By Guru Acharya

Question 1

At this stage it is difficult to speculate whether or not the incumbents will win back spectrum in the 900 MHz band. Therefore, to reserve spectrum in the 1800 MHz band on the basis of only speculation is not the ideal approach. It would be preferable if spectrum is reserved for refarming in the 1800 MHz band after the outcome of the 900 MHz band auction is known which will reveal detailed information about which incumbents need spectrum to be reserved in the 1800 MHz band. At the outset, it is argued that this uncertainty in reserving spectrum for refarming is artificial and finds its roots in the flawed premise that 1800 MHz must be auctioned before knowing the outcome of the 900 MHz auction. This can be avoided by scheduling the 1800 MHz auction after the results of the 900 MHz auction are declared. In this case, the NIA for the 1800 MHz auction should be designed on the basis of the results of the 900 MHz auction.

The auction of the 900 MHz spectrum should be kept separate from the auction of the 1800 MHz band. In this, the 900 MHz spectrum should be auctioned first and the 1800 MHz spectrum should be auctioned second with a gap of at least one month. Specifically, the details of the NIA for the 1800 MHz spectrum should be finalised only after the conclusion of the auction of 900 MHz spectrum so that an informed decision regarding the need to reserve spectrum can be taken. Spectrum in 1800 MHz should be reserved only if the incumbent operators fail to win back their spectrum in the 900 MHz band. This way there will be no uncertainty in the need to reserve spectrum. If spectrum in the 1800 MHz band is reserved before the results of the auction of the 900 MHz band are declared, then there are chances of jacking prices by creating an artificial shortage or of innocently forcing an established operator to exit.

To comply with the Supreme Court Judgement that all vacated 1800 MHz spectrum should be put for auction, the reservation should be enforced in the form of eligibility conditions for participating in auctions. Specifically, for that quantity of spectrum required for refarming, eligibility should be enforced with the criteria that only those incumbent operators who have lost spectrum in the 900 MHz band are eligible to participate. The remaining spectrum should be kept open to all. The reserved category must be required to match the winning bids of the open category or the highest in the reserved category, whichever is higher.

In case any operator fails to win back 900 MHz and needs to migrate to 1800 MHz, such an operator will need overlapping spectrum (both 900 MHz and 1800 MHz) for a time period ranging from 6 months to 2 years in order to ensure a seamless transition and to maintain continuity of services.

There are 2 options for implementing the migration from 900 MHz to 1800 MHz depending on the availability of parallel spectrum in the 900 MHz and 1800 MHz bands:

- Option 1: The first option involves allotment of parallel spectrum in the 900 and 1800 MHz bands for a period of approximately 2 years wherein the operator implements continuous cluster-wise swapping of the existing 900 MHz Base Transceiver Station (BTS) with the live 1800 MHz BTS over the said time period.
- Option 2: In the second option, parallel spectrum is made available to the incumbent operators for a period of only 6 months and involves setting up the entire 1800 MHz network (in non-radiating state) in parallel to the live 900 MHz network before initiating the transition when the parallel spectrum is made available.

The annexed Excel file highlights the detailed processes involved for each of the two options along with the challenges faced in their implementation. This may be used as a template in case any operator fails to win back spectrum in the 900 MHz band.

The cost involved in migration have been analysed while addressing Question 16.

The following points may be noted:

- In case an incumbent operator loses spectrum in the 900 MHz band, the regulator will need to decide whether the operator should be charged for the parallel/simultaneous/dual use of spectrum in the 900 MHz and 1800 MHz band while migrating. It is recommended that refarming may be incentivised by recommending that operators not be charged for parallel use of spectrum for that duration.
- It is further important to note that in case an incumbent operator loses spectrum in the 900 MHz band, the new winner of the same band will receive possession of the spectrum only once the migration has been completed. Therefore, the NIA for 900 MHz should clearly mention that possession will of the spectrum will not be granted for at least 2 years.
- As noted above, the NIA for 1800 MHz auction should be finalised only after the declaration of the results of the 900 MHz auction.

Question 2

At the outset, it is reiterated that the uncertainty in reserving spectrum is due to the flawed assumption that 1800 MHz must be auctioned before knowledge of the outcome of the 900 MHz auction. This can be avoided by designing the 1800 MHz auction after the successful completion of the 900 MHz auction and on the basis of the results of the 900 MHz auction.

The 900 MHz auction should be conducted for all licenses that are expiring between 2014 and 2016. It should not be restricted to only the metros. However, at the present stage, spectrum should not be auctioned (or reserved) for any licenses in the 900 MHz band expiring after 2016. Specifically, licenses expiring between 2014 and 2016 should be collectively auctioned in one go for the reason that the migration processes (from 900 MHz to 1800 MHz) for all of licenses will need to start simultaneously (or at least planned simultaneously) in order to benefit from economies of scale and for proper utilisation of resources. If auctions are only conducted for the spectrum in the metros then it will create an unfair bias towards the licenses expiring in 2015 and 2016.

Once the results of the 900 MHz band are released, the following possibilities may emerge:

- Scenario 1: All incumbent operators win back their spectrum in the 900 MHz band
- Scenario 2: A few operators do not win back their spectrum.
    - Scenario 2.1: That spectrum remains unsold and may be re-auctioned.
    - Scenario 2.2: That spectrum has been won by another operator and the incumbent needs to vacate the spectrum.

In case of Scenario 1, assuming that the NIA for the 1800 MHz band is finalised after the results of the auction in the 900 MHz band are declared, there should be no problem as DoT need not reserve any spectrum in the 1800 MHz band.

In case of Scenario 2.1 or a partial mix of Scenario 2.1 and 2.2, wherein there remains some spectrum in the 900 MHz band that has not been successfully sold in the auction, it should be mandated by TRAI that no spectrum in the 1800 MHz band should be auctioned till all spectrum in the 900 MHz band is successfully auctioned. For this, the reserve price of the unsold 900 MHz spectrum should be lowered and re-auctioned. This iteration should be repeatedly followed till all

spectrum in the 900 MHz is successfully auctioned. Alternately, the reserve price for 900 MHz should be kept low to begin with to ensure that all spectrum in 900 MHz is successfully sold. As a result of this process, Scenario 2.1 will transform to either Scenario 1 or Scenario 2.2.

In case of Scenario 2.2, wherein all spectrum in the 900 MHz band has been successfully sold and there are a few incumbent operators who need to vacate the 900 MHz band (lets call them ejected operators), the NIA for 1800 MHz needs to reserve spectrum for these ejected operators in the form of eligibility conditions for participating in the auction. It is again assumed here that the NIA for 1800 MHz is only finalised after the conclusion of the 900 MHz auctions. If there is isn't ample spectrum in the 1800 MHz band to accommodate all ejected operators, the auction design should cap the maximum spectrum per ejected operator to the bare minimum (equal distribution), but the NIA should promote spectrum sharing and mergers between these ejected operators. This could also be incentivised by relaxing sharing/merging rules for these specific entities.

Spectrum expiring after 2016 (both PSU and private) are not of urgent concern as the GSM ecosystem may lose its sheen in the forthcoming years. If the need be, the spectrum expiring after 2016 can be liberalised in the hands of the incumbents administratively on paying auction determined prices. This should not significantly affect the level playing field as by then the LTE ecosystem for other bands such as 700 and 800 would have sufficiently developed.

If refarming is rejected by TRAI in the course of this consultation, it is suggested that each player be asked to vacate spectrum in excess of 4.4 MHz in the 900 MHz band on the expiry of license. This vacated spectrum can then be auctioned to determine the market price which may be administered for the remaining 4.4 MHz in the 900 MHz band in the hands of the incumbent operators.

Question 3

If 1800 MHz auction is designed after the results of the 900 MHz auctions, then the reservation in the 1800 MHz should be enforced in the form of eligibility conditions for participating in auctions. Specifically, for that quantity of spectrum required for refarming (for accommodating the ejected operators), eligibility should be enforced with the criteria that only those incumbent operators who have lost spectrum in the 900 MHz band are eligible to participate. The remaining spectrum should be kept open to all. The reserved category must be required to match the winning bids of the open category or the highest in the reserved category, whichever is higher. This method would be in compliance with the Supreme Court requirement for auctioning all 1800 MHz spectrum as reservation is enforced in the form of eligibility conditions.

Question 4

-

Question 5 & 6

The regulator should consider allowing market trading of roll-out obligations. This has significant potential to make the networks more efficient. For example, if Airtel is expanding to remote rural areas as a result of which it surpasses its roll-out obligations, and if Vodafone does not have adequate footprint and is behind schedule on its roll-out obligations, in this case Vodafone should be allowed to purchase roll-out credits from Airtel in order to meet its roll-out obligations. This would further finance Airtels expansion in rural areas instead of duplication of the network in the same areas by Vodafone.

The regulator may consider prescribing additional roll-out obligations for existing TSPs with the option of achieving the same through the suggested format of trading.

Further roll-out obligations may be considered in dimensions other than geographic expansion. For example, roll-out obligations for existing TSPs may additionally be defined in the terms of quality of service, data speeds, carbon emissions etc.

Question 7

The private property regime expects the following conditions for maximisation of welfare

- auctions in the primary market
- freedom to decide the best use of the private property (liberalisation of spectrum)
- secondary market to reorganise efficiently (spectrum trading)
- low transaction costs (including dispute resolution costs before TDSAT; and information costs before regulator and in the market)

Question 7 addresses liberalisation. Question 8 addresses trading. Both of these are pertinent issues that need to be addressed for the private property regime to function efficiently. Currently, the auctions in the primary market are inefficient (in terms of size of spectrum, location of spectrum, price of spectrum etc), and therefore liberalisation and trading in the secondary market are essential for the market to reorganise spectrum efficiently in terms of use, technology, size of blocks, geographic location, services etc.

Liberalisation increases efficiency by allowing operators to quickly respond to market requirements in terms of services and technology. However, it will also create a lack of harmonisation as a result of which customers may find it difficult to roam across networks or port from one network to another.

For example, Videocon is planning to launch FD-LTE in 1800 MHz and Reliance is planning to launch TD-LTE in 2300 MHz. The handsets for both these networks will be incompatible. It may result in lack of roaming and loss of economies of scale.

However no limitations can be imposed on the network operators who will consider both ecosystem and market dynamics before deciding on which technology to choose. The only conditions that the government may impose are (i) regarding the recognition of technology by an international standardisation body; and (ii) regarding interference conditions on neighbouring bands. With respect to the interference conditions, it is suggested that no technical preconditions regarding interference be imposed. The private property regime expects the private players to protect their own property by pointing out instances of disputes to the judiciary, which should then be decided by TDSAT on a case-by-case basis.

Similarly, handsets are governed by an international ecosystem wherein the regulator will find hard to interfere. Most handsets will not work across the plethora of LTE bands or may take substantial time for the costs of such handsets to reduce.

What the regulator may infact insist on is reducing the information asymmetry (or cost of information) between the handset manufactures and consumers. For example, a consumer does not presently understand whether the 800 MHz LTE handset offered by Samsung will work on the RIL network in the 2300 MHz band. Simialrily, the consumer does not know that the iPhone with 700 MHz TD-LTE will not work in India. The regulator may correct this anomaly by mandating an information labeling instrument which requires mandatory labeling of handsets manufactured in

India or imported into India. This mandatory labeling should clearly inform the consumer about which all networks the device will be compatible to and incompatible to. Accordingly, the consumer will be able to take an informed decision.

Presently, as a clause in the NIA, it should be clearly mentioned that any device sold by operators in India should be clearly labeled about which all networks it will be compatible to and incompatible to.

Question 8

As mentioned in the previous question, trading in the secondary market is essential for the market to reorganise efficiently specifically so if the auctions in the primary market are inefficient as in the case of India. Additionally, trading will also allow discovery of market prices which has become a routine problem for the regulator and the government.

Firstly, who all should be allowed to trade? It is recommended that since license is now delinked from spectrum, any entity possessing a Unified License should be allowed to buy spectrum in the secondary market.

But does trading only limit itself to buying and selling or does it include sub-leasing and sub-sub-leasing? In that case would the associated responsibilities (such as roll-out obligations and lawful interception) also be passed on to the sub-sub-lessee? This gains special significance especially since the spectrum is not truly a private property owned by the TSP. The TSP is in fact only a licensee and the Central Government its licensor. In light of these questions, it is recommended that spectrum continue to be governed by a direct license agreement between the central government and the TSP. The only form of trading to be allowed should be wherein the licensee changes from one person to another. Therefore, if UL1 wants to sell 1.25 MHz to UL2, it will need the request the central government to revoke the license agreement between the central government and UL1 in respect of that 1.25 MHz of spectrum and form a new license agreement between the Central Government and UL2. In this case, UL2 will become directly answerable to the Central Government. UL1 should not be allowed to directly sub-lease the spectrum to UL2 as it will become difficult to identify the body responsible for roll-out obligations and lawful interception.

The central government should impose a fee equivalent to the administrative fee of revoking the old agreement and executing a fresh agreement. This should not be looked at as a source of revenue as the private property regime expects transaction costs to be negligible in order to efficiently reorganise.

Secondly, there needs to be a framework for penalising hoarding out of incompetency or out of anticompetitive intentions. To prevent hoarding, a system of SUC based on an efficiency factor is recommended. This has been explained in detail with calculations in answer for question 18.

Thirdly, there should not be any restriction regarding the size of spectrum to be traded as the market knows best about the relevant technologies and the services that can be provided over the given size of spectrum.

However, if spectrum is traded in small and varying sizes, it will be difficult for the Central Government to decide what proportion of the roll-out obligations should passed on to the new owner. To deal with this, the regulator could create minimum lock-in periods wherein no trading is possible till the time roll-out obligations are completed satisfactorily. Once the roll-out obligations are completed, there would be no need to calculate the proportion of rollout obligations to be passed

to the new owner.

Needless to say, the duration of the spectrum license will not change or be renewed on trading.

The potential for trading is significant as highlighted by the table below:

Peak Subcribers per MHz (millions)	Aircel	Bharti	BSNL	Idea	Loop	MTNL	Unitech	Videocon	Vodafone
AP	0.21	1.78	0.66	1.37			0.49		0.86
Assam	0.49	0.53	0.09	0.07					0.33
Bihar	0.69	2.12	0.21	1.11			0.57	0.00	0.96
Delhi	0.41	0.74		0.59		0.10			0.80
Gujarat	0.01	1.08	0.35	1.33			0.57	0.09	1.55
Haryana	0.00	0.37	0.16	0.60				0.10	0.51
HP	0.09	0.31	0.11	0.12					0.09
J&K	0.39	0.38	0.10	0.04					0.09
Karnataka	0.23	1.59	0.39	0.95					0.76
Kerala	0.00	0.55	0.50	0.99					0.77
Kolkata	0.31	0.43	0.08	0.24					0.41
MP	0.00	1.22	0.28	2.04				0.10	0.54
MH	0.13	1.20	0.48	1.68			0.68		1.77
Mumbai	0.21	0.39		0.62	0.14	0.07			0.58
NE	0.39	0.43	0.09	0.05					0.13
Orissa	0.39	0.85	0.26	0.18					0.41
Punjab	0.09	0.85	0.39	0.71					0.56
Rajasthan	0.52	1.67	0.35	0.89					1.45
UP(E)	0.64	2.12	0.45	1.26			1.04	0.00	1.61
UP(W)	0.07	0.98	0.23	1.33			0.73	0.00	1.07
WB	0.47	1.47	0.22	0.41					1.33

This table reflects the pressure on the spectrum of different TSPs and their willingness to buy/sell additional spectrum if the regulatory framework so permits.

Question 9

Since spectrum in the 1800 MHz band was recently sold in all circles except for four, it is now not advisable to reduce the reserve price in those circles where it was successfully sold. If it is done, firstly, the operators who have previously bid such high amounts will create noise for refund and may even approach the could even approach the court for redressal. Secondly, this will create a bad precedent wherein potential bidders will refrain from bidding and try to game the system into lowering the prices.

The question should therefore be limited to only the four circles where spectrum in the 1800 MHz band could not be successfully auctioned. And for those circles, the recent auctions has clearly reflected that 3G prices are not a good indicator of the valuation.

The explanation given in the consultation is exhaustive and needs no further explanation.

Question 10

A bottoms up approach will ignore the benefit that an operator receives from the synergies of pan-India operations whereas a top down approach will ensure that each circle is valued individually for small operators.

Examples of Siestma, Videocon and Telewings demonstrate that operators are not looking to create

a pan-India footprint and therefore may not have the pan-India synergies that a top-down approach would reveal.

Therefore, the bottoms up approach is more suited than the top down approach.

Question 11

Indexation of 2001 prices is not the appropriate method for the calculations since the ecosystem and potential for GSM has changed significantly since then.

Question 12

Regression should not be used because the proposed model is not appropriate for prediction. Further, it ignores some essential parameters and creates a missing variable bias.

Question 13

This method is not appropriate for the reason that it ignores greenfield/new operators. The incremental nature of the phone network does not apply to all instances at BTS.

Question 14

There are technical limits to that statement and it does not apply to greenfield valuations of spectrum. Therefore this method is not appropriate.

Question 15

It can be safely assumed that 1800 MHz band will be used for GSM services for the first 10 years and then used LTE service in the following 10 years. Accordingly, a GSM based valuation should be applied for the first 10 years and a BWA based valuation should be applied for the subsequent 10 years. Finally the net present value will give the current valuation of the spectrum. In this, BWA valuation can be used directly from 2010 BWA auctions as they are recent. Further, GSM valuation can be derived from any of the methodologies proposed form questions 10 to 14.

Question 16

It should be calculated on the basis of economic efficiency and not on technical efficiency because the objective is to calculate the economic valuation of the spectrum. It should be calculated on the basis of migration costs because the currently the 900 MHz band is held by the incumbent operators.

Circle	**Total Cost (Per 1.25 MHz)**
Maharashtra	605
Gujarat	482
MP	492
AP	705
Haryana	193
Kerala	370

UP(W)	394
Punjab	266
Karnataka	534
Delhi	223
UP(E)	632
Rajasthan	546
HP	98
Mumbai	157
Bihar	550
Orissa	273
TN	412
Kolkata	109
WB	525
Assam	212
NE	113
J&K	179

The migration costs have been calculated for each of the circles in detail in the annexed excel file. The final values demonstrate that migration costs are significantly high and cannot be used for arriving at a valuation for 900 MHz as it significantly exceeds the factor of 2 as well.

Question 17

Since spectrum in the 1800 MHz band was recently sold in all circles except for four, it is now not advisable to reduce the reserve price in those circles where it was successfully sold. If it is done, firstly, the operators who have previously bid such high amounts will create noise for refund and may even approach the could even approach the court for redressal. Secondly, this will create a bad precedent wherein potential bidders will refrain from bidding and try to game the system into lowering the prices.

The question should therefore be limited to only the four circles where spectrum in the 1800 MHz band could not be successfully auctioned.

Question 18

The current SUC is a function of the slab of frequency that a SUC falls in. An analysis of the frequency held by each operator will reveal that it holds spectrum equal to either 4.4 or 6.2 or 8.2 MHz regardless of the technical inefficiency as a result of such holding. This is done keeping in mind the present structure of slabs created by the regulatory framework.

A system of SUC is proposed wherein the SUC is calculated as a function of the efficiency (subscribers per MHz). Currently, 3% is fixed and 5% is variable according to slabs. In the proposed system 4% is fixed and 4% is variable according to efficiency (subscribers per MHz). The proposed system is demonstrated to be revenue neutral in the annexed excel file.

The proposed SUC structure creates an incentive for handling spectrum efficiently, giving up excess spectrum, rewarding efficient TSPs and as a result promoting trading.

Question 19

Reserve price should be 50 % of valuation to flexibility of valuation to the market.