

TO BE PUBLISHED IN THE GAZETTE OF INDIA, EXTRAORDINARY, PART III,
SECTION 4

**THE TELECOMMUNICATION INTERCONNECTION USAGE CHARGES
(ELEVENTH AMENDMENT) REGULATIONS, 2015
(1 of 2015)**

**TELECOM REGULATORY AUTHORITY OF INDIA
NOTIFICATION**

New Delhi, the 23rd February, 2015

File No. 409-8/2014-NSL-1 ----- In exercise of the powers conferred upon it under section 36, read with sub-clauses (ii), (iii) and (iv) of clause (b) of sub-section (1) of section 11, of the Telecom Regulatory Authority of India Act, 1997 (24 of 1997), the Telecom Regulatory Authority of India hereby makes the following regulations further to amend the Telecommunication Interconnection Usage Charges Regulation, 2003 (4 of 2003), namely:-

1. (1) These regulations may be called the Telecommunication Interconnection Usage Charges (Eleventh Amendment) Regulations, 2015 (1 of 2015).															
(2) They shall come into force with effect from the 1 st day of March, 2015.															
2. In Schedule I of the Telecommunication Interconnection Usage Charges Regulation, 2003 (4 of 2003), for paragraph 1, the following paragraph shall be substituted, namely:-															
"1. Termination Charges The following termination charge shall be applicable for Local, National Long Distance and International Long Distance calls:-															
<table border="1"><thead><tr><th>Type of Call</th><th>Type of traffic</th><th>Termination charge</th></tr></thead><tbody><tr><td rowspan="4">(1) Local and National Long Distance Call</td><td>Wireless to wireless</td><td>Re. 0.14 (paise fourteen only) per minute</td></tr><tr><td>Wireless to wireline</td><td>0 (Zero)</td></tr><tr><td>Wireline to wireline</td><td>0 (Zero)</td></tr><tr><td>Wireline to wireless</td><td>0 (Zero)</td></tr><tr><td>(2) International call</td><td>International incoming call to wireless and wireline</td><td>Re. 0.53 (paise fifty three only) per minute</td></tr></tbody></table>	Type of Call	Type of traffic	Termination charge	(1) Local and National Long Distance Call	Wireless to wireless	Re. 0.14 (paise fourteen only) per minute	Wireless to wireline	0 (Zero)	Wireline to wireline	0 (Zero)	Wireline to wireless	0 (Zero)	(2) International call	International incoming call to wireless and wireline	Re. 0.53 (paise fifty three only) per minute
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Note-Wireless means full mobility, limited mobility and fixed wireless access services."															

**(Sudhir Gupta)
Secretary**

Note 1. The principal regulations were published vide F.No. 409-5/2003-FN dated 29.10.2003 (4 of 2003) and subsequently amended vide notifications Nos. --

- (i) 409-5/2003-FN dated 25.11.2003 (5 of 2003) (First Amendment);
- (ii) 409-5/2003-FN dated 12.12.2003 (6 of 2003) (Second Amendment);
- (iii) 409-5/2003-FN dated 31.12.2003 (7 of 2003) (Third Amendment);
- (iv) 409-8/2004-FN dated 06.01.2005 (1 of 2005) (Fourth Amendment);
- (v) 409-8/2004-FN dated 11.04.2005 (7 of 2005) (Fifth Amendment), which has been set aside by Hon'ble TDSAT vide its Order dated the 21.09.2005 in appeal No. 7 of 2005;
- (vi) 409-5/2005-FN dated 23.02.2006 (1 of 2006) (Sixth Amendment);
- (vii) 409-5/2005-FN dated 10.03.2006 (2 of 2006) (Seventh Amendment);
- (viii) 409-2/2007-FN dated 21.03.2007 (2 of 2007) (Eighth Amendment);
- (ix) 409-22/2007-FN dated 27.03.2008 (2 of 2008) (Ninth Amendment);
- (x) 409-12/2008-FN dated 09.03.2009 (2 of 2009) (Tenth Amendment).

Note 2. The Explanatory Memorandum explains the objects and reasons of The Telecommunication Interconnection Usage Charges (Eleventh Amendment) Regulations, 2015 (1 of 2015).

**Explanatory Memorandum to “The Telecommunication
Interconnection Usage Charges (Eleventh Amendment) Regulations,
2015”**

A. Interconnection and Interconnection Usage Charges

1. Interconnection means the commercial and technical arrangements under which service providers connect their equipment, networks and services to enable their customers to have access to the customers, services and networks of other service providers.
2. Interconnection is extremely important from a consumer perspective. Telecom users cannot communicate with each other or connect with services they demand unless necessary interconnection arrangements are in place. Commercial and technical arrangements must be made to facilitate interconnection between network operators. A number of issues must be agreed upon by the operators or determined by the regulator in order to finalize these arrangements. The most important commercial issue for a successful interconnection arrangement is the Interconnection Usage Charge (IUC). A brief description of the various components of IUC is given below.

(1) Termination Charge

3. Termination charges are the charges payable by an access provider, whose subscriber originates the call, to the access service provider in whose network the call terminates. In a calling-party-pays (CPP) regime, the calling party subscriber pays for the call to his access provider and the calling party's access provider usually pays termination charge to the called party's access provider to cover the interconnection/ network usage cost.

(2) International Termination Charge

4. International termination charges are the charges payable by an International Long Distance Operator (ILDO), which is carrying calls from outside the country, to the access provider in the country in whose network the call terminates.

(3) Transit Charge

5. When two telecom networks are not directly connected, an intermediate network is used through which calls are transmitted to the terminating network. Such an intermediate network is known as a transit network and the charges to be paid to the transit network to cover the interconnection/ network usage cost are called transit charges.

(4) Carriage Charges

6. Access providers in India can offer access services within the Licensed Service Areas (LSAs), also known as circles; the inter-circle traffic is required to be routed through a National Long Distance Operator (NLDO). The charges to be paid by an access provider to the NLDO to cover the cost for carrying the inter-circle calls are called carriage charges.

(5) Origination Charges

7. The calling party's access provider collects call charges from the calling party (i.e. his subscriber) as per the applicable tariff. From the amount so collected from the subscriber, the access provider has to pay termination charges to the called party's access provider and carriage charges (in case of an inter-circle call) to the NLDO. The access provider retains the balance amount to cover the cost of originating the call. The amount so retained by the calling party's access provider is called an origination charge. In India, origination charges have not been specified and are under forbearance.

(6) International Settlement Charge

8. International settlement charges are the charges exchanged between foreign service providers and Indian ILDOs for exchanging international traffic. The international settlement charge includes international carriage charge, national carriage charge (if any) and the termination charge applicable in the respective country.

B. Framework for IUC in India

9. The framework of Interconnection Usage Charges was established by the Authority through 'The Telecommunication Interconnection Usage Charges (IUC) Regulation, 2003 (1 of 2003)' dated 24.01.2003. This Regulation, which became effective from 01.05.2003, introduced the CPP regime in India. It is widely believed that the CPP regime is a major factor contributing to the fast growth of the telecom services sector in the country.
10. The origination charge, carriage charge and termination charge were specified through this Regulation. The charges were based on the type of network in which the call originated or terminated and the distance travelled in a service provider's network. In case of the cellular network, the charges were also based on whether the destination network was in a metro or a non-metro city. While termination charges varied from Re. 0.15 to Re. 0.50 per minute depending on the distance, carriage charges varied from Re. 0.20 to Re. 1.10 per minute.
11. On the basis of the feedback received from various stakeholders about the IUC regime put in place through the Telecommunication Interconnection Usage Regulation, 2003, the Authority initiated a consultation process in May, 2003. After completing the consultation process, a revised IUC regime was notified through 'The Telecommunication Interconnection Usage Charges Regulation, 2003 (4 of 2003)' dated the 29.10.2003 superseding the earlier

Regulation. This Regulation came into effect from 01.02.2004. At present, this Regulation is the principal IUC Regulation. In this Regulation, a uniform termination charge of Re. 0.30 per minute was prescribed irrespective of distance for all types of calls viz. fixed-line, wireless in local loop and full mobility. The carriage charges remained distance based.

12. The Authority conducted another review of IUC regime based on its consultation paper dated 17.03.2005. Based on the consultation process and discussions with industry, the Authority notified an amendment regulation dated 23.02.2006, through which the ceiling on carriage charges was fixed while other IUC components were kept at the same level as before. The change in the carriage charge regime provided a strong basis to the telecom service providers (TSPs) to reduce long-distance tariffs and to offer uniform STD tariffs across the country.
13. Subsequently, another IUC review was conducted in 2008-09. Based on the detailed consultation process, the Authority notified a revised IUC regime on 09.03.2009 which became effective from 01.04.2009. Through the revised regime, the following charges were prescribed:
 - (i) Termination charge of Re. 0.20 per minute for local and national long-distance voice calls to fixed-line and mobile (revised downwards from the erstwhile charge of Re. 0.30 per minute)
 - (ii) Termination charge of Re. 0.40 per minute for international long-distance call (revised upwards from the erstwhile charge of Re. 0.20 per minute)
 - (iii) A ceiling carriage charge of Re. 0.65 per minute (unchanged)
 - (iv) Transit carriage charge of Rs. 0.15 per minute (revised downwards from the erstwhile charge of Re. 0.20 per minute)

C. Need for the present review

14. Some TSPs challenged the IUC Regulation dated 09.03.2009 before the Telecom Disputes Settlement & Appellate Tribunal (TDSAT) on various grounds. TDSAT passed its judgment on 29.09.2010 and directed TRAI to consider determining the IUC afresh, on the basis of its observations and directions.

15. TRAI filed an appeal in the Hon'ble Supreme Court challenging the order of TDSAT dated 29.09.2010 on various technical and legal grounds including, *inter-alia*, the principal legal issue whether the validity of TRAI's Regulation framed in exercise of powers conferred under section 36 of the TRAI Act, can be challenged before the TDSAT under section 14 of the TRAI Act, 1997. TRAI also prayed the Hon'ble Supreme Court to allow the appeal and set aside the final judgment and order dated 29.09.2010 passed by TDSAT.

16. On 29.07.2011, the Hon'ble Supreme Court passed the following order:

"... Before taking up the matter for final hearing, this Court would like the Regulator to compute the IUC with the inclusion of capital cost and without inclusion of the capital cost. In this case, the TRAI, which is the original Authority, has taken the view as a matter of law/regulation that capital cost should not be taken into account in the matter of fixation of IUC, whereas the Telecom Disputes Settlement and Appellate Tribunal [TDSAT, for short] has taken a contrary view saying that the capital cost should be taken into account in the matter of fixation of IUC. Therefore, we want the Regulator to give us the computation of the IUC to be worked out on both the basis, namely, what would be the IUC if capital cost is taken into account and what would be the IUC if the capital cost is not taken into account?..."

...The Regulator will give its working by 31st October, 2011. ..."

17. Accordingly, TRAI filed its report in the Hon'ble Supreme Court on 29.10.2011. The relevant paras of the order of Hon'ble Supreme Court dated 06.12.2013 are as follows:

“3. When the cases were listed before this Bench, learned counsel for the parties agreed that a preliminary issue relating to jurisdiction of the Telecom Disputes Settlement Appellate Tribunal (TDSAT) to entertain challenge to the regulations framed by the Authority may be decided Thereupon, the Court decided to hear the arguments on the following question:

“Whether in exercise of the power vested in it under Section 14(b) of the Act, TDSAT has the jurisdiction to entertain challenge to the regulations framed by the Authority under Section 36 of the Act.”

.....
.....

64. In the result, the question framed by the Court is answered in the following terms:

In exercise of the power vested in it under Section 14(b) of the Act, TDSAT does not have the jurisdiction to entertain the challenge to the regulations framed by the Authority under section 36 of the Act.

...

As a corollary, we hold that the contrary view taken by TDSAT and the Delhi High Court does not represent correct law. ...”

18. Since neither TDSAT nor the Hon’ble Supreme Court had stayed the applicability of the IUC regime which was put in place through the amendment in the IUC Regulation of 2009, the changes to the IUC regime put into effect by the Regulator have remained in force since 2009. In the past, revisions in the IUC regime have been undertaken on a regular basis with an interval of two to three years. However, as the matter was pending before the Hon’ble Supreme Court since 2010, the IUC review could not be conducted though it was due. As a significant amount of time (5 years) has elapsed since the last review, the Authority initiated this review of the IUC regime in the country in November, 2014.
19. As a precursor to the exercise, the Authority asked wireless access providers, wire-line access providers and NLDOs through letters of 30.04.2014 and 05.06.2014 to submit information related to network usage and costs. Subsequently, the Authority issued a

Consultation Paper (CP) on IUC dated 19.11.2014 to seek the views of stakeholders on various aspects of IUC. Stakeholders were asked to submit written comments by 11.12.2014 and counter-comments by 18.12.2014. On the request of some stakeholders, the dates for submission of comments and counter-comments were extended up to 22.12.2014 and 29.12.2014 respectively. Written comments were received from two industry associations, 15 TSPs and 47 other stakeholders, including companies, organizations, firms and individuals. Counter-comments were received from six TSPs and one individual. The comments and the counter-comments received from the stakeholders were placed on the TRAI's website—www.trai.gov.in. An Open House Discussion was held on 09.01.2015 in Delhi with stakeholders. The issues raised in the CP and the views of stakeholders thereon are examined in the succeeding paragraphs.

D Analysis of the Key Issues Raised in the Consultation Paper

20. In the CP dated 19.11.2014, the Authority had sought the views of stakeholders on the following broad issues related to IUC:
 - (i) Should Mobile Termination Charge (MTC) and Fixed Termination Charge (FTC) be cost-oriented (or cost-based) or should they be under the Bill-and-Keep (BAK) arrangement?
 - (ii) Which methodology is most appropriate for prescribing MTC and FTC in case a cost-oriented or cost-based approach is chosen?
 - (iii) What is the most appropriate level of International Termination Charge (ITC)?
 - (iv) Which methodologies are appropriate for determination of domestic carriage charges and transit carriage charges?
21. An analysis of these issues based on the comments and inputs received from stakeholders is presented below.

(1) Should MTC and FTC be cost-oriented or under BAK arrangement?

22. The two industry associations, a majority of the TSPs and a few other stakeholders have favored a regime of cost-oriented termination charges. They have argued that in India, where the CPP regime has been adopted for retail tariffs, market players can be compensated for their work done in terminating off-net incoming calls only through a cost-oriented termination charge regime. On the other hand, a few TSPs and other stakeholders have favoured a BAK regime. They have argued that since the last review, network usage has increased significantly and network costs have reduced extensively; however, the benefits have not been reflected in retail tariffs because the termination charge, which acts as a floor for off-net traffic, has remained high. They also contend that a BAK regime would prevent incumbent TSPs from recovering their costs of operations from their competitors and, thereby, would enable greater competition in the sector.
23. Before examining the issue on hand, it is appropriate to mention that since 2003, when the IUC regime was first put in place in the country, the Authority has generally followed the principle of a cost-oriented IUC regime. While devising regulatory frameworks for telecom services in the country, the Authority has always aimed to balance the following twin objectives, viz.
- (i) to protect the interests of consumers - by way of ensuring adequate choice and affordable services to them by promoting competition and efficiency in the market, and;
 - (ii) to create incentives for TSPs - by way of ensuring adequate (fair) returns on investment so as to stimulate orderly growth and innovation in the sector.

24. In this backdrop, let us first examine the issues pertaining to MTC. Against a global average of about 96, the wireless tele-density¹ in India is only 75.43. Though rural penetration of wireless telephony in both population and coverage terms has improved with the passage of time, it has remained lower than expected. As against an urban wireless tele-density of 142.46, the rural wireless density was only 45.47 as on 31.12.2014. The tele-density figures indicate the proportion of number of SIMs² in use and not the number of wireless users. As per a report³, globally, on an average, each mobile subscriber owns two SIMs. Thus the proportion of wireless users to the total population in rural India is far lower than the tele-density figure of 45.47. In coverage terms too, wireless penetration has remained inadequate; though wireless telephony was introduced in India about two decades ago, about 50,000 villages are yet to be covered by wireless networks i.e. there are still so many villages without basic connectivity.
25. The alternative telecom facility in the form of wireline telephony is practically non-existent in rural India. Only 0.63% of the rural population use wireline phones. In effect, no TSP except for the state-owned BSNL provides wireline services in the rural areas. The number of wireline subscribers in the country has dwindled for reasons such as (i) higher costs of operation than wireless telephony, and, (ii) wireless telephony allows mobility to subscribers which wireline telephony cannot. Though Digital Subscriber Line (DSL) broadband Internet has, to some extent, saved wireline telephony from a free fall, it does not appear likely that wireline telephony will provide an affordable alternate telecom service to the rural masses. Clearly, wireless telephony will remain the most effective mode to bridge the rural-urban divide in terms of telecom services.

¹ Tele-density is the number of telephone connections for every hundred individuals living within an area.

² SIM is an acronym of 'Subscriber Identity Module'.

³ Report titled 'Winning with Real-time Insights in a Multi-SIM Market', Mahindra Commviva, March 2013

26. Businesses naturally have a propensity to invest in those ventures and those geographies which are likely to yield higher returns on investments (ROIs). Urban areas not only provide higher ROIs to the TSPs, but also a greater ease of conducting business. As a result, for a long time, wireless access providers in the country focused only on urban areas. This underwent change only when competition heated up and these areas started showing signs of saturation.
27. Typically, the telephony business yields increasing returns to scale (IRTS) once a TSP acquires a critical mass (in terms of subscriber base)⁴. As a result, there has been a rush amongst TSPs to sign up new subscribers, sometimes even at a huge upfront cost of acquisition. The underlying hope is to attain positive customer-lifetime-value (CLV) in the long-run. As urban areas in India began saturating, the TSPs started building telecom networks in rural areas, albeit cautiously. Investments in the rural telecom networks have lacked momentum because the TSPs have realized that the CLV of rural customers is far lower than that of urban customers because of (i) the level of utilization of the radio access network remains much lower in rural areas (i.e. the cost of servicing per customer is much higher in rural areas) for a considerably long period and (ii) the average rural customer's willingness-to-pay (WTP) for consumption of telecom services is relatively lower due to lower per capita income and higher incidence of poverty in rural areas (i.e. average revenue per rural customer is lower). Thus, break-even levels on investment in rural areas come much later than they do in urban centres. The net result has been that the 'push' for wireless telecom services from the TSPs by way of investment in rural areas has not met expectations. As a consequence, network coverage and performance have remained patchy and inadequate in rural areas. Owing to these reasons, wireless telephony has not been able to

⁴ In theory, the high capital cost of setting up a network can lead to a natural monopoly, the same high capital costs can also constitute as a barrier to entry.

enter into the rapid growth path through the virtuous cycle of supplier's push and buyer's pull in rural India. Thus, while promoting investments in rural telecom networks remains an important public policy priority, it needs to be recognized that wireless TSPs have shown far less enthusiasm in investing in rural areas.

28. When a TSP intends to provide network access to the 'marginal subscribers', who have either low income or who are currently not served by the telecom networks (these features together characterize the majority of rural subscribers), it lures such subscribers by way of offering attractive tariff packages to them in which call rates are much cheaper than standard rates during the initial period. Thus, a TSP might initially have to incur losses, when it serves outgoing voice call activity of such subscribers. In case there is an IUC regime in which cost-oriented mobile termination charges are paid by the calling party's service provider to the called party's service provider, the TSP serving marginal subscribers can be assured of receiving the cost of the 'work done' in carrying the off-net incoming calls. In short, while it may be incurring losses on outgoing calls initially, this would be partially offset by receiving fair and reasonable use-based returns on the off-net incoming calls. This would provide at-least some incentive for TSPs to invest in rural areas. Hence, a cost-oriented MTC regime could induce TSPs to expand their footprints in rural areas and, thereby, increase the overall value of the telecom networks. A corollary is that setting MTC at a level which does not recover the 'work-done' by the called party's service provider in terminating the call carries the risk of hindering the expansion of telecom networks in rural areas.
29. Besides, in case MTC is set below cost, TSPs would just not have sufficient incentives to carry off-net incoming calls on their networks. They may choose not to maintain the same standards of quality for off-net incoming calls as they do for their outgoing calls

by not augmenting required number of E1 ports at point of interconnection. This would degrade consumer experience and, in turn, make telecom networks much less valuable. This risk is accentuated when MTC is set as zero (i.e. BAK arrangement) because in this case, the wireless access provider would get no reimbursement at all for the underlying costs in terminating off-net incoming minutes. Therefore, they would have absolutely no incentive to carry off-net incoming calls on their networks.

30. It has been pointed out that the BAK arrangement is best suited in an environment in which traffic flow between the networks is balanced i.e. the off-net outgoing minutes and off-net incoming minutes are fully or nearly balanced. In such a situation, the BAK regime is unlikely to distort incentives for the TSPs in carrying off-net incoming calls. In India, the TSPs are at different stages of growth. While some networks are nearly two decades old, some others are only six to seven years old. Therefore, their sizes and particularly the profiles of their customers are vastly different. As a result, the traffic flows between the TSPs are significantly asymmetric. The following figure provides the distribution of total off-net minutes by decomposing them into off-net outgoing minutes and off-net incoming minutes in 2013-14 for access providers offering full-mobility services.

Figure 1: Distribution of off-net minutes in the F.Y. 2013-14 for the access providers offering full mobility services

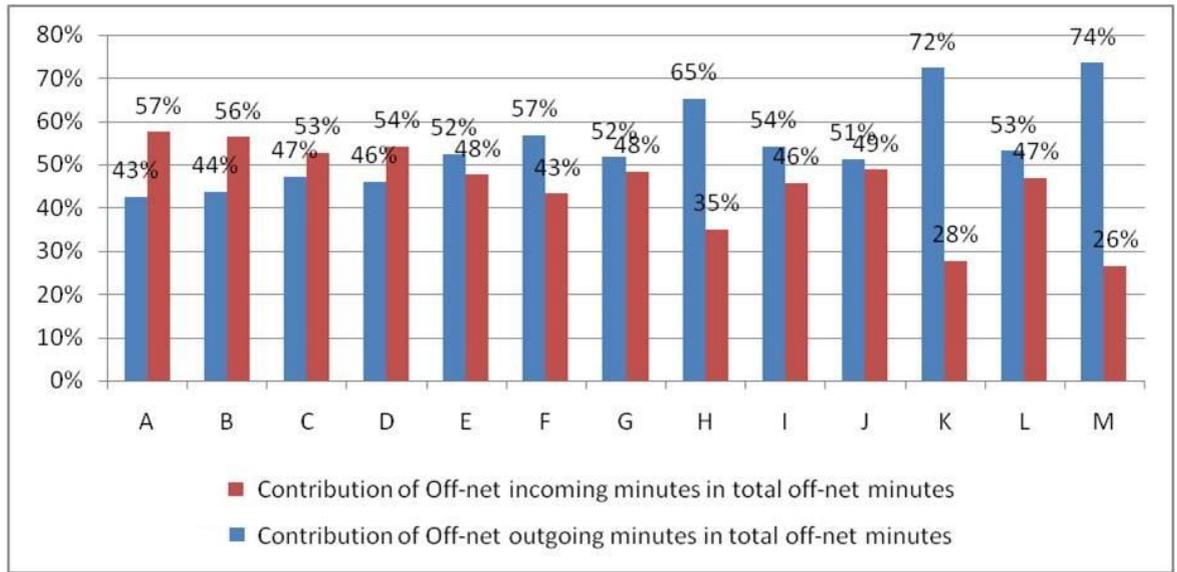
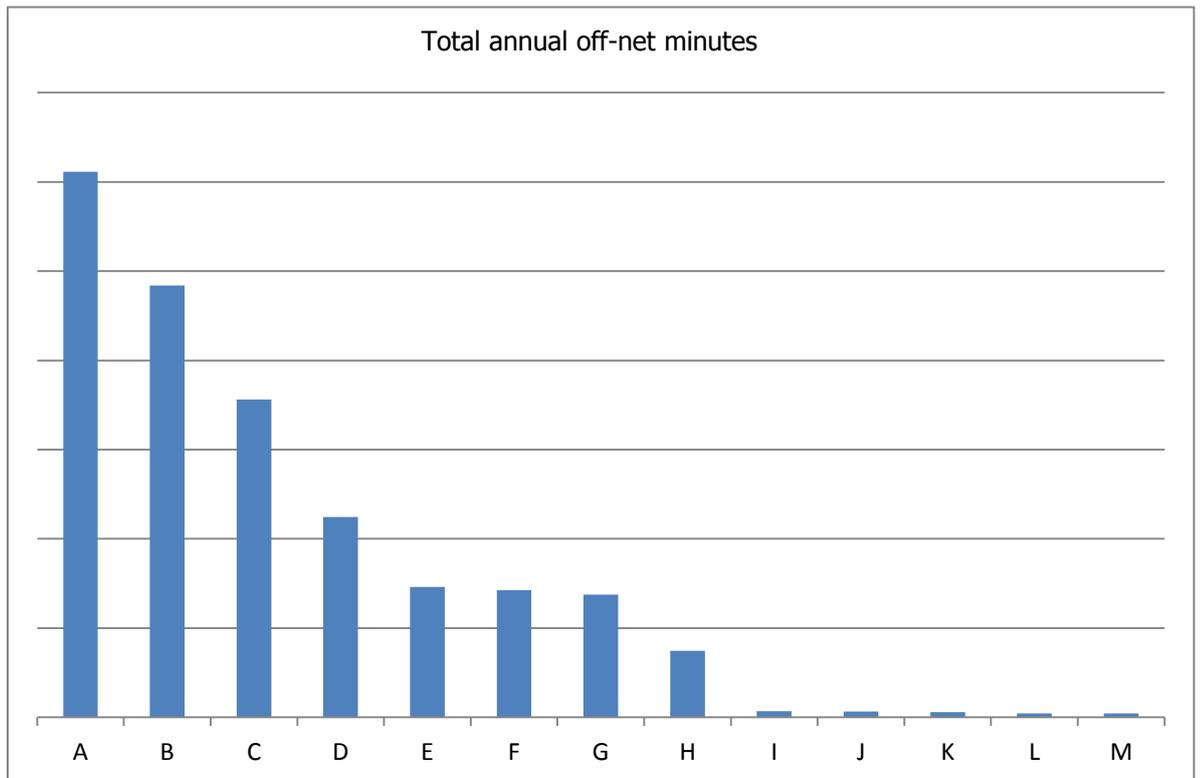


Figure 2: Comparison of annual off-net minutes carried by access providers offering full mobility services in the F.Y. 2013-14



A, B, C,...M are the legends for the access providers offering full mobility service.

31. In the report filed by the Authority in the Hon'ble Supreme Court on 29.10.2011, it was stated that it would take another two years for the asymmetries in the traffic flows to converge to some form of equilibrium between the new and old TSPs and it was opined that the BAK arrangement may, therefore, be implemented after two years. However, as can be seen from the above figure, traffic flows remain vastly asymmetric even as recently as 2013-14.
32. International experience shows that not many countries have adopted the BAK arrangement. BAK has not yet been mandated by regulatory fiat even in those jurisdictions which have matured telecom networks. In countries where the BAK arrangement has been adopted, it has, generally, happened not by a regulatory action but through voluntary action of the TSPs themselves. BAK regime has been implemented in some countries where the CPP regime has not been put in place; instead, a Mobile-Party-Pays (MPP) regime (in which both calling party and receiving party pay for the call) is in force in such geographies. In view of the fact that the CPP regime is the prevailing regime in India since 2003 and a significant asymmetry in traffic flows between the TSPs still exists, the case for implementation of the BAK regime remains weak even in the present day conditions of the telecom market.
33. Since a large part of rural India is still waiting to be connected⁵, building and enhancing telecom infrastructure in rural areas continues to be a policy and regulatory priority. The Authority is of the view that, in the present day telecom market, the MTC should be fixed at a level which compensates TSPs adequately for the work done by them in terminating off-net incoming calls. The absence of a cost-oriented MTC (including one where 'MTC=0' as in the BAK regime) would discourage TSPs from investing in rural areas and maintaining network quality standards to the optimum.

⁵ 50,000 villages

Accordingly, the Authority has decided to continue to prescribe a cost-oriented MTC in the country.

(2) Which methodology is most appropriate for determination of Mobile Termination Cost?

34. On this issue, stakeholders have expressed widely divergent views. While some stakeholders have favoured the Fully Allocated Cost (FAC) model, many others are in favor of the Long Run Incremental Cost (LRIC) models.
35. The supporters of the FAC model opined that this model assures the recovery of the entire cost, including historical costs, and is a more credible method because it relies on the actual data furnished by the TSPs. They have contended that most variants of the LRIC model consider only incremental cost and, therefore, do not entirely (or, adequately) compensate the full cost; besides, the LRIC model is based on a large set of assumptions on network parameters and, therefore, lacks robustness and is not as sturdy as the FAC model.
36. A few stakeholders have stated that amongst the variants of the LRIC model, the LRIC+ is the most suitable. On the other hand, many stakeholders have favored the Pure LRIC model stating that this model would yield the smallest MTC which would, in turn, help the TSPs to provide competitive tariffs in the market. It is worth mentioning that many TSPs and the Cellular Operators Association of India (COAI), who have supported the FAC model in the present consultation process, had favoured the use of LRIC models in TRAI's consultation process of 2008-09.
37. As indicated in the preceding section, the Authority has decided to fix the MTC on a cost-oriented basis. This is to ensure that the MTC compensates a TSP adequately for the work done by it in terminating off-net incoming calls. Accordingly, the issue at hand of identification of the most appropriate methodology for

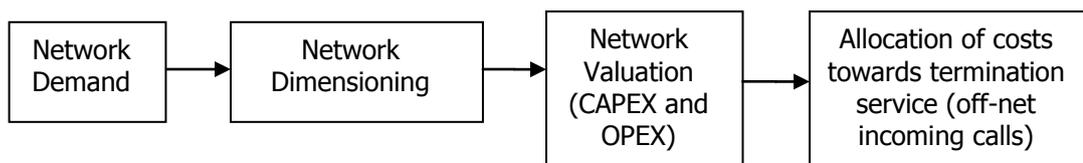
determination of MTC is reduced to: Which methodology amongst FAC and variants of LRIC would capture the cost of the 'work done' in carrying off-net incoming minutes most faithfully in the present day telecom market? It needs to be pointed out that the Authority has used a modified version of the FAC model for determination of MTC in its past IUC review exercises.

38. In most countries of the world, the MTC was traditionally determined with the help of FAC models using historical costs. Most regulators seek Accounting Separation Reports (ASRs) from the TSPs in their respective countries. These reports contain, *inter-alia*, segregated costs for various services. Based on the ASRs, many regulators computed MTC per minute as 'the relevant annual cost for providing voice telephony' divided by 'annual voice minutes'. However, as telecom markets started growing, the traffic increased manifold while the relevant costs, particularly the network-related costs, started declining owing to the march of technology and economies of scale. Though market costs of telecom networks declined significantly, incumbent TSPs continued to carry historical costs, albeit depreciated, on their balance sheets. Since the incumbent TSPs had an incentive for gold-plating their costs, the information on costs furnished by them in the ASRs started becoming more and more removed from the actual level of current costs. Further, ironically, the incumbent TSPs were being rewarded for their inefficiencies, if any, in running their networks; this is because full historical costs were being recovered through the MTC.
39. Intuitively, the MTC per minute would be best captured when the network is valued with the help of replacement costs as on date i.e. on the basis of current costs, and not historical costs. This is especially so because these are the costs are to be borne by competing and non-cooperating operators. In view of the inherent limitations of the FAC model and the growing consensus on the view that the inefficiencies of incumbent operators should not be

- passed on to interconnecting TSPs, many country regulators have developed variants of the Long Run Incremental Cost (LRIC) model for estimation of MTC. As the LRIC models have started acquiring acceptance, most regulators in the world have slowly but steadily moved away from the use of the FAC model for determining MTC.
40. In view of the above, the Authority is of the view that the case for using the FAC model to estimate MTC is not strong in the present day telecom market. Before proceeding to evaluate the fitness of the variants of the LRIC models, it would be appropriate to discuss the basic characteristics of these models.
41. In any generic LRIC model, the MTC is determined on the following basic assumptions:
- (i) The model is run for an equivalent operator⁶ i.e. a TSP who has a fair share in the relevant market.
 - (ii) This TSP incurs costs that would occur in a competitive market. Thus the model uses present costs i.e. forward looking costs.
 - (iii) The method of costing is long-run costing i.e. the size of the network deployed is reasonably matched to the level of network demand; any over- or under- provisioning would be leveled out in the long-run.
 - (iv) The model allocates the costs to wholesale services i.e. off-net incoming calls.
42. A block schematic diagram of the LRIC model for computation of termination cost is given below:

⁶ An equivalent operator is a representative TSP in each LSA. It has an average size, which can be determined through the Herfindahl-Hirschman Index (HHI).

Figure 3: Block Schematic Diagram of LRIC Model



43. In the LRIC model, the network demand for an equivalent operator is identified. In order to meet this demand, an efficient network is dimensioned. The costs of the various network elements are then computed on the basis of present costs. These costs are then allocated to wholesale service (i.e. off-net incoming minutes) using a routing table in order to determine termination cost per minute.

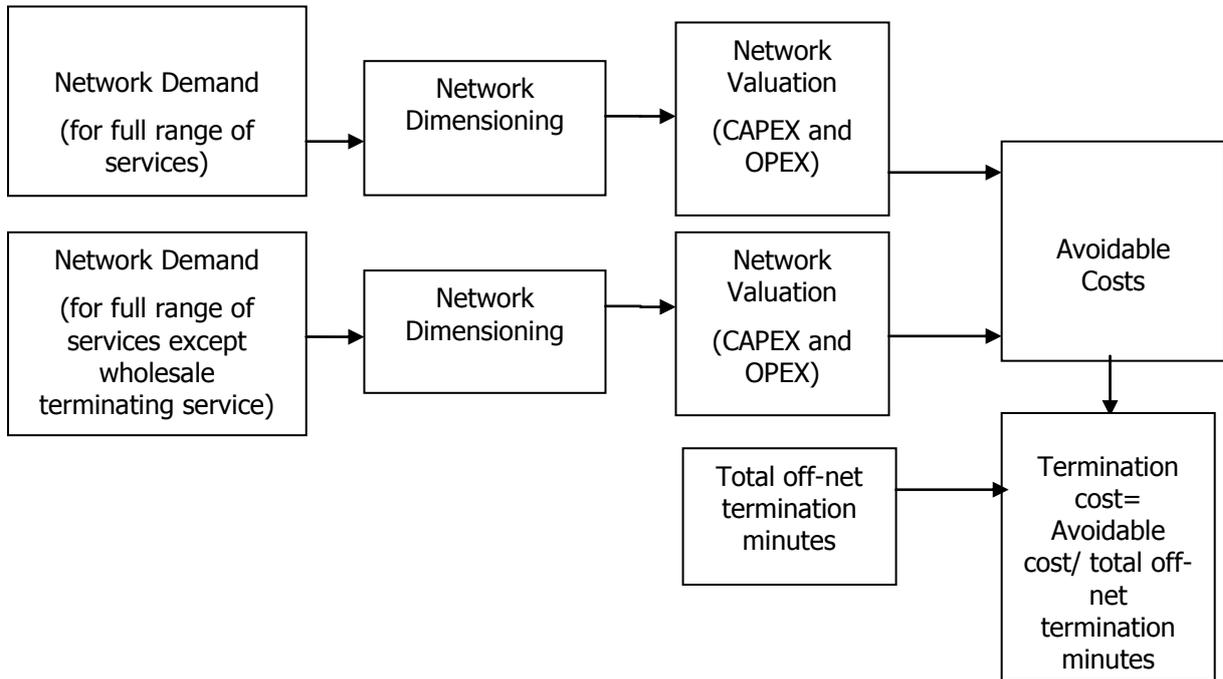
Mobile termination cost as per LRIC model
= (Total annualized termination cost computed on a long-run incremental cost basis) *divided by* (No. of off-net incoming minutes to be served by in the year)

44. In the LRIC+ model, a certain portion of the common costs is also allocated for the purpose of computation of termination cost. The costs that are common to both the wholesale business and the retail business of the TSPs are termed common costs e.g. costs pertaining to the corporate office, head offices etc. The reason for including a part of these common costs is that these costs are indeed incurred by TSPs while providing mobile termination service. This add-on is called the mark-up for common costs.

The mobile termination cost as per LRIC+ model
= (Mobile termination cost as per LRIC model) *plus* (Mark-up for common costs)

45. In the pure LRIC model, the relevant increment is the wholesale call termination service and it includes only avoidable costs. A block schematic diagram of the pure LRIC model is given below.

Figure 4: Block schematic diagram of Pure LRIC Model



Mobile termination cost as per Pure LRIC
 = (Avoidable cost if wholesale termination service is not provided) *divided by* (No. of total off-net incoming minutes)
 = (Total annualized cost for providing entire range of services *minus* Total annualized cost for providing entire range of service excluding wholesale termination minutes) *divided by* (No. of total off-net incoming minutes)

46. A summary of the foregoing discussion yields the following conclusions:
- (i) The LRIC model allows recovery of direct costs of providing the termination service.
 - (ii) The LRIC+ model not only allows recovery of direct costs of providing the termination service but also a reasonable

portion of the common costs is allocated to the termination service.

- (iii) The Pure LRIC model allows recovery of only avoidable costs. This model approximates, as closely as possible, the textbook measure of marginal cost of providing termination service.
47. In the present day telecom market, the off-net incoming minutes are about 30% of the total minutes of usage (MOU). This is a significantly high proportion. When making capital investment decisions, a TSP has to necessarily take into account the off-net incoming traffic. A model based on textbook theory of marginal costs, which allows recovery of only avoidable costs, would not adequately reimburse the costs of providing a termination service to the TSPs. In India, the wireless telecom infrastructure has not yet reached many far-flung areas. It would be erroneous to predicate the computation of termination costs on the premise that the telecom market has matured. Even in many matured markets like Germany and Malaysia, the Pure LRIC method has not been accepted yet.
48. Unless TSPs are assured of cost recovery of the wholesale services (such as termination service) provided to competing TSPs, there would be little incentive to invest and grow in areas where connectivity is far from adequate. The case for using a Pure LRIC model for estimation of mobile termination cost is not strong given the present day development of the telecom sector and keeping in view the public policy imperative of enhancing rural tele-density.
49. As discussed earlier, the LRIC+ model estimates the direct costs which can be allocated to the termination service along with a reasonable allocation of the common costs to the termination service. By including the direct costs and a portion of the common costs, the LRIC+ model approximates the costs of 'work done' in carrying off-net incoming minutes by the TSP in a competitive

market. Based on this reasoning, the Authority is of the view that that the cost of the 'work done' in carrying off-net incoming minutes would be most faithfully estimated using the LRIC+ model. Accordingly, the Authority has decided to determine the MTC using the LRIC+ model in the present exercise.

50. For computation of mobile termination cost using the LRIC+ method, the Authority made use of the information furnished by the TSPs offering full mobility services using GSM technology. Broadly, the following method has been employed:

- (i) The model has been built for an equivalent operator and not for any specific TSP.
- (ii) The equivalent operator has an average size in terms of subscriber base in each LSA.
- (iii) The usage profile of its customers matches that of an average customer in the LSA.
- (iv) The equivalent operator's network in each LSA has been designed using the information furnished by the TSPs.
- (v) The costing of the LSA-wise network, has been done on the basis of the recent cost information furnished by the TSPs.
- (vi) The LSA-wise costs so computed have been allocated to the termination service using a routing table.
- (vii) The total cost allocated to the termination service in the LSA is divided by the total off-net incoming minutes in the LSA to arrive at the cost per minute in each LSA.
- (viii) A weighted average of the LSA-wise costs per minute (on the basis of the weights of off-net terminating minutes) has been computed to arrive at an average cost per minute.
- (ix) Besides this cost, a mark-up for common cost has also been allowed as 10% of the cost so computed. In the past, the TSPs and their associations have computed the mark-up for common costs in the range of 10 to 15% of the cost per minute.

- (x) Together with the mark-up for common cost, the cost per minute so derived is termed the MTC.
51. A brief description of the LRIC+ model may be seen in the **Annexure** to this Explanatory Memorandum. As is clear from the above description, the LRIC+ model has been built on the basis of information submitted by the TSPs themselves and industry-best practices, wherever needed. The use of arbitrary assumptions has been avoided to make the model mirror reality as closely as possible.

Inclusion of spectrum cost in determination of MTC

52. On this issue, stakeholders have expressed divergent views. A few TSPs and other stakeholders are of the view that costs paid for acquisition of spectrum must be factored in while determining MTC. On the other hand, a few TSPs and other stakeholders have opined that spectrum costs should not be included in determining MTC.
53. Access spectrum is the most critical network resource which is used for serving wireless subscriber's traffic including off-net incoming minutes terminating in the access provider's network. Earlier, access spectrum was given to the TSPs as a part of the licence viz. spectrum was bundled with the licence. However, in the recent past, the Government has started assigning access spectrum to the TSPs through an auction process. The cost of spectrum acquired through auction is significantly high. At present, a few TSPs have only administratively allotted spectrum; a few others hold only the spectrum acquired through an auction. However, many TSPs have spectrum of both varieties viz. administratively assigned and also that acquired through auctions.
54. The cost of spectrum, acquired through the recent auction processes in India, is significantly higher when compared to auction determined price of spectrum in some developed countries. In view

of the fact that the cost of spectrum acquired through the auction process is considerably high, the non-inclusion of this cost in determination of MTC would result in non-recovery of a significant cost item. As indicated before, the Authority is of the view that the entire cost of the 'work done' on carrying off-net incoming calls ought to be recovered from the MTC. Hence, inclusion of the cost of spectrum is necessary for ensuring full recovery of the cost incurred for the work done on termination service.

55. In the LRIC model, the network has been built for an equivalent operator which has an average size in terms of subscriber base in each LSA. The spectrum holding of the equivalent operator is likely to be similar to the spectrum holding of an average TSP. The following table presents the LSA- wise amount of spectrum in 900 MHz and 1800 MHz bands assigned to the TSPs through the auction process as a proportion of the total spectrum held by the TSPs as on date (in %) and the expected amount of spectrum through the auction process after taking into consideration licenses expiring in 2015-16 as a proportion of total spectrum (in %).

Table 1: % Spectrum in 900 MHz and 1800 MHz bands acquired in auction process

S. No.	Name of LSA	Amount of spectrum acquired through auctions as a proportion of total assigned spectrum as on date (in percent)	Likely amount of spectrum acquired through auctions as a proportion of total assigned spectrum after taking into consideration licenses expiring in 2015-16 (in percent)
1	Andhra Pradesh	37%	61%
2	Assam	38%	50%
3	Bihar	26%	39%
4	Delhi	55%	55%
5	Gujarat	34%	59%
6	Haryana	28%	49%
7	Himachal Pradesh	22%	46%

8	Jammu & Kashmir	30%	30%
9	Karnataka	33%	56%
10	Kerala	39%	59%
11	Kolkata	60%	60%
12	Madhya Pradesh	37%	57%
13	Maharashtra	30%	54%
14	Mumbai	50%	50%
15	North East	47%	68%
16	Orissa	32%	43%
17	Punjab	28%	53%
18	Rajasthan	19%	44%
19	Tamilnadu	33%	48%
20	Uttar Pradesh (East)	30%	42%
21	Uttar Pradesh (West)	25%	39%
22	West Bengal	36%	47%
	Total	36%	51%

56. The above table brings out that about 36% spectrum in the 900 MHz and 1800 MHz bands held by the TSPs has been acquired in the auction process. This is likely to increase to 51% in 2015-16. As the present IUC review exercise is being conducted for the period starting from the fiscal year 2015-16, it seems appropriate to consider that half of the spectrum holding of an equivalent operator has been obtained through an auction. Accordingly, in the present exercise, 50% of the spectrum held by the equivalent operator is assumed to have been acquired through the auction process.

57. As the Government grants 'the right to use' of the access spectrum to the TSPs for a period of 20 years, the cost incurred by the TSPs in acquiring the spectrum has to be annualized for the purpose of determining its contribution to the termination cost. In case a TSP borrows from commercial banks for making the periodic payments to the Government, the annualized cost of spectrum for the TSP would be the equated annual installment (EAI) paid by it to the creditors. Accordingly, the annualized cost on spectrum has been

computed as the EAI using the SBI-base rate. The annualized cost of spectrum so calculated has been divided by the total annual traffic minutes in order to compute spectrum cost per minute. This cost has been added on to the cost computed in the previous step viz. the LRIC+ method described in paras 43 and 44.

MTC = Cost per minute from LRIC model + Mark-up for common costs + Spectrum cost per minute
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58. Based on the afore-mentioned approach, mobile termination cost has been computed as below:

Sl. No.	Item	Legend	Cost per minute (in Paise)
1	Cost per minute as per LRIC model	(a)	11.83
2	Mark-up for common cost	(b)= (a) * 10%	1.18
3	Spectrum cost per minute	(c)	0.78
4	Mobile termination cost	(d)= (a)+(b)+(c)	13.79

59. Keeping in view the mobile termination cost as computed above, the Authority has decided to fix the Mobile Termination Charge as Re. 0.14 (paise fourteen only) per minute.

Fixed Termination Charge and a special case of MTC viz. calls originated from wireline network and terminating on wireless networks

60. In India, of the total minutes terminating on wireless networks, about 3% minutes are originated from wireline networks. As on 31.12.2014, as against a wireless tele-density of 75.43, wireline tele-density stood at a mere 2.16. Since the beginning of the new millennium, while wireless penetration rate has witnessed exponential growth, the wireline penetration rate has dwindled in

the country. The issues pertaining to the decline of wireline telephony in the country need careful examination.

61. Wireless networks were introduced in India in 1994. As wireless telephony grew in the country, it led to an initial increase in the wireline network traffic (due to complementarities) and then a steady decline in the wireline network (due to dominance of substitution effects). The wireline-to-wireless substitution happened primarily because of the following:
 - (i) Wireline networks in India remained under-developed in the pre-wireless era because of a lack of investment. In the absence of a fully developed wireline alternative, creation of a wireless substitute was much easier.
 - (ii) With innovations in wireless access network technologies, it became cheaper to run the operations of wireless networks as compared to wireline networks. Thus, while wireless telephony became increasingly cheaper with innovations and infusion of competition in the wireless segment, wireline telephony did not see much of a decline in tariff levels.
 - (iii) The mobility feature of wireless telephony made it an irresistible choice when compared to wireline telephony.

62. While consumers have embraced wireless networks for a voice solution, it needs to be remembered that wireline networks have some inherent strengths which cannot be matched by wireless networks -
 - (i) In the event of catastrophes, when wireless radio networks could be choked or unavailable altogether, wireline networks become a robust alternative.
 - (ii) Wireline telephone handsets connected through copper pair are powered by the central exchanges and, therefore, continue working even during prolonged power cuts.

(iii) As more and more customers are seeking high speed data (Internet) services, wireless networks are increasingly finding it tough to meet the ever-rising data demand, particularly in a spectrum constrained sector. Wireline networks, on the other hand, can deliver much higher speeds of data transfer. As a matter of fact, the base stations of wireless networks have only a limited data speed capability (constrained by the type of radio access technology in use and access spectrum resource available to them) and wireless subscribers have to compete for data speeds from this limited capability of base stations (rivalrous character). On the other hand, wireline networks can deliver much higher data speeds to subscribers because the central equipment (e.g. network edge routers) and wireline cables have much larger bandwidth capacities. Besides, subscribers do not have to compete for data speeds because an individual subscriber consumes services on an exclusive dedicated wireline connection reaching his premises. It is widely believed that ubiquitous broadband access can be made possible only through wireline infrastructure (built on copper pair and optical fiber cable) because of its capacity and, therefore, when it comes to broadband, wireless networks will remain a complement to, rather than a substitute for, wireline networks. In a nutshell, wireline networks promise much better delivery of high-speed data services to consumers than the presently available wireless networks.

63. The President and CEO of CTIA⁷-The Wireless Association in USA has summed up the difference in capabilities of wireline networks and wireless networks as below.

“Due to the science and physics of spectrum use, there is only so much capacity that is available. This differs dramatically from

⁷ CTIA is an acronym of ‘Cellular Telecommunications and Internet Association’.

landline and cable broadband service. One strand of fiber has more capacity than the entire electromagnetic spectrum. So even if we were able to get all the spectrum available in the U.S., we still wouldn't be able to have the same capacity as a single strand of fiber."

64. As per a survey report⁸ from Ericsson, apart from calls and messaging, consumers perform more digital activities, such as watching TV/videos, work or study related activities and online shopping, when they are indoors (i.e. in home, office, school etc.). This is because people spend a major part of their time indoors; in fact, the ratio of time spent indoors versus outdoors is 7:1.
65. If consumer behavior in India is anywhere similar to the consumer behaviour claimed in the survey report from Ericsson, the requirement of high-speed data can be offloaded to wireline networks when subscribers are indoors rather than choking the already bandwidth constrained wireless networks. In many countries around the world, where wireline networks are at a much more developed stage as compared to India, wireline networks are already being used for off-loading data traffic from wireless networks.
66. In India, where several lakhs kilometers of copper cable is buried underground, the wireline-to-wireless substitution, has slowly but steadily rendered much of it out of use with the passage of time. However, as consumer preferences are changing from predominantly voice consumption to exponentially rising data consumption and wireless networks are increasingly finding it difficult to cater to the ever-rising consumer demand for high-speed data, there is a crying need for robust wireline networks which are maintained and upgraded on an ongoing basis. Since the Government is poised to build country-wide digital infrastructure with the aim to connect one and all under the state-sponsored

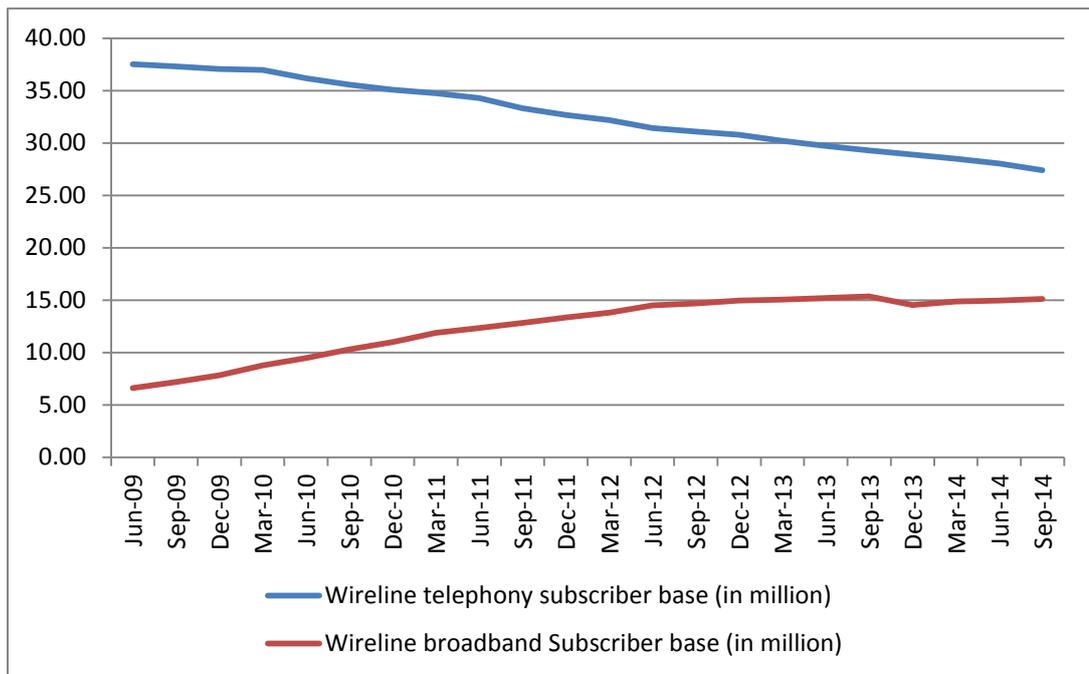
⁸ Ericsson Consumer Insight Summary Report October 2014.

'Digital India' campaign, India simply cannot afford to let the wireline telephony infrastructure (which was primarily built from the exchequer's money) to languish in the current pitiable state. Indeed, the revival of wireline networks in the country is an important policy and regulatory priority to complement the Government's mission.

67. In this backdrop, the Authority, while revising the IUC regime, examined the options available to it to help revive wireline networks in the country. The Authority is conscious of the following: (i) The market for any product or service can grow only when buyer's pull and supplier's push co-exist, and, (ii) the role of a regulator/policymaker is limited to that of a facilitator. While international experience may suggest that a wireline network is the best vehicle for provisioning broadband services in the country, the regulator can only go to a certain distance beyond which the wireline segment will have to take care of itself.
68. The wireline networks in India traditionally offered voice telephony to consumers using Plain-Old-Telephone Services (POTS). In the middle of 1990s, Internet access through dial-up became possible in India. However, such Internet access remained sub-optimal for two reasons: (a) Consumers experienced very low speeds of data transfer through dial-up Internet, and, (b) Consumers were deprived of the use of the telephone when they were accessing Internet. From the year 2004 onwards, wireline access providers in the country started providing high-speed Internet using DSL technology. This technology, not only offered broadband Internet (speeds of 256 kbps and more), but also enabled simultaneous use of the voice telephony and Internet access. Many consumers, particularly those in urban areas, subscribed for wireline connections for accessing broadband Internet. This was also the time when wireless networks were beginning to make steady growth in the country. As a result, while consumers looking for broadband

Internet got drawn towards wireline connections, many wireline consumers, who were primarily consuming voice telephony service, abandoned wireline telephony and switched to wireless telephony. The hitherto unconnected consumers opted for wireless telephony. As a result, broadly two kinds of customers remained on wireline networks: (i) Enterprises, because they consider wireline networks to be more secure, reliable and cost effective, and, (ii) individual users who consume high-speed data service. However, the anchor which saved wireline networks from virtual extinction has essentially been the wireline network’s ability to provide broadband Internet. The following figure shows the manner in which broadband subscriber base has increased in the country even as the wireline telephony subscriber base has declined in the past five years.

Figure 5: Comparison of wireline telephony subscriber base and wireline broadband subscriber base in India



69. The declining trend in the wireline network suggests that neither consumers nor suppliers see enough value in wireline telephony. The TSPs have to incur a significant upfront cost when they go to

serve a wireline subscriber but they do not see an assured positive CLV in the face of the onslaught from competing wireless networks. For consumers, wireline telephony service is much more expensive than wireless telephony service. The average outgo per outgoing minute for wireless access services is only about Re. 0.50 per minute; in contrast, the average outgo per outgoing minute for wireline access services is more than Re. 1 per minute.

70. Based on the above analysis, it becomes clear that unless subscribers start looking at wireline access services as an affordable solution for both voice telephony and broadband services and, in turn, TSPs start gaining traction from the segment, the mere capability to provide high-speed data services will not be able to save the wireline networks in the country. In this context, the Authority examined the suitability of an IUC regime in which MTC for calls originating from wireline networks and terminating on wireless networks and fixed termination charge (FTC) is set to zero. The Authority is of the opinion that in case the MTC is set to zero for wireline to wireless calls, wireline access providers would be able to provide innovative tariff packages (e.g. flat rental plans with unlimited or a significantly large number of outgoing calls) which is likely to stimulate usage and prevent the trend of churn-out of wireline connections. Similarly, in case the FTC for calls originating from wireless networks and terminating on wireline networks is set to zero, this would propel wireless access providers to offer cheaper tariffs for wireless-to-wireline calls. In turn, the adoption of wireline phones for receiving calls would improve and wireline telephones may be able to see a revival across households. Further, in view of the fact that the majority of wireline networks are run by the state-owned TSPs - BSNL and MTNL - and the traffic flow between wireline access providers is largely balanced, the case for prescribing FTC as zero for wireline to wireline calls is also strong. The Authority believes that these steps together would help make

wireline telephony a viable venture for market players and would also make wireline telephony an affordable voice and data solution for consumers.

71. To promote investment in, and adoption of, wireline networks (so that they may become an effective vehicle for the delivery of high-speed Internet in the country), the Authority has decided to prescribe FTC as well as MTC for wireline to wireless calls as zero.

(3) International settlement rate

72. Some TSPs had represented that some countries have fixed a very high settlement rate (especially Middle-East countries) for calls to their country. Therefore, in the CP, a specific question was raised whether the Authority's intervention was necessary in the matter of international settlement rates. Most TSPs are of the view that these rates should continue to be left open for mutual negotiation between the Indian ILDOs and foreign TSPs. According to these TSPs, the International Termination Charges (ITC) should be revised upward, which will strengthen Indian ILDOs to negotiate a higher settlement rate with foreign operators. One TSP suggested that the settlement may be on the basis of reciprocal arrangements with other countries.
73. The issue has been examined. It is observed that prescribing a settlement rate between an Indian ILDO and a foreign ILDO does not fall under the jurisdiction of TRAI. Further, prescribing any settlement rate would take away the flexibility of negotiation of an Indian ILDO when dealing with a foreign operator. Moreover, fixing rates on a reciprocal basis in a global market where all ILDOs are mesh-connected to each other would neither be practical nor feasible as it may create arbitrage opportunities for routing the call from the country where the international settlement rate is very

low. Therefore, the Authority has decided not to prescribe any settlement rate.

(4) International carriage charge

74. Another issue raised in the CP was the need, if any, for fixing a floor for international carriage charge for incoming international traffic or prescribing some revenue share between the access provider and the ILDO to safeguard the interests of the ILDO. There were mixed responses on this issue from the TSPs. While some TSPs are in favour of continuing the present forbearance on international carriage charge, other TSPs suggested fixing an international gateway charge at a suitable level for incoming international calls. A few TSPs suggested that if the Authority decides to keep an asymmetric termination charge for domestic and international calls, the additional amount charged over and above the domestic termination charge should be divided in a 60:40 ratio between the ILDO and the access provider.
75. The issue has been carefully considered. International carriage charge has been under forbearance since the inception of IUC regime. The cost structure of various ILDOs, carrying incoming international voice minutes, was also examined through their Accounting Separation Reports (ASR). It was noted that the cost of international carriage varies from 2 paise per minute to 72 paise per minute. This may be because of the use of different drivers by ILDOs for allocating cost in different heads as the same infrastructure which is being used for providing voice services is also being used for providing other services like international leased circuits etc. Similarly, the per minute net revenue realization amongst various ILDOs also varies from 3 paise to 65 paise per minute; this again is a function of how revenues are booked between an Indian ILDO and their foreign affiliated companies.

76. Keeping in view the complex structure of cost, the wide disparity in both costs and revenue, the varying methods of cost-booking and revenue accrual and net revenue realization of Indian ILDOs, it is not possible to fix a cost-based floor or ceiling for International Carriage Charge. Moreover, it has remained under forbearance since the IUC regime was instituted. Since there is no evidence of market failure in carrying international calls to India, there is no good reason to move away from forbearance. Therefore, the Authority is of the view that International Carriage Charge should remain under forbearance.

(5) International termination charge

77. Another important issue raised in the CP for ILD segment was the appropriate value at which the ITC should be fixed. On this issue, TSPs are generally of the view that ITC should be increased from the present level. They have suggested values which vary from 60 paise per minute to Rs.3.50 per minute. During the consultation process, the TSPs emphasized the fact that termination charge for an international call fixed by TRAI during the last review of IUC put them at a hugely disadvantageous situation vis-à-vis foreign operators, as they have to pay 8-10 times higher termination charges for international outgoing calls compared to what they receive as charge for international incoming calls. The minority view was that the ITC should be estimated purely based on the work done principle and should be the same as the domestic termination charge. These TSPs were of the view that any asymmetric ILD termination rates may lead to a grey market.
78. The first issue that needs to be analysed is whether there is a case for fixing the ITC at the same level as the domestic termination charge.

79. Setting the ITC equal to the Domestic Termination Charge (DTC) has the following advantage: since the cost involved in terminating an international call is the same as that of a domestic call, setting one charge equal to the other meets this cost-based criterion. There are, however, some other aspects that need to be taken into consideration:
- (a) For the past six years (since 2009), the ITC has been set at a level different from the domestic termination charge i.e. the practice that has been in vogue is that the ITC is not equal to the DTC.
 - (b) While the DTC applies to all TSPs falling within Indian regulatory jurisdiction, the ITC is different. The DTC set by TRAI has to be paid/settled amongst Indian access service providers. In contrast, as brought out in the CP, the ITC is set independently across two separate regulatory jurisdictions viz. the ITC applicable in India is set by TRAI while in other countries it is set by the Government/the Regulator or left to the operators of those countries.
 - (c) While the DTC is paid by domestic subscribers, all within the domestic regulatory jurisdiction, the ITC is paid for incoming calls by foreign consumers in an external regulatory jurisdiction.
80. If ITC were set equal to the DTC, it would not ensure any parity for Indian TSPs vis-a-vis their foreign counterparts. This is because the foreign TSPs would continue charging higher fees for terminating calls (over which TRAI has no regulatory authority). And, the Indian TSPs would be obliged to continue paying these higher charges. Thus, Indian subscribers would continue to pay higher charges for their outgoing international calls even as foreign subscribers enjoy the benefits of lower overall tariffs for calling Indian subscribers, at least partly because of the much lower Indian ITC. The CP brings

out that the ratio of international incoming calls to outgoing calls has worsened significantly over the last six years. It now stands at 18:1. This impacts domestic consumers (as discussed above); but, it also adversely impacts domestic TSPs. As brought out in para 77, the high overseas ITC becomes means for capture of international traffic by overseas operators viz. the differential in incoming overseas ITC vis-à-vis the outgoing ITC payable for calls to India incentivizes outgoing calls for the overseas operators. If some degree of balance were restored to this ratio then domestic TSPs would earn revenues from both incoming and outgoing calls. Clearly, what matters is the tariff faced by consumer. While the ITC is only part of that overall tariff, for domestic subscribers, the high overseas ITC partly explains why overall tariffs for outgoing calls are high. Obviously, the domestic ITC impacts foreign subscribers. The Authority has already taken action to lower tariffs for outgoing international calls through a Regulation on Calling Cards. The Regulation prescribes an access charge of 40 paise per minute for international outgoing calls to be paid by ILDOs to the Access Service Providers. This will be of direct benefit to domestic subscribers making international calls. As pointed out above, keeping the Indian ITC at a level far short of that prevailing in other countries effectively means that domestic consumers are subsidizing their foreign counterparts; and, this is abundantly clear from the adverse international incoming-outgoing calls ratio. There is, therefore, a need to address this problem.

81. There is another dimension to the problem of international call traffic. In 2009, the ITC was revised from 30 paise per minute to 40 paise per minute, though the domestic termination charge was brought down to 20 paise. Since then there has been one major development, namely, the significant increase in international traffic being carried by OTT players such as Skype. This has adversely impacted the revenues of TSPs the world over. The major reason for

this diversion of traffic is that OTT players either carry the calls free of charge or charge very low fees as compared to the traditional TSPs. And, there is a regulatory imbalance because communications OTTs entirely bypass the domestic regulatory (licensing) regime. As per one estimate⁹, Skype carried 214 billion minutes of international 'on-net' (i.e. calls made from Skype to Skype applications) calls in 2013. Skype's traffic was almost 40% the size of the entire conventional international telecom market and in growth terms, it now far outpaces the combined growth in voice minutes of the global telecom industry.

82. Therefore, the moot question is: What should be the level for the ITC? This charge has to be fixed at such a level that it neither creates arbitrage opportunities for operation of the grey market nor diverts more traffic towards OTT players such as Skype, Viber etc. The two options that are available are the following:

- (i) Leave the ITC under forbearance.
- (ii) Continue to regulate the ITC (as has been done before) and set it at an appropriate level.

There are serious difficulties associated with the exercise of complete regulatory forbearance on the ITC. All call termination is a monopoly. Further, when it occurs across two different regulatory jurisdictions and it is not known whether the foreign jurisdiction is levying the ITC on the directions of the Government and/or as a result of regulatory practice, it would be imprudent to leave this to be settled between players in the market. Such negotiations may become protracted and may lead to uncertainty and disputes in the market. An access provider who has market power would always try to obtain a higher termination charge from the ILDOs which may lead to a situation of non-settlement and therefore, non-completion of the call.

⁹ Telegeography report executive summary.

83. During the discussions, some TSPs also mentioned the adverse impact arising from the depreciation of the rupee. When the ITC of 40 paise/minute was fixed, the exchange rate for the US dollar was Rs 47 per dollar¹⁰. That rate is now Rs. 62 per dollar. The international currency value of the ITC has fallen viz. the TSPs' earnings in foreign exchange from ITC have declined. Therefore, in international markets, they are further disadvantaged viz. effective foreign currency tariffs for calls to India have fallen (or foreign operators are making larger profits because of the resultant savings on the India ITC).
84. The Authority further noted that the recently issued Regulation on calling card prescribes an access charge of 40 paise per minute for international outgoing calls to be paid by ILDOs to the access service providers. During the discussions, some access providers stated that the Calling Card Regulation would impose large costs on them; since their margins on outgoing calls would decline sharply, they may be compelled to revise tariffs for domestic calls. This would imply that the general domestic subscribers would end up subsidizing domestic subscribers who make international calls. And, the latter are a small minority. Clearly, this would not be a desirable outcome. A higher ITC may help TSPs earn additional revenues to rebalance their tariffs without imposing any additional burden on domestic calls in the post-calling card regulation period. To the extent additional revenues earned from ITC and passed on to consumers, there could be the following benefits:

- (a) The lower international call tariffs; and
- (b) No pass through to general domestic tariffs.

In fact, an increase in ITC (to be paid by foreign customers) may also enable Indian TSPs to reduce tariffs for domestic calls if the TSPs share pass-through at least partly the increased revenue

¹⁰ Average for 2009

- realized through this. The possibility of stalled negotiation, which is likely if the ITC is kept under forbearance, would also be averted.
85. In view of the foregoing discussions, the Authority is of the opinion that the ITC should be fixed at a level which meets three objectives viz. (a) encourage TSPs to reduce tariffs on outgoing international calls and prevent any pass-through to domestic tariffs of revenue losses arising from the calling card Regulation; (b) prevent the diversion of traffic towards OTT players such as Skype, Viber; and do not create arbitrage opportunity for grey market, (c) neutralize the effect of the foreign exchange rate variation.
86. If the ITC were to completely neutralize the variation of the rupee vis-à-vis the US dollar, the ITC would need to be set at a level of 53 paise/minute only on the foreign exchange variation.
87. Therefore, after careful consideration of the circumstances in entirety, the Authority has decided that the termination charge for international call shall be Re. 0.53 (paise fifty three only) per minute. The Authority would closely monitor foreign exchange rate variations, implementation of the International Calling Card Service Regulations (Access Charges) 2014, the trends and patterns of international outgoing and incoming calls; and, if there appears to be any distortions in the ILD market, the Authority would not hesitate to take appropriate steps including review and downward fixation of the termination charges for international calls.

E. Review of termination charges

88. The termination charges framework plays an important role in the telecom sector, given its potential effects on capturing network externalities as well as on retail tariffs. Changes in technology, cost structures and other market dynamics mandate that a periodic regulatory recalibration of these charges is undertaken so that industry concerns are balanced against consumer benefits. The

Authority is of the view that setting a specific timeline for undertaking such a review would impart a modicum of certainty which is in the interest of all stakeholders. Hence, the Authority has decided that it shall review the termination charges regime two years after it has been in force, i.e., the review will be undertaken and concluded in financial year 2017-18.

Annexure to the Explanatory Memorandum

LRIC+ Model for Determination of Mobile Termination Cost

1. At present, voice telephony in India is offered using GSM (2G), WCDMA (3G) and CDMA technologies. However, the predominant technology continues to remain GSM. Nearly all wireless access providers which offer telecom services using GSM technology, hold spectrum in the 1800 MHz band (apart from spectrum in 900 MHz band). The Mobile Termination Cost has been computed, using the LRIC+ model, on the basis of the network of an equivalent operator offering full mobility services in GSM (1800 MHz band) in each LSA in the country.
2. An equivalent operator in an LSA is a GSM operator which has a fair share of the GSM subscribers in that LSA. The characteristics of an equivalent operator in any LSA are:
 - (i) It has an average size in terms of subscriber base. The average size has been computed on the basis of the Herfindahl–Hirschman Index (HHI).

<p>No. of GSM subscribers of the equivalent operator in an LSA = (Total no. of GSM subscribers in the LSA) <i>multiplied by</i> (HHI of the GSM market in the LSA)/ 10,000</p>
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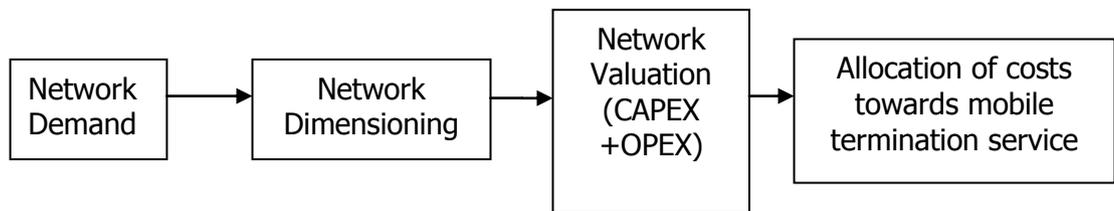
HHI of the GSM market in an LSA has been computed as below:

$\text{HHI} = \sum_{i=1}^n (s_i)^2$ where s_i is the percent market share of the i^{th} GSM operator in the LSA, and 'n' is the number of GSM operators in the LSA.
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- (ii) The usage profile of its subscriber matches that of the average customer in the LSA. Thus, the average voice Minutes of Usage (MOU), SMS and data usage per subscriber per month in the LSA reflects the usage profile of the equivalent operator.

- (iii) It operates efficiently. It has deployed modern GSM technology in its network, its network design is optimal, and its costs reflect the present costs.
3. A block schematic diagram of the LRIC model for computation of Mobile Termination Cost is given below:

Fig. 1: Block Schematic Diagram of the LRIC Model



4. As shown in the above diagram, Mobile Termination Cost (MTC) is been computed on the basis of the network of an equivalent operator providing GSM-full mobility services using the following steps:
- (i) **Estimation of the network demand** i.e. coverage requirement and the capacity requirement of the equivalent operator in each LSA as on 01.04.2014
 - (ii) **Dimensioning of the network** on the basis of network demand (derived in the first step) and the network-related information provided by the operators and industry benchmarks;
 - (iii) **Valuation of the network** (dimensioned in the second step) using the current prices of the network elements as furnished by the operators
 - (iv) **Allocation of costs towards mobile termination service** on the basis of a routing table as explained in the subsequent section.

Description of LRIC Methodology

5. The following steps describe the LRIC methodology used in the present exercise.

(1) Data Collection

6. The Authority, through a letter dated 30.04.2014, asked all wireless access service providers to furnish the following information about their networks:
 - (i) Voice, SMS and Data Traffic
 - (ii) Land coverage based on geo-types
 - (iii) Average radius of a BTS cell
 - (iv) Frequency reuse factor in radio access network
 - (v) No. of network elements
 - (vi) No. of various types of BTS sites
 - (vii) No. of transmission links
 - (viii) Average length of transmission links
 - (ix) Average capacity of transmission links
 - (x) Capital cost of network equipment
 - (xi) Annual operating cost of passive equipment per BTS site
 - (xii) Annual operating cost of active equipment of BTS and other core equipment
 - (xiii) Annual Leasing cost of transmission bandwidth
 - (xiv) Annual operating cost of network management system (NMS)
 - (xv) Any other relevant capital cost or operating cost which may be allocated to wireless access services

(2) Estimation of Network Demand

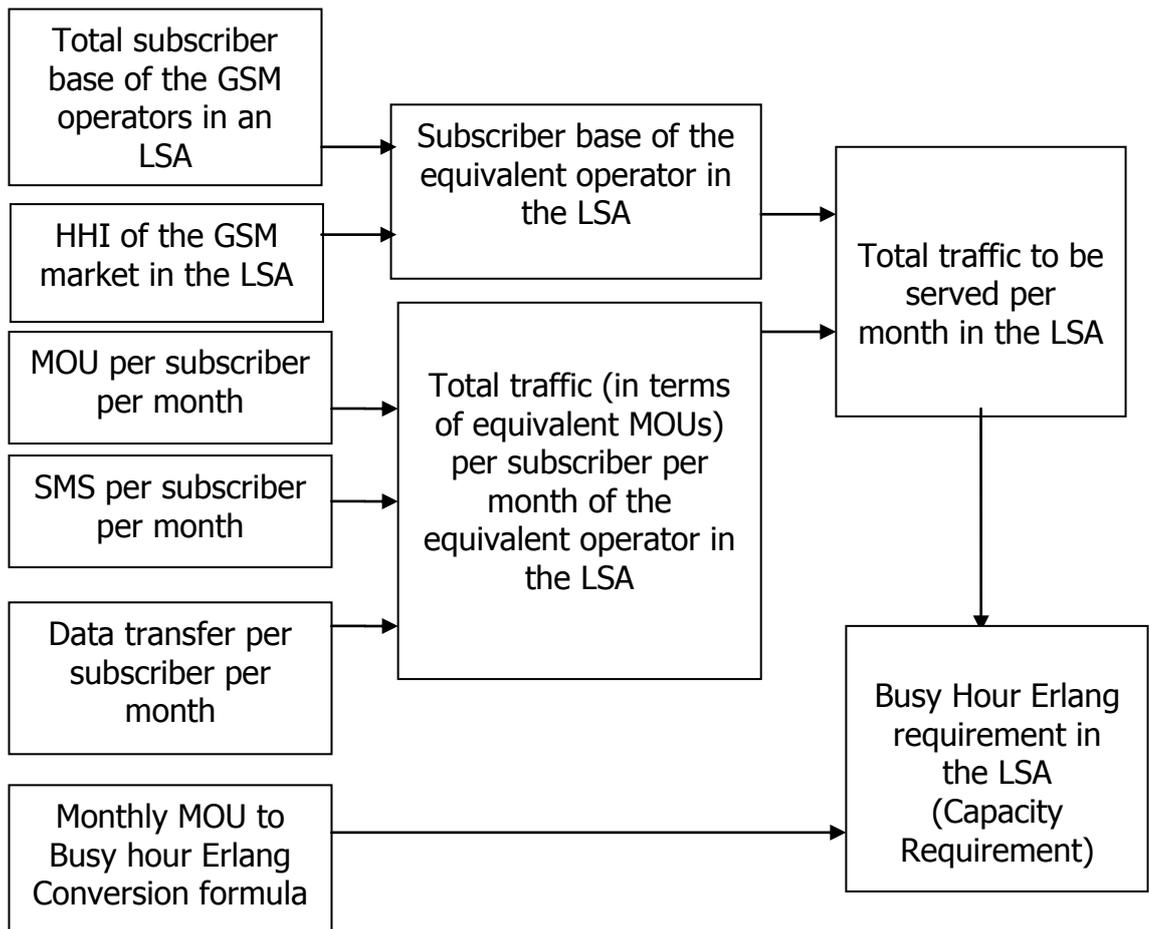
7. The network demand of the equivalent operator has been modeled as a combination of (i) coverage requirement and (ii) capacity requirement.
8. **Coverage Requirement:** In order to estimate the coverage requirement of the equivalent operator, each LSA was divided into four geo-types, based on the population density as below:

Table 1: Geo-type wise Population Density

S. No.	Geo-type	Population Density (Population per sq. km)
1	Dense Urban (DU)	More than or equal to 20,000
2	Urban (U)	More than or equal to 8,000 but less than 20,000
3	Semi Urban (SU)	More than or equal to 400 but less than 8,000
4	Rural (R)	Less than 400

9. The coverage requirement of an equivalent operator (i.e. land area covered in various geo-types) has been estimated on the basis of the information on the land area covered in the various geo-types, as furnished by the operators.
10. **Capacity Requirement:** The following block schematic diagram depicts the method to determine the capacity requirement of the equivalent operator in an LSA:

Fig. 2: Block Schematic Diagram of Capacity Requirement



11. As discussed earlier, the subscriber base of the equivalent operator in an LSA

$$= (\text{Total GSM subscriber base in the LSA}) * (\text{HHI of the GSM market in the LSA}) / 10,000$$

12. The total traffic (in terms of equivalent MOUs) per subscriber per month has been computed as below:

Total equivalent MOU per subscriber per month

$$= \text{Voice MOU} + \text{SMS converted to MOU} + \text{Data usage converted to MOU}$$

13. Based on the hourly traffic information submitted by the operators, MOUs per month have been converted into busy hour erlangs. With the help of this information, the capacity requirement of the LSA (i.e. total busy hour erlang requirement in the LSA) has been computed.

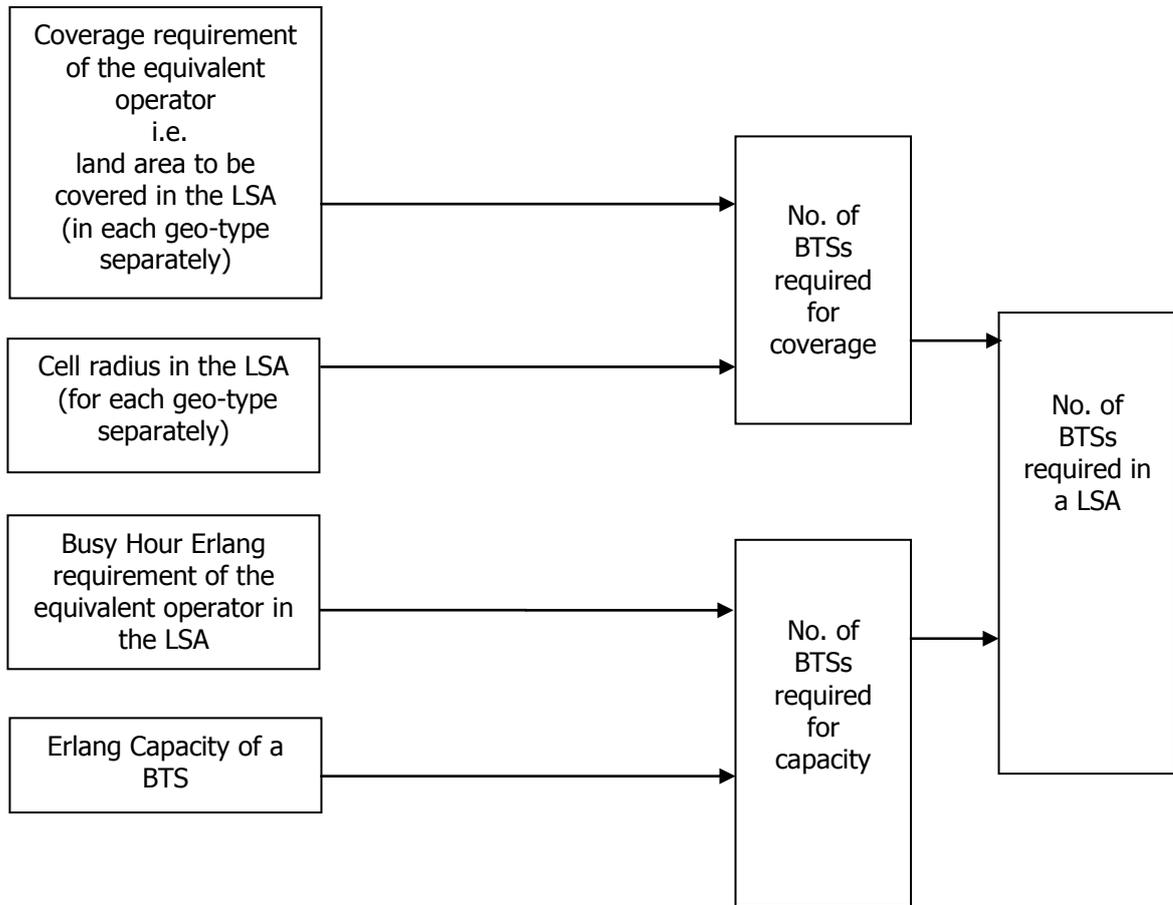
(3) Network Dimensioning

14. Based on the estimation of the network demand (in terms of coverage requirement and capacity requirement), the number of Base Transceiver Stations (BTSs) of the equivalent operator in an LSA has been dimensioned as per the block schematic diagram given in Fig: 3.

15. **No. of BTSs required for coverage:** The cell radii of the equivalent operator for the various geo-types have been estimated on the basis of cell radii furnished by the operators. Based on the cell radius for a particular geo-type, the no. of BTSs required for coverage in GSM (1800 MHz band) has been estimated.

16. **No. of BTSs required for capacity:** The throughput per TRX and average number of TRXs per BTS in the LSA along with the total busy hour erlang requirement of the LSA has been used to estimate the number of BTSs required for capacity in the LSA.

Fig. 3: Block Schematic Diagram for Estimation of BTS Sites



17. **No. of BTSs required:** BTS required in a LSA has been computed based on number of BTSs required for coverage and no. of BTSs required for capacity as computed above.
18. **No. of other Network elements in an LSA:** On the basis of subscriber base and number of BTSs required for an equivalent operator, the information on network design furnished by the operators and industry benchmarks, the number of following network elements in an LSA have been estimated:
 - (i) No. of Base Station Controllers (BSCs)
 - (ii) No. of BTS - BSC links
 - (iii) No. of Mobile Switching Centers (MSCs)
 - (iv) No. of Gateway Mobile Switching Centers (GMSCs)

- (v) No. of MSC - GMSC links
- (vi) Other network elements such as HLR, INs etc.

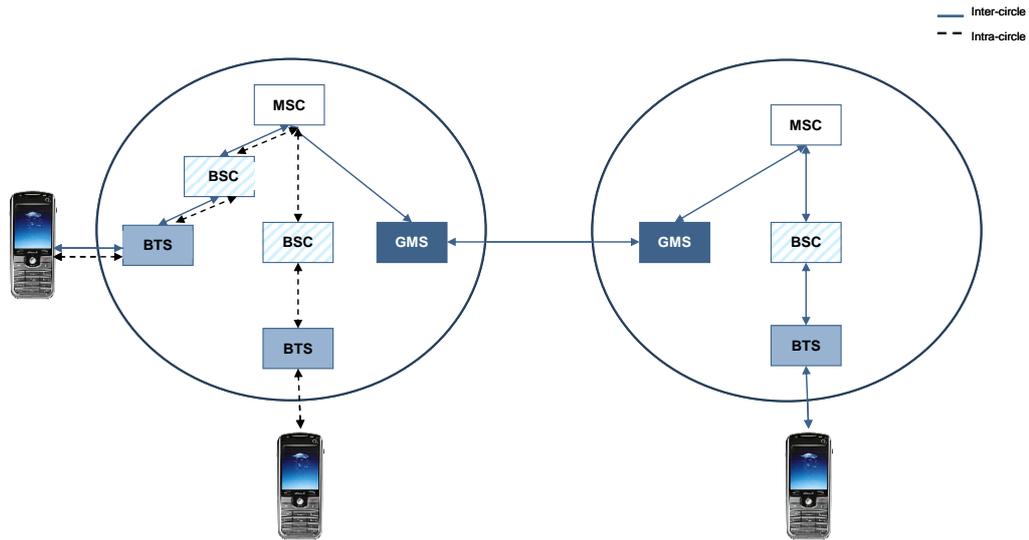
(4) Network Valuation

19. The annualized CAPEX and OPEX of each network element (viz. BTS, BSC, BTS to BSC link, MSC etc.) has been computed on the basis of the information furnished by the operators on capital cost, useful life, and operating cost of the network elements. The annualized CAPEX has been computed on the basis of annual depreciation (using straight line method of depreciation) and a Weighted Average Cost of Capital (WACC) of 15% per annum.

(5) Allocation of costs towards mobile termination service

20. Voice calls may be categorized as 'on-net calls' and 'off-net calls'. An on-net call is a call between the same operator's network i.e. both calling party and called party are on the same operator's network. On the other hand, an off-net call is a call between different operator's networks. Off-net calls may further be categorized as 'off-net outgoing calls' and 'off-net incoming calls'. While an off-net outgoing call for an operator means a call originating from its network and terminating on another network, an off-net incoming call for an operator means a call originating from some other network and terminating on its network. In order to allocate the network related costs to the off-net incoming calls, a routing table has been used. The following diagram illustrates the equipment used in various types of calls.

Fig. 4: Equipment Used in Various Types of Calls



21. After discussions with several service providers at various stages, the routing table used for allocation of costs towards termination service, is as below.

Table 2: Routing Table

Service Types	BTS	BTS - BSC	BSC	BSC - MSC	MSC	MSC-GMS C	GMS C POI	SMSC	GSN	NMS	HLR	IN
Voice on-net	2	2	2	2	1.67	0.37	0.37			1	1	1
Voice Off-net outgoing	1	1	1	1	1	1	1			1	0	0.9
Voice Off-net incoming	1	1	1	1	1	1	1			1	1	0.1
SMS incoming	0.01	0.01	0.01	0.01			0.01	0		0.01	1	0
SMS Outgoing	0.01	0.01	0.01	0.01			0.01	1		0.01	0	0.9
GPRS data downloads	1	1							1	1	1	0

22. The annualized CAPEX and OPEX costs determined in the previous stage have been allocated to the off-net incoming minutes with the help of the aforementioned routing table. The Mobile Termination Cost as per LRIC methodology has been computed by dividing the total allocated cost towards off-net incoming minutes by the total off-

net incoming minutes for each LSA. The weighted average Mobile Termination Cost for each LSA as per the relative weights of the LSAs (in terms of off-net incoming MOU) has been used to compute the pan-India Mobile Termination Cost as per LRIC methodology.

Mark-up for common costs to arrive at Mobile Termination Cost as per LRIC+ model

23. The costs that are common to both the wholesale business and the retail business of the TSPs are termed as common costs e.g. costs pertaining to the corporate office, head offices etc. A part of these common costs is added in order to determine Mobile Termination cost because these costs are incurred by TSPs while providing mobile termination service. This add-on is called the mark-up for common costs.
24. In the present exercise, a mark-up for common cost has been considered to be equal to 10% of Mobile Termination Cost computed through the LRIC model.

The mobile termination cost as per LRIC+ model
= (Mobile termination cost as per LRIC model) *plus* (Mark-up for common costs)
= 1.1 *multiplied by* (Mobile termination cost as per LRIC model)