Spectrum management is one of the most critical issues in deciding the future of telecommunication in the country”. So it is perhaps unfortunate that the consultation mixes fundamental spectrum policy questions of a general nature with many narrow issues specific to certain services like mobile telephony and allows just 3 weeks for the public to respond. Combining so many broad and narrow issues ensures that the responses will be either incomplete or superficial. More useful information might have been gathered in a series of smaller consultations than in one “flash flood”. Be that as it may, this response lists only the questions for which we provide answers.

3. How can the spectrum required for Telecommunication purposes and currently available with the Government agencies be re-farmed?

This is one of the most important questions for India to answer as it will set the pace of economic development and social modernisation for many years to come. A first step which seems essential to successful re-farming is the licencing of all spectrum use by government agencies. A report in the February 2004 issue of *India Telecom* said that “As part of the new spectrum policy, from April 1, 2004 government departments and agencies, including the defence and police, will have to pay licence fees and royalties for radio frequency spectrum”. But we know nothing of the size of the fees - if they are sufficient to discourage hoarding of unneeded spectrum - if the fees have

been widely and rigorously applied, or if this policy is still in effect. In any case, licencing makes agencies' use of radio frequencies clearly revocable - when the licences are limited in duration, as they should be. The approaching end of the licence period should trigger a review of the continuing need for the channels. That is to say, the renewal of governmental radio licences should not be automatic since conditions change: radio technology and demand for wireless services are both evolving.

Many countries licence government agency use of spectrum and collect fees from their agencies based on the potential market value of the allotted frequencies, not just on the administrative costs of managing the spectrum:

- In Canada, Bill C-3 - enacted in March 1987 - amended the Radio Act to eliminate the preferential treatment given to federal, provincial and municipal government bureaux - including police and public safety agencies - in the setting of licence fees for spectrum use.
- Australia was among the first to impose spectrum use fees on its defence, public safety and security agencies. According to the Communications and Media Authority, fees for governmental bodies' use of spectrum reflect the opportunity cost (the value of the "best alternative use" of that spectrum) along with the cost of managing the spectrum. State, territorial and commonwealth agencies now pay spectrum fees comparable to what commercial licensees pay. Only entities providing public safety services staffed mainly by volunteers (such as search and rescue teams and rural ambulance services) are exempt from fee payment. Nevertheless, an independent review of government spectrum holdings in 2007 found the fees are still not high enough to ensure the efficient use of spectrum:

“Only very large and unpalatable licence fee increases may address that, though the greater use of market allocation methods such as auctions or secondary trading may help... It should be possible for Defence to compete successfully [against commercial bidders] in an auction using the resources available to it. It would enable the ADF to make a judgement about paying for spectrum versus investment in other areas such as training, other weapon systems, etc. Or, Defence could seek additional funding from the Government in order to bid. From the Commonwealth Government's point of view, this is a no-cost exercise (as the money received from the auction would flow back to Consolidated Revenue). However, by helping to identify the true cost of spectrum the Government would be better placed to make decisions about whether it wishes to use the money for this purpose.”¹

- In his 2005 audit of the UK Government's spectrum holdings, Prof. Martin Cave recommended a 2-to-4-fold increase in the annual spectrum use fees paid by the Ministry of Defence and suggested that if MoD needs more spectrum it should bid at public auctions. More importantly from India's perspective, Prof. Cave described an approach to public/private band sharing that provides great

¹ *Independent Review of Spectrum Holdings - Final Report* (April 2007), pages 66-67, by SpectrumWise Radiocommunication Consulting - http://www.acma.gov.au/webwr/assets/main/lib310647/irgsh_report.pdf

flexibility and gives government agencies a strong incentive to exploit spectrum efficiently. In his scheme, the primary user of the band would pay for the spectrum, and then collect fees from secondary users, at rates negotiated and agreed between the parties. When a Government service is the primary user, it pays for the spectrum and is entitled to sublet frequencies or make sharing arrangements with private users. (These sharing arrangements might be interruptible under agreed conditions, *e.g.*, emergencies.) When a private firm is the primary user, a government office needing more spectrum could rent frequencies at what both sides consider a fair price. To encourage this decentralised, market-based approach to band sharing, government agencies and private licencees would both be allowed keep their income from renting out spectrum.²

5. How and when should spectrum in 700 MHz band be allocated between competitive services?

The “Summary record of the meeting of [National Frequency Allocation Plan] Review/Revision Committee held on 25 June 2009” contains this passage:

“While unveiling the NFAP-2008 document, Secretary, DOT... mentioned that 700 MHz band has been found very suitable for broadband services, especially for rural areas which many countries are deploying and he desired that India should also work for 700 MHz in order to make use of the same”.

We, too, support the allocation of 700 MHz spectrum to broadband services, with priority for services in rural areas. However, the 3G business model is such that other network types - WiMAX, for example - would bring greater benefits to more people at lower cost.

6. What is the impact of digital dividend on 3G and BWA?

The UHF band’s favourable propagation characteristics enable wide area coverage with a limited number of base stations, greatly reducing the cost of network build-out. This cost reduction makes UHF ideal for “digital inclusion” projects, just as UHF television had earlier provided a kind of “analog inclusion.” UHF’s reduction of coverage costs is attractive to network operators in urban areas because higher profit margins are possible. But for India’s social policy goals, it is much more significant that lower build-out costs make voice and/or data networks in less densely populated areas economically viable. The digital dividend offers a unique opportunity to deliver affordable, high quality telecommunication services to currently unserved and underserved rural areas.

However, there is also “unfinished business” in India’s development of broadcasting which should not be forgotten in the rush to broadband. TRAI’s recommendations on Terrestrial TV (including community TV) have been gathering dust since 29 August 2005. From a regulatory perspective, it would be easier to award some channels freed by the switchover from analog to digital to new TV stations providing local

² *Independent Audit of Spectrum Holdings - Final Report* (December 2005) by Martin Cave – <http://www.spectrumaudit.org.uk/pdf/caveaudit.pdf>

programming than it would be to devise new rules for the coexistence of broadband and broadcasting. Indeed, even before digital switchover, there is underused spectrum in India's TV and FM bands which could be assigned to low-power stations almost immediately. Broadcast receivers are widespread, even among the poor, as are content producers: the wedding market ensures that every village has someone with a video camera, a microphone and the ability to edit.

In this consultation, TRAI appears to distinguish between the 700 MHz band and the "digital dividend". The situation is similar in Asia, Europe and North and South America, where regulators are discussing how to use UHF channels that have been completely cleared of television broadcasting, and, separately, how to use the "interleaved" UHF channels in bands which have not been fully cleared of broadcasting. So-called "white space" exists in any geographic area not licensed to a broadcaster - particularly in rural areas, since broadcasters prefer to operate in densely populated locales. The US Federal Communications Commission has ruled that the TV "white spaces" can be used on a non-interfering basis by licence-exempt devices possessing "cognitive" capabilities - that is to say, with either location awareness or the ability to detect and avoid primary users of the spectrum.³

More recently, CITELE, the association of telecom regulators in North, Central and South America, and CEPT, the European committee of telecom authorities, have both started work on region-wide standards for unlicensed cognitive use of "white spaces".

Large numbers of Indian engineers are working on other countries' cognitive radio development projects. If India were to authorise the use of TV "white spaces" for rural broadband access networks, too, then this country could quickly claim a central position in the creation of a technology that is bound to shape radio's future - and which could, at the same time, alleviate the acute shortage of spectrum for privately owned wireless networks in India. Once cognitive radio proves effective in the UHF band, it will spread to other parts of the spectrum and enable bands currently reserved for exclusive use to be shared with low risk of interference.

7. Should the spectrum be delinked from the UAS Licence? Please provide the reasons for your response.

Some countries distinguish between a spectrum licence, which confers the right to use a radio channel without interference, and a service licence, which confers the right to offer the public a commercial service. Countries that require *both* types of licence for commercial wireless services find it easy to make decisions for each type of licence

³ See "Regulatory Tutorial Material" compiled for the IEEE White Spaces Study Group (March 2009) - <https://mentor.ieee.org/802-sg-whitespace/dcn/09/sg-whitespace-09-0048-05-0000-regulatory-tutorial-material.ppt>; "GL-05 - Interim Technical Guidelines for Remote Rural Broadband Systems Operating in the Band 512-698 MHz (TV Channels 21 to 51)", Industry Canada (March 2007) - <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08739.html>; "FCC Adopts Rules for Unlicensed Use of Television White Spaces", FCC press release (November 2008) - http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-286566A1.doc; and "Microsoft, Dell, Spectrum Bridge launch first public white spaces network", *Network World*, 21 October 2009 - <http://www.networkworld.com/community/node/46577>

contingent on the other licencing body's action, which can put applicants in a "double bind" that practically invites bribery.⁴

If delinking from UAS were to allow spectrum use without a spectrum license, we would support that. The extraordinary creativity and accelerated cycles of product innovation unleashed by the opening of the 2.4 GHz band to licence-free communication suggests how much better off we would be if the heavy hand of bureaucratic control was lifted in other bands, too.

10. Is there a need to put a limit on the maximum spectrum one licensee can hold? If yes, then what should be the limit? Should operators having more than the maximum limit, if determined, be assigned any more spectrum?

There is a need to put a maximum limit on the spectrum held by one licensee, the Government of India. Whatever percentage of the spectrum it now holds, that amount should be reduced by half - through sharing and transfer to nongovernmental users - during the next 10 years.

14. Is there a need to do spectrum audit? If it is found in the audit that an operator is not using the spectrum efficiently what is the suggested course of action? Can penalties be imposed?

Last summer's press reports that mobile network operators exaggerate their claimed subscriber base numbers in order to gain more spectrum illustrates the need for a spectrum audit.⁵ Australia's audit of government spectrum holdings (quoted in our answer to Question 3) reveals another consideration: most government agencies are *unable* to improve the efficiency of their spectrum use because they lack essential data on how their radio systems are currently being used. Thus a comprehensive spectrum audit - one not limited to specific services or commercial bands - would be a far more valuable policy tool than a limited audit like the one DoT is conducting now.

And yet "efficient use of spectrum" can be defined and measured in many different ways. Which definition and metric to use in the audit are important enough questions to be the focus of a another public consultation before the audit begins. We would argue that *spectral efficiency* (using the least amount of spectrum to transmit the greatest amount of information) is much less important than *economic efficiency* (creating the most value to society with the least - or least costly - inputs). Spectrum should not be treated as an isolated variable; it is just one resource among many others.⁶

⁴ A dual licencing system designed to abuse broadcast applicants is described in "A Law that Can Stamp Out the Last Vestiges of Independent Radio and TV in Ukraine", by V. Yavorsky, *Telecriticism*, 14 May 2003 - http://www.telekritika.kiev.ua/comments_eng/?id=8659; see also "Majority of Corruption Cases in China Linked to Licensing: Official", *People's Daily*, 30 August 2003 - http://english.people.com.cn/200308/30/eng20030830_123408.shtml

⁵ See, for example, "Fudged numbers: DoT roll call for cell users", by Joji Thomas Philip, *The Economic Times*, 27 July 2009.

⁶ This is a digression from our main argument but we must note that scarcity alone does not justify the rationing of goods. Attractive women are scarce - should the government ration them?

What should be measured in the audit is *not* the number of subscribers per MHz but *the total social benefit generated from each service, per MHz*. This is not the same as the anticipated value of spectrum at auction. Since social benefits are diverse and often hard to quantify, an expert team of social scientists (including but not limited to economists) should make this calculation for TRAI and DoT. Regulators may well discover from this exercise that radio-based services vary widely in per-MHz value to society, as they do in average efficiency of spectrum use. If *economic efficiency* is the key factor, does that mean penalties should be imposed on those who provide less valuable services? No. Penalties are not the best way to promote either spectral or economic efficiency. Allocations which maximize benefits to society are the way to promote the efficient use of resources.

15. Can spectrum be assigned based on metro, urban and rural areas separately? If yes, what issues do you foresee in this method?

The distinction between “urban” and “metro” in this context may need clarification, as well as an explanation of why this distinction is useful.

24. Is spectrum trading required to encourage spectrum consolidation and improve spectrum utilization efficiency?

The meaning of “consolidation” in this context is unclear. If it means an excessive concentration of spectrum rights, then no, spectrum trading is not required to encourage spectrum consolidation. Regulators can achieve that all by themselves - without spectrum trading - by issuing licences whose conditions encourage the formation of cartels, monopolies and other anti-competitive arrangements. Terrestrial television broadcasting in India is a good example of consolidation without spectrum trading. On the other hand, trading can improve the efficiency of spectrum utilization - as can subletting (see the answer to Question 3).

30. Should size of minimum tradable block of spectrum be defined or left to the market forces?

Market forces.

31. Should the cost of spectrum trading be more than the spectrum assignment cost?

This should not be a matter for regulators to decide.

32. Should Spectrum sharing be allowed? If yes, what should be the regulatory framework for allowing spectrum sharing among the service providers?

Sharing should be allowed whenever it is practical. Regulations to limit sharing should only be introduced when a sharing problem arises that cannot be resolved without government intervention.

In the case of mobile telephony, modern handsets seem to be able to select the correct service provider's signal even in the presence of many other signals, which suggests that exclusive frequency block assignments for each carrier are no longer necessary,

at least in the GSM and CDMA bands. Frequencies could be deployed as needed in each zone, dynamically, according to fluctuating levels of traffic, perhaps with real-time channel auctions among carriers.⁷ A less flexible approach to frequency management may *contribute* to congestion; conversely, congestion might be relieved by more flexible sharing.

33. What should be criteria to permit spectrum sharing?

Only that harmful interference should not be caused to band users entitled to protection.

34. Should spectrum sharing charges be regulated? If yes then what parameters should be considered to derive spectrum sharing charges? Should such charges be prescribed per MHz or for total allocated spectrum to the entity in LSA?

If the sharing arrangement is the result of the assignment of channels by the regulator and usage charges are to be paid to the Government, then the charges might be regulated. If the sharing arrangement is the result of negotiations between users of the spectrum and the charges are mutually and voluntarily agreed, then they should not be regulated at all.

37. Should there be a time limit on licence or should it be perpetual?

No radio licence should ever be perpetual. Radio technology and public demand for specific services change over time, and need to be reconsidered periodically.

57. What in your opinion is the desired structure for efficient management of spectrum?

We appreciate the opportunity to deliver our views to TRAI on important policy matters before they have been decided. But with all due respect, TRAI only makes recommendations. It is not the regulator, and the regulator is free to ignore TRAI's best efforts. A consultation like this should have been initiated by DoT, and the fact that it wasn't shows a major shortcoming in the way spectrum is managed in India: those who listen have little power while those with power tend not to listen. What is needed is more accountability and transparency in decision-making, as well as much more openness to input from stakeholders and telecom users - *i.e.*, the general public.

It is also a problem that responsibility for managing the radio spectrum is shared among three dozen members of the Standing Advisory Committee on Radio Frequency Allocation (SACFA). If even one SACFA member opposes a licence application, that is enough for the application to fail. The deck is stacked against anyone who innovates, which clearly threatens India's socioeconomic development.

⁷ As TRAI notes in paragraph 2.49 of the consultation document, "innovative technologies such as Dynamic spectrum access (DSA), Software defined radio (SDR), and cognitive radio (CR) are likely to be play a crucial role in encouraging spectrum sharing in future". An in-depth study of DSA for mobile telephony is reported in *Specification and Performance of Dynamic Spectrum Allocation including Evaluation of Spectrum Coexistence* by Paul Leaves, Michele Breveglieri, David Grandblaise, Christian Hamacher and Fabien Migneret (February 2004) - <http://www7.informatik.uni-erlangen.de/~dulz/fkom/06/Material/12/OverDrive/overdrive-wp1-D13-v1.0.pdf>.