Consultation Paper No. 13/2014

Telecom Regulatory Authority of India

Consultation Paper on
Interconnection Usage Charges

New Delhi, the 19th November, 2014

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New Delhi – 110002

Stakeholders are requested to furnish their written comments by 11.12.2014 and counter-comments by 18.12.2014 to the Advisor (Network, Spectrum & Licensing), TRAI. The comments may also be sent by e-mail to fn@trai.gov.in. Comments would be posted on TRAI's website www.trai.gov.in. For any clarification/ information, Shri Arvind Kumar, Advisor (Network, Spectrum & Licensing), TRAI may be contacted at Tel. No. +91-11-23220209 Fax: +91-11-23230056.

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Chapter - I
Introduction and Background

A. Introduction

1.1 In a multi-operator multi-service scenario, an Interconnection Usage Charges (IUC) regime is an essential requirement to enable subscribers of one service provider to communicate with subscribers of another service provider. Providing interconnection entails costs for which service providers need to be fairly compensated. The IUC regime not only determines the revenue accruable to the service providers but also how this revenue is to be distributed among them. An efficient interconnection and charging regime is central to efficient and seamless connectivity between various networks.

B. Impact of IUC on telecom sector

1.2 The primary purpose of an IUC regime is to facilitate inter-operator settlement. The establishment of IUC has far-reaching consequences for the telecom sector. It is an important tool for implementing policy and to give desired direction and impetus to growth of services. It enables competition, welfare of consumers, sustained growth of telecom services and economic development of the country. The IUC regime determines revenue accruals and also their distribution amongst services providers, various networks, and services, and promotes their development in correct measure. Though IUC defines the wholesale inter-operator charges and not directly the retail tariffs payable by customers, it is naïve to assume that it has no bearing on the retail tariff. A well-designed IUC regime should not only allow recover costs of service provider but also provide flexibility to service providers to offer innovative tariff plans.

1.3 An IUC regime regulates the transfer of network costs between service providers and thus affects their relative scale and prosperity. Therefore, the IUC regime should also ensure that a service provider does not pass on the burden of its own tariff decision to other networks involved in completing the

call or to new competing service providers in the form of a high IUC. The IUC regime should provide flexibility for introducing innovative tariff plans by the service providers.

1.4 An important objective in the design of any IUC regime is to balance investment incentives and the interest of competition, while at the same time ensuring that the benefits of positive network externalities are delivered in practice to consumers. In jurisdictions such as India, characterized by asymmetries in network sizes of different service providers, this balancing act must take into account both pecuniary externalities that work through the price system by benefiting some and harming other operators as well as non-pecuniary spillover effects arising from technological considerations that impose benefits or costs outside of market mechanisms. For example, termination charges could be set at a particular level, as a ceiling, or as a range (i.e., a combination of ceiling and floor within which service providers have price flexibility on a non-discriminatory basis); the price system that is finally mandated would have network-wide pecuniary effects that are different for different service providers. At the same time, the system would also have an impact on technological aspects such as traffic routing, congestion, etc. It is necessary therefore to design the IUC regime in a manner that negative externalities are minimized and positive externalities are internalized in the best possible manner.

C. Components of IUC

1.5 A brief description of various components of IUC is given below.

(1) Termination charge

1.6 These are the charges payable by a service provider, whose subscriber originates the call, to the service provider in whose network the call terminates. In the calling party pays (CPP) regime, only the calling party pays for the call and the calling party's service provider usually pays termination

charge to the called party's service provider, to cover the interconnection/ network usage cost.

(2) International termination charge

1.7 These are the charges payable by an International Long Distance Operator (ILDO) who is carrying calls from outside the country, to the service provider in the country in whose network the call terminates.

(3) Transit charge

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

(4) Carriage charge

1.9 In India, access service providers are licensed on the basis of service areas and inter-service area traffic has to be routed through a National Long Distance Operator (NLDO). The charges to be paid to the carriage network (i.e. the NLDO) to cover the cost for carrying the call are called carriage charges.

(5) Origination charge

1.10 An originating network is required to pay, from the amount collected from its subscribers (tariff), the carriage and termination charges for the call and retain the balance towards the expenses of originating the call. Origination charges are not specified and are under forbearance which provides flexibility in setting tariff to a service provider.

(6) International settlement charge

1.11 These are the charges paid 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 termination charges as applicable in the respective country.

D. Regulatory treatment of IUC so far

1.12 The Authority notified the first interconnection Regulation on 24.01.2003 which, *inter-alia*, contained charges for origination, transit and termination of a call. This Regulation came into effect from 01.05.2003. With this, the IUC Regulation introduced the regime of Calling Party Pays (CPP). In this regime, the originating, carriage and termination charges were based on the type of network in which a call originated, terminated and the distance travelled in a service provider's network. In the case of a cellular network, the charges were also based on whether the destination network was in a metro or a non-metro city. The termination charges then varied from Rs.0.15 (15 paisa) per minute to Rs.0.50 (50 paisa) per minute and carriage charges were from Rs.0.20 (20 paisa) per minute to Rs.1.10 per minute depending on the distance.

1.13 On 29.10.2003, a revised Regulation was issued superseding the earlier Regulation of 24.01.2003. This Regulation prescribed a uniform termination charge of Rs.0.30 (30 paisa) per minute for all types of calls. The carriage charges remained distance-based.

1.14 The IUC regime was reviewed again in 2005. However, after a detailed consultation process, the Authority decided to keep termination charges at the same level. In the amendment dated 23.02.2006, implemented from 01.03.2006, a ceiling was placed on carriage charges while other IUC components remained unchanged. The reduction in the carriage charges provided a strong basis to service providers to reduce long-distance tariffs and offer a uniform STD tariff.

1.15 A revised IUC regime was notified on 09.03.2009 and became effective on 01.04.2009. The termination charge for local and national long-distance voice calls to fixed line and mobile were uniformly fixed at the rate of Rs. 0.20 (20

paisa) per minute and termination charges for incoming international long-distance calls were fixed at the rate of Rs. 0.40 (40 paisa) per minute. The carriage charges were retained with a ceiling of Rs. 0.65 (65 paisa) per minute. Transit carriage charge was also reduced to Rs. 0.15 (15 paisa) per minute from Rs. 0.20 (20 paisa) per minute.

1.16 Some service providers challenged the IUC Regulations dated 09.03.2009 before the TDSAT (Telecom Disputes Settlement & Appellate Tribunal) 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.

1.17 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 the 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.

1.18 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. …"

1.19 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. …"

1.20 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 prevailing IUC regime has been in place since 2009. A significant amount of time (5 years) has elapsed since the last review. The Authority is, therefore, of the view that there is an urgent need to review the IUC regime.

1.21 As a precursor to the exercise, the Authority asked wireless access service providers, wireline access service providers and NLDOs to submit information related to network usage and the costs thereof through letters of 30.04.2014 and 05.06.2014. Many service providers have furnished the required information; this is being examined internally for completeness and accuracy.

Further, this consultation paper (CP) also takes into account discussions held with stakeholders previously, including at the time of the previous consultation in 2011. Some submissions made by stakeholders at that time that have relevance for the present exercise have been incorporated at the appropriate place in the subsequent chapters.

1.22 This CP is divided into six chapters. The first chapter introduces the background in which this consultation is being initiated along with a brief description of the IUC components. Chapter - II deals with the approaches available for inter-operator settlement; Chapter - III describes the costing methodologies for the determination of IUC; and Chapters - IV and V deal specifically with international settlement and termination charge and transit and carriage charge respectively. Chapter - VI lists the issues for consultation.

Chapter - II
Approaches for Inter-operator Settlement

A. Significance of IUC

2.1. With the liberalization of telecom markets across the world, the issue of interconnection has become perhaps one of the most important issues facing regulators as well as incumbent operators and new entrants.

2.2. While the public interest motive for an efficient interconnection is strong, individual service providers may view it in a different light. Where two networks are vying for customers of the same service, the commercial benefits of interconnection may seem to accrue principally to the smaller network: its customers benefit more from the larger range of communication possibilities made available. As a result, large networks find it to their advantage to refuse, delay or otherwise impede interconnection, even when it is mandated by regulation. A large network may also seek to foreclose entry by charging high interconnection prices which eliminates or weakens smaller competitors for the same pool of retail customers. In addition, a large network will, other things being equal, benefit from high interconnection charges which enhance its revenues.

2.3. On the other hand, a low IUC such as mobile termination charge would allow the small networks to keep lower tariffs for off-net outgoing calls and, thereby, attract new customers. *Ceteris paribus*, this would lead to overloading and congestion of the larger network. In their bid to retain their customers, the large networks would be compelled to reduce tariffs for off-net outgoing calls. As this can potentially reduce the overall revenue of the large network providers, such service providers would prefer a regime with a high IUC.

2.4 The design of the IUC regime needs to balance disparate interests so that investments in network expansion and upgradation are incentivized while at

the same time enhancing competition and consumer interest. In the Indian context, an additional factor that requires attention is the poor penetration of telecom services in rural areas. Wireless services are predominant across the country, and hyper-competition in the access services market imposes constraints on operators' margins from retail tariffs. At the same time, affordability of retail tariffs is also an important consideration for rural consumers. These aspects place the onus on the IUC regime to establish prices that would simultaneously protect operators' investments and keep retail tariffs affordable. There is a consensus amongst economists and regulators that interconnection prices based on cost are most likely to lead to such desirable outcomes. Measuring "cost" is challenging; hence, there is no single correct interconnection charge. Depending on the methodology used the results might be significantly different. If interconnection charges are set "too low" then inefficient competitors may enter the market. Such new entrants may seek profitable opportunities by purchasing services at low regulated prices and simply re-selling them, instead of developing new innovative product offerings. At the same time, "too low" interconnection charges would discourage the incumbent service providers from investing in the network and maintaining good quality of service (QoS). On the other hand, if the interconnection charges are set "too high" it will deter the entry of efficient competitors. In such a scenario, the incumbent service providers may concentrate only on maximizing payments from other service providers, instead of focusing on providing services to retail customers. In turn, consumers may end up paying more than they need to.

B. Termination Charges

2.5 As discussed, these are the charges payable by the originating service provider to the terminating service provider. The way these charges are recovered depends on the method of payment of a call by a mobile subscriber. If the mobile subscriber has to pay for both outgoing and incoming calls (Mobile Party Pays or MPP regime) then the terminating operator recovers the cost of interconnection from his own subscriber and,

therefore, a termination charge may not exist. If the calling party, whether fixed or mobile, pays for calls (Calling Party Pays or CPP regime) then the calling party's service provider has to pay a termination charge to the called party's service provider in order to reimburse the interconnection/network usage cost.

2.6 There is no uniform treatment of mobile termination charges across various countries. Some countries only regulate mobile termination charges for fixed-to-mobile calls. In other countries, mobile networks are required to apply a single regulated termination charge regardless of where the call originates.

2.7 Termination charges could be symmetric irrespective of the geographical location of the subscriber or the type of network originating and terminating the call. A regulator may, however, choose to have asymmetric termination charges if the situation so warrants. Such asymmetry could be based on rural-urban, fixed-mobile or any other criteria that may be relevant.

2.8 In India, the concept of termination charges came into existence with the implementation of IUC Regulation dated 24.01.2003 which became effective from 01.05.2003. This IUC regulation introduced the CPP regime in India. In this regime, the termination charges were not uniform but differed on the basis of (i) the type of network (viz. fixed, WLL or cellular mobile) in which call originated (ii) category of destination network i.e. whether metro licensed service area (LSA) or a non-metro LSA and (iii) distance travelled in a particular network.

2.9 Such termination charges ranged from Rs. 0.15 (15 paisa) to Rs. 0.50 (50 paisa) per minute. Subsequently, on 29.10.2003, a revised Regulation was issued superseding the earlier Regulation of 24.01.2003. This Regulation prescribed a uniform termination charge of Rs. 0.30 (30 paisa) per minute for all types of calls, thereby moving towards a regime of symmetric termination charges.

2.10 The termination charges were reviewed in the year 2005. However, after a detailed consultation process, the Authority decided to keep termination charges at the same level and the reasons for such decision were given in the explanatory memorandum accompanying the Regulation.

2.11 In the Consultation Paper of 31.12.2008, the issue of termination charges was reviewed and an amendment to the IUC Regulation was notified on 09.03.2009. This amendment became effective on 01.04.2009. The IUC prescribed through this Regulation is still in effect. As per the prevalent IUC regime, the termination charge for all types of domestic voice calls is Rs. 0.20 (20 paisa) per minute and for international calls, it is Rs. 0.40 (40 paisa) per minute. Termination charges for 3G voice calls are the same as those for 2G voice calls.

C. Approaches for regulating Termination Charges

2.12 Broadly, there are the following approaches for regulating IUC.

(1) Bill and keep (BAK) or sender keeps all

2.13 In this method, a service provider does not pay any termination charge to its interconnecting operator. Each service provider bills its own customers for outgoing traffic that it sends to other interconnecting service providers and keeps all the revenue received from its subscribers.

(2) Cost-based or cost-oriented

2.14 Cost-based IUC have a strong economic rationale; however, there is no single, simple way to estimate the interconnection cost. The determination of cost-based charges is a complex exercise. The moot question in a cost-based exercise is the relevant costs to be taken into account for determining the IUC. A related issue is whether current costs or historical costs have to be considered. Lastly, there are a number of methodologies like Fully Allocated Cost (FAC), Long Run Incremental Cost (LRIC) and Pure LRIC, which are used

in various jurisdictions across the globe. Therefore, the regulator also has to choose the methodology to be used for determining IUC.

(3) Retail minus method

2.15 In this method, IUC is determined on the basis of retail tariff - either prevailing in the market or the regulated tariff fixed by the regulator. Thus, in this method, IUC are determined by subtracting avoidable costs from the retail tariff. This method was also raised in the previous consultation process. However, since retail tariffs for voice calls (except tariff for national roaming) are under forbearance and service providers are offering various tariff schemes, it appears to be difficult to fix IUC on the basis of the retail minus method.

(4) Revenue sharing

2.16 A revenue sharing arrangement between service providers is also sometimes used in place of paying explicit IUC. This method was used in India before implementation of the IUC regime. However, this regime limits the capability of offering innovative tariff plans by a service provider as the calling party's service provider has to share a certain percentage with the interconnecting service providers which would require prior consent from them. This could potentially restrict innovations in tariff offerings.

D. Bill and Keep (BAK)

2.17 In a regime where one service provider pays termination charges to another service provider, the net revenue realization to the service provider depends on the difference in minutes exchanged between the two networks. Under BAK, there are no per minute termination charges levied between interconnected service providers for the exchange of traffic; hence, no payments are exchanged. The service provider can recover the cost of termination of any traffic originated from other networks, from their own consumers in whatever way they choose.

2.18 Supporters of this regime argue that BAK provides a solution to address the issue of market power of call-terminating networks. They also argue that the theory and practice of identifying an optimal termination charge is complex. The result is that any determination of a termination charge, even if done with great care and at a cost, could be disputed by a set of service providers who perceive it to be loaded against them. Various factors like determination of costs, the method of allocation, determining costs sensitive to traffic volumes and the extent to which different products/services should contribute to common costs, etc. can at times be debated. They further argue that a termination charge becomes an effective floor for retail tariffs. BAK helps to remove this barrier to retail pricing for off-net calls (i.e. inter-operator calls) and has been proven to result in significantly higher levels of calling activity as service providers are given the flexibility to offer innovative customized tariff plans to their consumers.

2.19 With the evolution of technology and convergence, more and more telecom networks are migrating towards an IP-based network. Regulators the world over are working towards facilitating migration towards Next Generation Networks (NGN) which are IP-based networks so that innovative services could be provided to customers. One argument is that the termination charges work as a disincentive to deployment of IP-based telecom networks by the service providers. Moving towards BAK will encourage deployment of IP-based telecom networks. Since IP based networks are poised to be the networks of the future for providing telecom services, a BAK regime may be seen as a natural progression in line with the development of technology.

2.20 At the same time, it is argued by the detractors of BAK that it may result in a race to the bottom in that service providers may be incentivized to set prices well below costs to enter new market segments and capture larger market share. As already discussed at paragraph 1.4, this may result in inadequate investment in network infrastructure and consequent inefficiencies in

capturing positive externalities. This is particularly salient in India which suffers from poor rural coverage, both in fixed line and mobile.

E. Cost-based or cost-oriented

Principles of cost recovery

(a) Efficiency

2.21 The goal of economic efficiency is generally achieved by establishing charges that are as close to cost as possible, and are specifically based upon cost causation. That is, when certain costs stem from the activities of a given service provider or customer, they should be recovered through charges levied on that service provider or customer. Moreover, the relationship between costs and charges should be direct. Variable (traffic-sensitive) costs should be recovered through traffic sensitive charges, and fixed (non-traffic-sensitive) costs should be recovered through fixed or "flat" charges. Under a pure efficiency policy, these differences should be suitably reflected in interconnection charges.

(b) Equity and competitive balance

2.22 In markets where the number of service providers is few, sustaining and nurturing competition is often a more immediate policy priority than achieving short-term economic efficiency. The competitive balance principle calls for interconnection charges to be generally set at the same levels for all similarly situated service providers. They may even be set at deliberately favourable levels for new market entrants. The equity principle may lead regulators to impose interconnection costs equally, or at least proportionally, on both interconnected service providers, even though, from a cost-causation point of view, one service provider may be generating more costs than the other. Equity can also be the motivating philosophy behind interconnection policies that base charges on discounts from relevant retail prices.

(c) Costing Methodologies

2.23 The two most commonly followed international practices or methodologies for determination of IUC are Fully Allocated Cost (FAC) and Long Run Incremental Cost (LRIC). FAC involves the allocation of all historical costs incurred to date for individual services based on a set of criteria such as relative capacity utilization, minutes of usage or proportional revenue generated. On the other hand, the LRIC approach involves determining the incremental cost of providing an additional unit of service over current levels and over a defined future period of time. Thus, it considers costs that are both forward looking and incremental, which would generate a credible charge that reflects real economic cost for providing interconnection. These two methods are explained in detail in the next chapter.

Q1: Which of the following approaches would be the most appropriate for Mobile Termination Charge and Fixed Termination Charge:

(i) Cost oriented or cost based;
(ii) Bill and Keep

Please provide justification in support of your response.

Q2: In case cost-oriented or cost-based approach is used for determining Mobile Termination Charge and Fixed Termination Charge, is there a need to give a glide path towards Bill and Keep and what will be the appropriate time frame to migrate to Bill and Keep regime?

Chapter - III

Costing Methodologies for Determination of IUC

3.1. As already mentioned, the two most commonly used methodologies for cost determination are FAC and LRIC. LRIC also has variants such as LRIC+ and pure LRIC. A brief discussion of Operating Expenditure (OPEX), Capital Expenditure (CAPEX) recovery in the form of Depreciation and Return on Capital Employed i.e. Weighted Average Cost of Capital (WACC) would be in order before embarking on a detailed evaluation of these costing methodologies.

A. Depreciation

3.2. Depreciation is an important cost element since assets utilized in operations are not consumed fully in a particular accounting period. Such assets have an economically useful life which is typically longer than the accounting period. Thus, the assets can and will be used to produce benefits in future. This is why the cost relating to the acquisition of such assets is likely to be spread over their useful life rather than being recovered fully in the year of acquisition itself. Such a cost (depreciation) must be charged in future years of use in a rational and systematic manner. Depreciation occurs due to use, wear and tear, passage of time, change in technology and obsolescence. Depreciation is a non-cash item of cost and represents the recovery of a part of the Capital Expenditure (CAPEX) incurred on the acquisition of assets.

3.3. There are several methods of charging deprecation on the useful life of assets. The most commonly used are the Straight Line Method (SLM) and the Diminishing Balance (Written Down Value or WDV) Method.

(i) Under the Straight Line Method, depreciation is calculated by allocating to each year an equal amount of the cost of the asset over the asset's estimated useful life. Under this method, an equal amount of depreciation per year is charged over the useful life of the asset.

(ii) In the Diminishing Balance/ WDV Method, a (fixed) percentage of the remaining value of the asset is charged as depreciation every year. Under this method, the amount of depreciation charged is high initially and gradually decreases in subsequent years.

3.4. The service-wise Accounting Separation Reports (ASR) submitted by the service providers under the Reporting System on Accounting Separation Regulations 2012, provide information on depreciation charged on fixed assets (Gross Block) of the respective telecom service. There are differences in the estimation of useful life of the assets used and the rates of annual depreciation adopted by various service providers. It is worth noting that, for purposes of computing corporate taxes, the Companies Act, 2013, permits application of any method of depreciation or the rate of depreciation subject to a minimum rate prescribed under the Act. However, for the purpose of setting IUC, it is imperative that a normative measure for costing of relevant network elements is developed, quite distinct from what the statutory regime prescribes for taxation purposes.

Q3: Which method of depreciation for the network elements should be used and what should be the average life of various network elements?

B. Weighted Average Cost of Capital (WACC)

3.5 WACC is used to measure the firm's cost of capital or the expected return on the funds (both debt and equity) deployed in the business. Firms are generally financed through a mix of debt and equity resources. The measure of the overall cost of capital of a firm is the WACC. WACC may vary from service provider to service provider depending on the particular service provider's debt-equity ratio, risk factors, the cost of procuring debt, the cost of equity and other related factors. In the past, the Authority has used a WACC of 15% (pre-tax) in most regulatory exercises and this has met with general acceptance by stakeholders.

Q4: Should TRAI continue with a pre-tax WACC of 15% as used in framing other regulations, tariff orders, and regulatory exercises? If not, please state what pre-tax WACC would be appropriate for the present exercise, along with justification and computations.

C. Fully Allocated Cost (FAC) method

3.6 In this methodology, shared and common costs are assigned to individual services or service elements. Obviously, there is no single correct way of assigning costs. One way is to allocate costs according to relative capacity utilized; another could be by minutes of use. In some cases, the proportionate revenues generated by different services are used as the basis of allocation. The FAC method has the advantage of simplicity; it also ensures that costs corresponding to each network element are reckoned on the basis of work done. It can be used both in top-down and bottom-up costing exercises. It uses the accounting data submitted by service providers in their balance sheet, profit & loss account and ASRs.

3.7 The core idea in the FAC approach is to simply divide the total cost that the service provider incurs amongst the services it provides. FAC is based on historic costs because accounting data reflect the firm's actual costs; it is, therefore, easy to audit. The cost allocation principles indicate how various costs have been allocated/ apportioned to different products/ services/ network elements. Based on the FAC methodology, interconnection charges can be set so as to recover costs which service providers incur.

(1) Allocation of costs to different network elements and activities

3.8 However, the crucial decision of how the allocation/ attribution of costs to the different network elements and activities must be based on reasonable criteria like appropriateness, practicability, state of the market, causation principle, consistency, objectivity, etc. The goals of economic efficiency and financial viability are generally achieved by setting charges that are cost-oriented and that are specifically based upon cost causation. That is, when certain costs arise from the activities of a given service provider or customer, they should be recovered through charges levied on that service provider or customer. Moreover, the relationship between cost and charges should be direct. Traffic-sensitive costs ought to be recovered through traffic-sensitive charges and non-traffic-sensitive costs ought to be recovered through fixed or flat charges.

3.9 The total cost of providing a product or a service has both fixed and variable elements. Further, there are costs which may not be directly linked/ attributable to termination charges, both OPEX and CAPEX. In the context of termination charges, there can be two approaches: OPEX can be recovered through per-minute termination charges, leaving CAPEX, such as depreciation and cost of capital to be recovered through fixed or flat charges e.g. rental. Alternatively, OPEX as well as CAPEX can be taken as relevant to the product/ service/ activity and can be recovered through per minute termination charges. However, the utility of two-part tariffs is debatable in the Indian market context as the latter is predominantly mobile (not fixed line) and is further dominated by pre-paid subscriptions.

3.10 An additional feature that needs to be considered in the present IUC exercise is the shift from administrative allocation of spectrum to a market determination of spectrum prices through auctions. The auction regime introduced in India since 2010 has imposed large upfront costs on access service providers for obtaining access spectrum. While spectrum is an intangible asset (unlike, say, land and buildings and physical network infrastructure), the auction prices paid by service providers yield benefits over

the tenure of licence, and the amortized cost of the spectrum may need to be treated in a similar manner as CAPEX.

(2) Treatment of revenue from other sources

3.11 Service Providers earn revenues from various sources (apart from voice call charges) like rental/ activation charges, short messaging service (SMS), data services, other Value Added Services (VAS) and other income etc. Ideally, the costs associated with these services should not form part of costs relevant for termination charges. However, on an examination of ASRs, it emerges that there is no uniformity amongst service providers in allocating costs to different products/services.

D. Long Run Incremental Cost (LRIC) method

3.12 An access service provider offers a wide range of services. While some services (viz. telephony, SMS, data transfer and other value added services) are offered in retail markets, some other services such as off-net incoming minutes are offered at a wholesale level. While the level of competition in the market for retail services is high, the same for wholesale services is much less, to the extent that the access service providers have a monopoly on carrying off-net incoming minutes in their network. In such a scenario, it is important that an incumbent access service provider does not charge a high price for wholesale services and uses the proceeds to subsidize low prices for its retail services. In many jurisdictions around the world, the regulators use long run incremental cost (LRIC) method to determine an appropriate level of termination charge for the off-net incoming calls.

3.13 In the LRIC model, the following basic assumptions are used.

(i) The model is built for a hypothetical efficient operator.

(ii) The hypothetical efficient operator incurs costs that would occur in a competitive market.

(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 identifies incremental cost, which would be incurred to support the service demand of the wholesale services i.e. off-net incoming calls.

3.14 Thus, in the LRIC model, all costs (capital expenditures (CAPEX) as well as operating expenditure (OPEX) become variable since the methodology takes a long-run view and in the long-run all factors of production become variable. The costs, both CAPEX and OPEX, incurred on carrying off-net incoming minutes are identified (say 'total termination cost') with the help of a routing table. This cost is then divided by off-net incoming minutes to determine termination cost per minute.

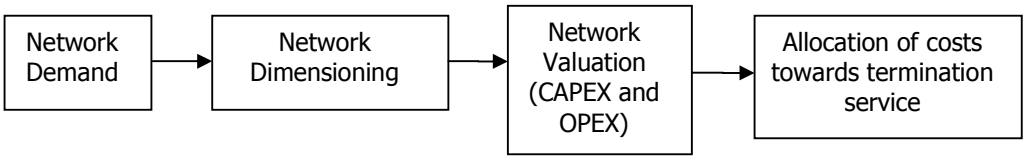
Termination cost per minute = (Total annualized termination cost for a hypothetical efficient operator computed on a long-run incremental cost basis) *divided by* (No. of off-net incoming minutes to be served by the hypothetical efficient operator in the year)

3.15 Unlike the FAC method, in which historical cost information is generally used, the LRIC method uses present costs (i.e. forward looking costs). Further, the LRIC method uses 'long-run' costing in which the size of the network deployed is reasonably matched to the level of network demand. On the other hand, even short-run costs[1] are accounted for in the FAC method using historical cost information. Further, in the LRIC method, the network is optimized for a hypothetical efficient operator.

[1] Short-run costs are those which are incurred at the time of the service output, and are typically characterized by large variations. For example, at a particular point in time, the launch or increase in a service demand may cause the installation of a new capacity unit, giving rise to a high short-run unit cost, which then declines as the capacity unit becomes better utilized with growing demand.

3.16 A block schematic diagram of the LRIC model for computation of termination cost is given below:

Figure 3.1: Block Schematic Diagram of LRIC Model



3.17 In the LRIC model, the network demand for a hypothetic efficient operator is identified at the beginning of a year. In order to meet this demand, an efficient network is dimensioned using the network design parameters of the typical service provider. The costs of the various network elements are then computed on the basis of the present costs. These costs are then allocated towards termination service (i.e. off-net incoming minutes) using a routing table[2] in order to determine termination cost per minute. Routing factors specify, for each type of service, the average use made of each type of network element. Each service therefore has a routing (or "usage") profile indicating how the service uses the network elements (distinguishing between the different types of exchange and the different parts of the transport network. As such, the routing table is a mechanism for apportioning costs.

3.18 As an illustration, the detailed methodology for computation of mobile termination cost with the help of LRIC model is placed as **Annexure**.

E. Long Run Incremental Cost plus (LRIC+)

3.19 The costs that are common to both wholesale business and retail business of the service provider are termed as common costs e.g. costs pertaining to the corporate office, head offices etc. In LRIC+ model, a certain portion of these costs are also allocated for the purpose of computation of termination cost with a view that these costs are incurred by the service provider while

[2] A typical routing table used for determining mobile termination cost per minute is available in the Annexure.

providing mobile termination service. Though service providers have furnished information on such costs, there are large variations in the quantum of such costs. Further, there is no consensus amongst operators on items to be included in the common costs. Stakeholders are requested to comment on items and quantum thereof which should be included in the common costs attributable to termination cost.

3.20 After determining the mark-up for common costs (attributable to termination), the termination cost as per LRIC+ model may be computed as below:
The termination cost as per LRIC+ model
= (Termination cost as per LRIC model) + (Mark up for common costs)

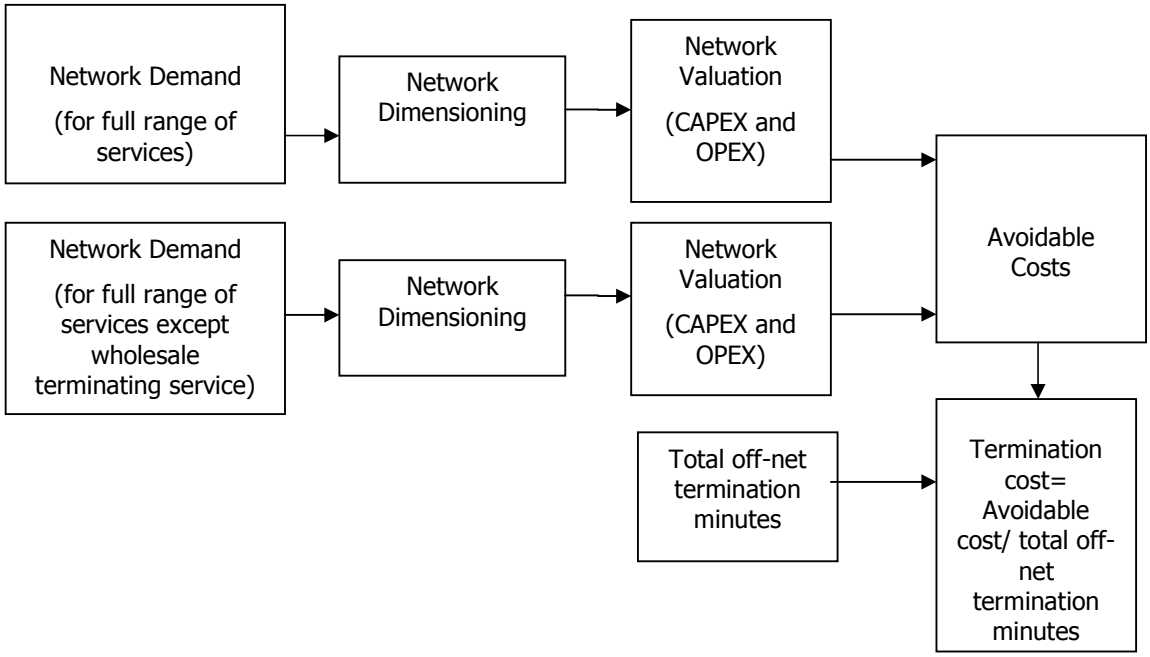
F. Pure LRIC

3.21 In the pure LRIC approach, the relevant increment is the wholesale call termination service and it includes only avoidable costs. This method also allows the recovery of all costs (fixed costs are assumed to become variable over the long run) which are incremental to the provision of the wholesale call termination service and would thereby facilitate efficient cost recovery. Avoidable costs are the difference between the identified total long-run costs of an operator providing its full range of services and the identified total long-run costs of that operator providing its full range of services except for the wholesale call termination service supplied to third parties (i.e. stand-alone cost of an operator not offering termination to third parties). Thus, the pure LRIC method measures the avoidable cost for carrying an off-net incoming minute i.e. service specific costs that arise from the increment of all off-net incoming minutes.

3.22 The avoidable cost is the difference between the network costs (CAPEX and OPEX) of a hypothetical efficient operator providing its full range of services and the network costs (CAPEX and OPEX) of that operator providing its full range of services except for the wholesale call termination service to the other operators. Thus, the pure LRIC model allows the recovery of only those

costs which would be avoided if a wholesale call termination service is not provided to the other operators. A block schematic diagram of the pure LRIC model is given below:

Figure 3.2: Block schematic diagram of Pure LRIC Model



3.23 Thus, using the Pure LRIC model, the termination cost may be computed as below.

Termination cost = (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)

Q5: In case a cost-oriented or cost-based approach is used for prescribing Mobile Termination Charge and Fixed Termination Charge, which method would be the most appropriate for estimating these costs?

Q6: In case your response to the Q5 is fully allocated cost (FAC) method, would it be appropriate to calculate IUC using historical cost data submitted by the service providers in Accounting Separation Reports (ASRs), Annual Reports/published documents or other reports submitted to TRAI?

Q7: In the FAC method, what items/nature of OPEX should be considered as relevant for the termination cost? Please provide justification in support of your opinion.

Q8: Should CAPEX be included in calculating termination cost? If yes, what items of fixed assets from the ASRs ought to be considered relevant for termination cost? How should costs incurred by service providers for acquiring usage rights for spectrum be treated?

Q9: Would it be appropriate to take an average life of 10 years for all network elements without any salvage value for the purpose of depreciation in the FAC method? If not, please suggest an alternative method keeping in view the categorization of network elements prescribed in Accounting Separation Regulations, 2012, along with justification.

Q10: Is there any need to adjust costs associated (as reported in ASRs) with products other than voice calls, for the purpose of computing termination cost using the FAC method? If yes, please suggest the appropriate cost driver along with justification.

Q11: Do you agree with the methodologies explained for various variants of LRIC, including the detailed description of computation of the termination cost using LRIC model in the Annexure? If not, please give your answer with justification.

Q12: In case it is decided to go for an LRIC model for determining termination cost, which is the most suitable variant of LRIC for the telecom service sector in the country in the present circumstances and why?

(i) LRIC
(ii) LRIC+
(iii) Pure LRIC

Q13: In case your response to the Q12 is LRIC+, what are the common costs that should be considered for computation of termination costs?

Q14: In case there is a significant difference in the mobile termination cost and fixed termination cost, will it be appropriate to prescribe different mobile termination charge and fixed termination charge?

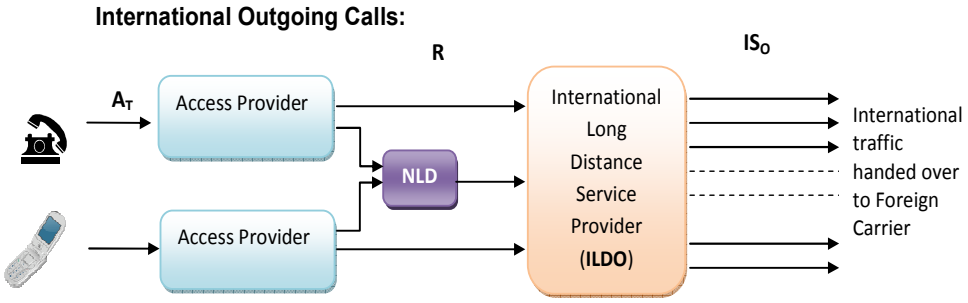
Chapter - IV
International Settlement and Termination Charge

4.1. There is a key difference between the international termination charges and other charges which are part of the IUC regime. The domestic mobile termination charge and domestic carriage and transit charges are settled amongst service providers located within a single legal-cum-geographical jurisdiction. However, the international termination charge is different in that, in completing a call the service providers belong to two separate legal-cum-geographical jurisdictions. In effect, for an outgoing call the domestic access service provider is a price-taker; it cannot materially affect the termination charge set by the foreign carrier. Similarly, for an incoming call, the foreign access service provider has to be a price-taker; the international termination charge to be paid to the Indian service provider is decided domestically.

A. International Outgoing Calls

4.2. For international long distance calls, international carriage charges and termination at the foreign end are settled between International Long Distance Operators (ILDOs) and foreign service providers. As per the clause (c) of Schedule II of the IUC Regulation dated 29.10.2003, these charges are under forbearance. The flow of traffic for international outgoing calls is depicted in the following figure.

Figure 4.1: Schematic diagram for international outgoing calls



4.3. The relevant charges for international outgoing calls are given in the following table:

Table 4.1: Relevant charges for international outgoing calls

Legend	Charge	Description	Position as per IUC Regulations / TTO	Remarks
A_T	Tariff	Tariff charged (or revenue received) by access service provider from Indian Subscriber for outgoing ISD Calls	Under forbearance	
R	Revenue shared with ILDO	Part of the revenue to be paid by access service provider to ILDO for carrying ILD Calls including NLD leg, if applicable	Under forbearance	
A_O	Origination Charge	Balance amount remaining with the access service provider after sharing a part of revenue with ILDO	Under forbearance	$A_O=A_T$ - R
N_C	Domestic carriage charge	Carriage charge to be paid by ILDO to the NLDO for NLD leg, if applicable	Ceiling of Re. 0.65/ min	
IS_O	International settlement rate (For outgoing calls)	Amount paid (@ international settlement rate) by Indian ILDO to a foreign carrier for carrying outgoing ISD Call from India to the destination country	Under forbearance	
I_C	International carriage charge	ILD carriage charge retained by the Indian ILDO after payment of (i) domestic carriage charge to NLDO, if applicable and (ii) international settlement rate to the foreign carrier	Under forbearance	$Ic = R-N_c-IS_0$
I_T	International termination charge	Termination charge to be paid by the foreign carrier to the access service provider at the foreign end		

4.4. In the Regulation on "The International Calling Card Services (Access Charges)" dated 19.08.2014, the Authority had observed that the prevalence of high tariffs for ISD calls in the country is one of the major factors which have contributed to distort the ratio of outgoing calls to incoming calls. In

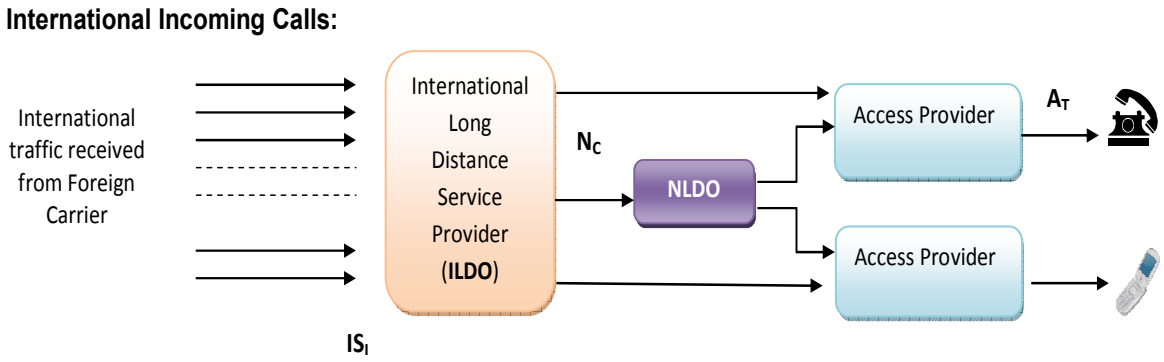
2012-13 the ILD outgoing minutes were 4,633 million vis-a-vis 76,354 million incoming minutes. The Authority further noted that, in the case of outgoing calls, access service providers retain a large margin after making necessary payments to ILDO for the carriage of calls to the foreign destination (including payment of termination charge at the foreign end). In this backdrop, the Authority prescribed access charges so as to facilitate the introduction of calling cards; this would give consumers a real choice by letting them pick the ILD carrier which offers the most competitive tariff for ILD calls.

Q15: The Authority has already prescribed access charges to facilitate the introduction of calling cards. Is there any other issue which needs to be addressed so that the consumer gets the most competitive tariff for ISD calls?

B. International Incoming calls

4.5. The flow of traffic for international incoming calls is depicted in the follo wing figure.

Figure 4.2: Schematic Diagram for International Incoming Calls



4.6. The relevant charges for international incoming calls are given in the following table.

Table 4.2: Relevant charges for international incoming calls

Legend	Interconnection Usage Charge	Description	Position as per IUC Regulations	Remarks
IS_I	International settlement Rate (For Incoming calls)	Settlement Rate to be paid by foreign carrier to Indian ILDO for terminating incoming ISD Call in India	Under forbearance	
N_C	Domestic carriage Charge	Carriage charge to be paid by ILDO to NLDO for carriage of incoming ISD call, if applicable	Ceiling of Re 0.65/min	
N_T	Termination Charge in India	Termination Charge to be Paid by ILDO to Indian access service provider	Re. 0.40/min	
I_C	International carriage charge	Carriage Charge retained by Indian ILDO for carrying ISD call from foreign country to India	Under forbearance	$I_c=IS_I-N_C-N_T$

C. International Settlement Rates

4.7. During discussions, some service providers have informed the Authority that operators in the some countries have fixed very high settlement rates (especially Middle East countries) for outgoing calls from India. These have to be paid by Indian ILDOs for traffic from India to those countries. However, the settlement rate paid to the Indian operator is low because of aggressive competition amongst Indian ILDOs. Settlement rate for ILD outgoing calls for some countries as submitted by ILDOs is tabulated in the following table.

Table 4.3: Settlement charges for some of the countries for Outgoing ISD Calls (as reported by the service providers)

Sr. No	Name of the Country	International Settlement between ILDO and Foreign Carrier (in Rs per minute)
1	Australia	0.86
2	Bangladesh	1.92
3	Brunei	3.52
4	China	0.76
5	France	7.35
6	Hongkong	1.13
7	Indonesia	3.36
8	Israel	3.20
9	Italy	0.54
10	Japan	1.67
11	Kuwait	5.37
12	Malaysia	1.44
13	Maldives	28.96
14	Mauritius	7.46
15	Oman	13.11
16	Pakistan	1.19
17	Saudi Arabia	6.39
18	Singapore	0.83
19	South Korea	2.31
20	Srilanka	6.16
21	Taiwan	5.91
22	Thailand	1.28
23	UAE	8.33
24	USA	0.63
25	Vietnam	3.91
26	Yemen	7.53

4.8. Many stakeholders are of the view that the core issue is the comparatively low level of termination rates in India which sets an artificially low floor price for international settlement rates. A few service providers have also indicated that the issue is not confined to the Middle East but applies to the entire

world i.e. it is a general problem of high termination charge in many countries.

4.9. One option could be to fix differentiated settlement rates for calls originating from specific world regions for India. However, this may create serious challenges in monitoring inbound calls to India.

4.10. A second option could be 'reciprocal arrangements' i.e. mandating the same settlement rate for calls from a country as that country applies to calls from India. However, this may lead to complexity in settlement. There would be a large number of settlement rates for calls terminating in various countries and settlement disputes would increase. This arrangement would also lead to hubbing of international traffic in a country that has a low settlement rate arrangement with India. This would not only lead to dependence on huge bandwidth on some routes and inefficient utilization of bandwidth on other routes but may also encourage the operators to alter Caller Line Identification (CLI) to show that the calls are from a country that enjoys low settlement rate for calls to India.

4.11. Some ILDOs have also represented that they also incur substantial costs in the form of international call carriage, gateway transit in carrying ISD traffic to and from the country. However, because of hyper-competition in the incoming international traffic, ILDOs are not being compensated enough vis-à-vis the cost incurred by them; this may hamper further investment in the international routes. In this backdrop, the stakeholders are requested to comment on the following questions.

Q16: Do you feel that the Authority's intervention is necessary in the matter of International Settlement Rates? If so, what should be the basis to determine International Settlement Rates?

Q17: Is there a need to fix a floor for international carriage charge for incoming international traffic or prescribe some revenue share between access service provider and the ILDO to safeguard the interest of ILDOs?

D. International Termination Charge

4.12. The prevalent termination charge for international incoming calls is Re 0.40 (40 paisa) per minute while the termination charge is Re.0.20 (20 paisa) per minute for domestic calls. During various discussions service providers have submitted that the termination charges for international calls fixed by TRAI during the last review of IUC, put Indian access providers in a hugely disadvantageous situation vis-à-vis foreign operators, as termination charges in some other countries are almost 8-10 times higher than Indian termination charges. On the other hand, some service providers are of the view that there is a no extra cost involved in terminating the international call, and, therefore, termination charges for domestic and international calls should be same.

4.13. Another aspect which needs to be kept in mind is that in view of the deployment of IP networks, or domestic traffic becoming balanced, or even otherwise, there may be a need to prescribe a Bill and Keep regime for domestic traffic which means termination charges for domestic traffic could be zero. However, an international termination charge still has to be continued as service providers are required to pay for their ILD outgoing calls.

4.14. One option could be forbearance of International Termination Charge i.e. leaving the charges to negotiation between ILDOs and access providers; but this has both advantages and disadvantages. It may help access providers in

negotiating higher than prevalent rates and earn more revenue. It may also reduce the tariff for outgoing international calls if service providers are willing to share the increased revenue with customers. However, such negotiations may become protracted and may lead to uncertainty and disputes in the market. Call termination is a monopoly; therefore, an access service provider would always try to obtain higher termination charges from the ILDOs which may lead to a situation of non-settlement and, therefore, non-completion of calls.

4.15. The option of increasing the international incoming termination charge from the current level also has its pros and cons. The advantages are that it may help access service providers earn more revenue; at the same time, the disadvantage of stalled negotiations, as in the case of forbearance, would disappear. It may also reduce tariffs for outgoing international calls if service providers are willing to share the increased revenue with customers. Critics of this approach would cite the disadvantage of the arbitrage opportunity that differential domestic and international termination charge would create. A view has also been expressed that the grey market is a concern of the Government and should not be considered while fixing the international termination charge.

4.16. Maintaining the international termination charge the same as domestic termination charge has the obvious advantage of justifying the fixation of such charge as the cost involved in terminating the international call is equal to that of domestic calls. Nevertheless, even today the international termination charge is set at a higher level than the domestic termination charge. However, this would not ensure parity for access service providers as they would be paying higher charges for their outgoing international calls as international settlement rates with the foreign carrier for outgoing ISD calls from India cannot be regulated by TRAI.

Q18: What is the most appropriate level for International Termination Charge? Should it be uniform or should it depend on the originating country/region? Please provide full justification for your answer.

Chapter- V
Carriage Charges and Transit Charges

A. Carriage charges

5.1 In India, access service providers are licensed on the basis of circles or service areas. However, an access service provider can carry intra-circle calls only. Inter-circle traffic has to be routed through a National Long Distance Operator (NLDO). The charges to be paid by an access service provider to the carriage network (i.e. NLDO) to cover the interconnection/network usage cost are called carriage charges.

5.2 Carriage charges for long-distance calls within India, as specified in the principal regulation of 29.10.2003 were Rs. 0.20, Rs. 0.65, Rs. 0.90, Rs. 1.10 per minute for the slabs of 0 to 50 Kms, 50+ to 200 Kms, 200+ to 500 Kms and above 500 Kms respectively. On the above specified carriage charges, service providers were allowed to negotiate a spot value within +/- 10% of the long-distance call carriage charge beyond 50 Kms.

5.3 The Authority reviewed the carriage charges and in its 23.02.2006 Regulation the ceiling for carriage charge was fixed at Rs. 0.65 per minute. The change in the carriage charge regime provided a strong basis to service providers to reduce long-distance tariffs as well as pave the way for greater usage of the long-distance networks.

5.4 The carriage charges were reviewed again in a consultation process started in December, 2008. After careful consideration of the circumstances in their entirety, the Authority decided in the IUC Regulation dated 09.03.2009 to retain the ceiling of Rs. 0.65 per minute on carriage charges.

5.5 Some service providers argue that as the prevailing market rates for carriage charge are well below the ceiling of Rs. 0.65 per minute and there is sufficient competition in the market, there is no need to review the carriage charges. On the other hand, other service providers contended that there is a need to

reduce the carriage charges. In their view, the actual cost of carriage is not more than Rs. 0.11 per minute. Some service providers have also argued that there is a case for a reduction of carriage charges in consideration of the improved utilization of the network. However, to maintain sufficient incentives for investment in laying fibre, they have proposed that the ceiling on carriage charges be reduced to Rs. 0.50 per minute. BSNL has also consistently represented to TRAI that while this ceiling may be reasonable for high traffic routes, there are many SDCAs in remote and hilly areas where the ceiling of Rs. 0.65 is not sufficient and there is a need to specify a higher ceiling for the carriage charge. Many service providers have migrated their long-distance traffic to IP-based networks (particularly in core networks) and, therefore, their cost of carriage has been drastically reduced. Another view is that the ceiling-based approach should continue; however, there may be a need to undertake a fresh analysis of the costs. A high ceiling is a powerful tool in the hands of the service provider with a dominant position in the market in carriage rate negotiations, particularly in poorly connected geographical areas or wherever these dominant operators can dictate connectivity. Yet another view may be that carriage charges need to be reviewed to bring the ceiling in line with the average range of carriage charges being levied and settled by and between the Unified Access Service (UAS) and NLD licence holders.

5.6 Stakeholders are requested to give their opinion on whether the existing ceiling of Rs. 0.65 per minute should continue or should be changed and also whether there is justification for a higher carriage charge for specific geographic regions such as hilly and other remote areas.

Q19: What should be the methodology for determining the domestic carriage charge? Is there a need to specify separate carriage charges for some specific geographic regions? If yes, on what basis should such geographic regions be identified? How should the carriage charges be determined separately for such geographic regions?

B. Transit and transit carriage charge

5.7 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 called the transit network. Charges to be paid to the transit network to cover the interconnection/network usage cost are termed transit charges. Generally, direct connectivity amongst various service providers is preferred; in such a case, no transit charges are applicable. However, in exceptional situations where direct connectivity may not be possible or due to emergency breakdown etc., and for overflow traffic, traffic can be routed through an alternate route through a transit switch. In such a case the service providers may mutually negotiate the transit charges but this should be lower than Rs. 0.15 (15 paisa) per minute.

5.8 The principal Regulation of 29.10.2003 prescribed forbearance for transit charges for intra-SDCA calls subject to the condition that these are lower than Rs. 0.20 (20 paisa) per minute. A special case of transit / carriage is intra-circle mobile to fixed line traffic, handed over by a wireless access service provider at Level-II TAX of Fixed line operator practically Bharat Sanchar Nigam Limited (BSNL) and carried to SDCA by BSNL. This was prescribed at Rs. 0.20 (20 paisa) per minute. Transit charges were reviewed in the Consultation Paper of 31.12.2008 and revised charges were prescribed through the amendment to IUC Regulation of 09.03.2009. The effective transit charges as on date are as follows:

(i) Trunk Automatic Exchange (TAX) transit charges: Trunk Automatic Exchange transit charge has to be less than Re.0.15 (15 paisa) per minute. Subject to the said limit, these charges may be decided by the concerned service providers through mutual commercial arrangement.

(ii) Transit Carriage Charge from Level II Trunk Automatic Exchange (TAX) to SDCA: Transit carriage charge for carriage of intra-circle traffic handed over from wireless networks to wireline networks, from Level II Trunk Automatic Exchange (TAX) of LDCA in

which the call is to be terminated, to SDCA, is Rs. 0.15 (15 paisa) per minute, irrespective of distance.

Q20: Is there a need to regulate the TAX transit charges or should this be left to mutual negotiations? In the event, the transit charge is to be regulated, please provide complete data and methodology to calculate TAX transit charges.

Q21: How can the cost of providing transit carriage be segregated from the cost data in the ASR? Please provide a method and costing details to separately calculate this charge.

Q22: If the costs of all relevant network elements are taken into account in the calculation of the fixed line termination charge, is there any further justification to have a separate transit carriage charge? Please give reasons for your answer.

Issues for Consultation

It may please be noted that answers/ comments to the issues given below should be supported with justification. The stakeholders may also comment on any other issues related to interconnection usage charges, along with all necessary details:

Q1: Which of the following approaches would be the most appropriate for Mobile Termination Charge and Fixed Termination Charge:

(i) Cost oriented or cost based;
(ii) Bill and Keep

Please provide justification in support of your response.

Q2: In case cost-oriented or cost-based approach is used for determining Mobile Termination Charge and Fixed Termination Charge, is there a need to give a glide path towards Bill and Keep and what will be the appropriate time frame to migrate to Bill and Keep regime?

Q3: Which method of depreciation for the network elements should be used and what should be the average life of various network elements?

Q4: Should TRAI continue with a pre-tax WACC of 15% as used in framing other regulations, tariff orders, and regulatory exercises? If not, please state what pre-tax WACC would be appropriate for the present exercise, along with justification and computations.

Q5: In case a cost-oriented or cost-based approach is used for prescribing Mobile Termination Charge and Fixed Termination Charge, which method would be the most appropriate for estimating these costs?

Q6: In case your response to the Q5 is fully allocated cost (FAC) method, would it be appropriate to calculate IUC using historical cost data submitted by the

service providers in Accounting Separation Reports (ASRs), Annual Reports/published documents or other reports submitted to TRAI?

Q7: In the FAC method, what items/nature of OPEX should be considered as relevant for the termination cost? Please provide justification in support of your opinion.

Q8: Should CAPEX be included in calculating termination cost? If yes, what items of fixed assets from the ASRs ought to be considered relevant for termination cost? How should costs incurred by service providers for acquiring usage rights for spectrum be treated?

Q9: Would it be appropriate to take an average life of 10 years for all network elements without any salvage value for the purpose of depreciation in the FAC method? If not, please suggest an alternative method keeping in view the categorization of network elements prescribed in Accounting Separation Regulations, 2012, along with justification.

Q10: Is there any need to adjust costs associated (as reported in ASRs) with products other than voice calls, for the purpose of computing termination cost using the FAC method? If yes, please suggest the appropriate cost driver along with justification.

Q11: Do you agree with the methodologies explained for various variants of LRIC, including the detailed description of computation of the termination cost using LRIC model in the Annexure? If not, please give your answer with justification.

Q12: In case it is decided to go for an LRIC model for determining termination cost, which is the most suitable variant of LRIC for the telecom service sector in the country in the present circumstances and why?

(i) LRIC

(ii) LRIC+

(iii) Pure LRIC

Q13: In case your response to the Q12 is LRIC+, what are the common costs that should be considered for computation of termination costs?

Q14: In case there is a significant difference in the mobile termination cost and fixed termination cost, will it be appropriate to prescribe different mobile termination charge and fixed termination charge?

Q15: The Authority has already prescribed access charges to facilitate the introduction of calling cards. Is there any other issue which needs to be addressed so that the consumer gets the most competitive tariff for ISD calls?

Q16: Do you feel that the Authority's intervention is necessary in the matter of International Settlement Rates? If so, what should be the basis to determine International Settlement Rates?

Q17: Is there a need to fix a floor for international carriage charge for incoming international traffic or prescribe some revenue share between access service provider and the ILDO to safeguard the interest of ILDOs?

Q18: What is the most appropriate level for International Termination Charge? Should it be uniform or should it depend on the originating country/region? Please provide full justification for your answer.

Q19: What should be the methodology for determining the domestic carriage charge? Is there a need to specify separate carriage charges for some specific geographic regions? If yes, on what basis should such geographic regions be identified? How should the carriage charges be determined separately for such geographic regions?

Q20: Is there a need to regulate the TAX transit charges or should this be left to mutual negotiations? In the event, the transit charge is to be regulated, please provide complete data and methodology to calculate TAX transit charges.

Q21: How can the cost of providing transit carriage be segregated from the cost data in the ASR? Please provide a method and costing details to separately calculate this charge.

Q22: If the costs of all relevant network elements are taken into account in the calculation of the fixed line termination charge, is there any further justification to have a separate transit carriage charge? Please give reasons for your answer.

List of Acronyms

S. No.	Acronym	Description
1	2G	2nd Generation
2	3G	3rd Generation
3	ASR	Accounting Separation Report
4	BAK	Bill and Keep
5	BTS	Base Transceiver Station
6	BSC	Base Station Controller
7	CAPEX	Capital Expenditure
8	CDMA	Code Division Multiple Access
9	CLI	Caller Line Identification
10	CP	Consultation Paper
11	CPP	Calling Party Pays
12	FAC	Fully Allocated Cost
13	FRU	Frequency Reuse Factor
14	GMSC	Gateway Mobile Switching Center
15	GSM	Global System for Mobile Communication
16	HHI	Herfindahl–Hirschman Index
17	ILDO	International Long Distance Operator
18	IP	Internet Protocol
19	IUC	Interconnection Usage Charge
20	LRIC	Long Run Incremental Cost
21	LRIC+	Long Run Incremental Cost plus
22	LSA	Licensed Service Area
23	MOU	Minutes of Usage
24	MPP	Mobile Party Pays
25	MSC	Mobile Switching Center
26	NGN	Next Generation Network
27	NLDO	National Long Distance Operator
28	NMS	Network Management System
29	OPEX	Operating Expenditure
30	QoS	Quality of Service
31	SDCA	Short Distance Charging Area
32	SLM	Straight Line Method
33	SMS	Short Messaging Service
34	TAX	Trunk Automatic Exchange

S. No.	Acronym	Description
35	TDSAT	Telecom Disputes Settlement & Appellate Tribunal
36	TTO	Telecommunication Tariff Order
37	UAS	Unified Access Service
38	VAS	Value Added Services
39	WACC	Weighted Average Cost of Capital
40	WDV	Written Down Value

Annexure

Long Run Incremental Cost (LRIC) Model for Determination of Mobile Termination Cost

Determination of Mobile Termination Cost using LRIC Model

1. Presently, the voice telephony in India is being offered by using GSM (2G), WCDMA (3G) and CDMA technologies. However, the predominant technology continues to remain GSM. Nearly all wireless access service providers, which offer telecommunication services using GSM technology, hold spectrum in 1800 MHz band (apart from spectrum in 900 MHz band). Mobile Termination Cost can be computed, with the help of LRIC model, on the basis of network of a hypothetical efficient operator offering full mobility services in GSM (1800 MHz band).

2. The hypothetical efficient operator may be modeled using the concept of equivalent operator. An equivalent operator in a service area is a GSM operator which has a fair share of the GSM subscribers in that service area. A hypothetical efficient operator in a licensed service area (LSA) may be characterized by the following set of features:

   (i) It has an average size in terms of subscriber base. The average size may be computed on the basis of Herfindahl–Hirschman Index (HHI) as below.

   No. of GSM subscribers of the hypothetical operator in an LSA

   = (Total no. of GSM subscribers in the LSA) *multiplied by* (HHI of the GSM market in the LSA)/ 10,000

   HHI of the GSM market in an LSA may be computed as below:

   $$HHI = \sum_{i=1}^{n} (s_i^2)$$

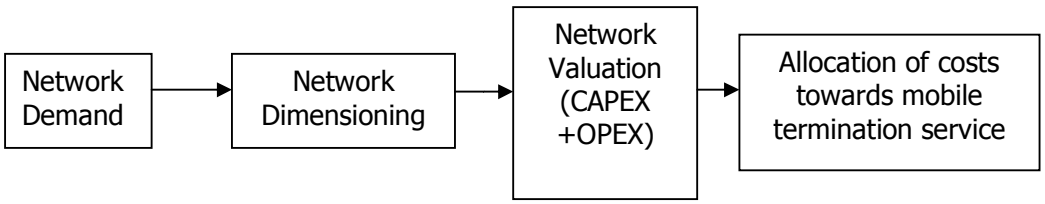
   where s_i is the percent market share of the i^{th} GSM operator in the LSA, and 'n' is the no. of GSM operators in the LSA.

(ii) The usage profile of its customer matches with that of the average customer in the LSA. Thus, the average voice MOU, SMS and data usage per subscriber per month in the LSA will reflect the usage profile of the hypothetical operator.

(iii) It operates efficiently; it has deployed the modern GSM technology in its network, it's network design is optimum and it's costs reflect the present costs.

3. A block schematic of the LRIC model for computation of Mobile Termination Cost is given below:

Block Schematic of the LRIC Model



4. As depicted in the above figure, Mobile Termination Cost can be computed on the basis of the network of a hypothetical efficient operator providing full mobility services in GSM (1800 MHz band) using the following steps:

(i) **Estimation of the network demand** i.e. coverage requirement and the capacity requirement of the hypothetical efficient 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.

5. The following section describes the detailed methodology for computation of Mobile Termination Cost using LRIC model.

(1) Data Collection

6. The Authority, through a letter dated 30.04.2014, has asked all the wireless access service providers to furnish the following information about their networks as on 31.03.2014:

(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 hypothetical efficient operator may be modeled as a combination of (i) coverage requirement and (ii) capacity requirement.

8. **Coverage Requirement**: In order to estimate the coverage requirement of the hypothetical efficient operator, each LSA may be divided into four geo-types, based on the population density as below:

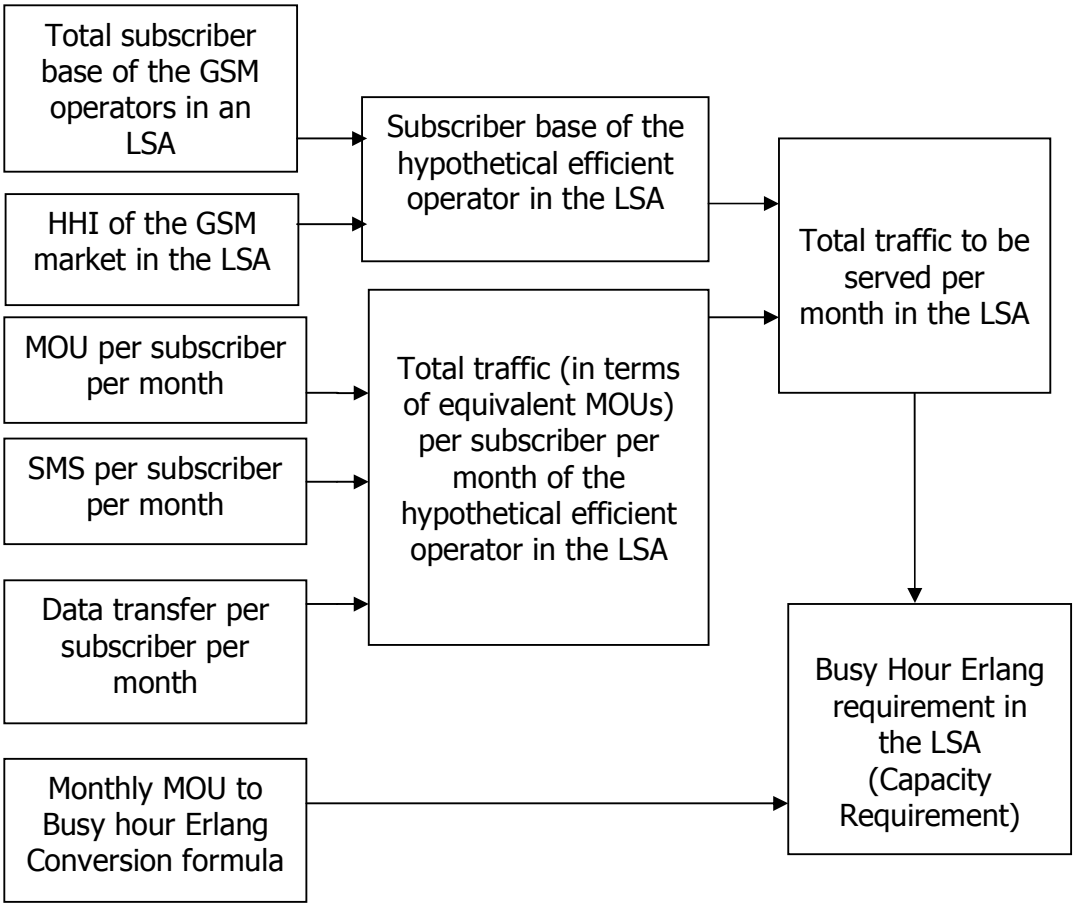
Geo-type wise Population Density

S. No.	Geo-type	Population Density (Population per sq. km)
1	Dense Urban (DU)	More than or equal to 20000
2	Urban (U)	More than or equal to 8000 but less than 20000
3	Semi Urban (SU)	More than or equal to 400 but less than 8000
4	Rural (R)	Less than 400

9. The land area covered by the hypothetical efficient operator in various geo-types may be estimated on the basis of the information furnished by the operators regarding the land area covered in the afore-mentioned geo-types.

10. **Capacity Requirement:** The following block schematic diagram depicts the method to determine the capacity requirement of the hypothetical efficient operator in an LSA:

Block Schematic Diagram of Capacity Requirement



11. As discussed before, the subscriber base of the hypothetical efficient operator in an LSA

= (Total GSM subscriber base in the LSA) * (HHI of the GSM market in the LSA)/10,000

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

Total equivalent MOU per subscriber per month

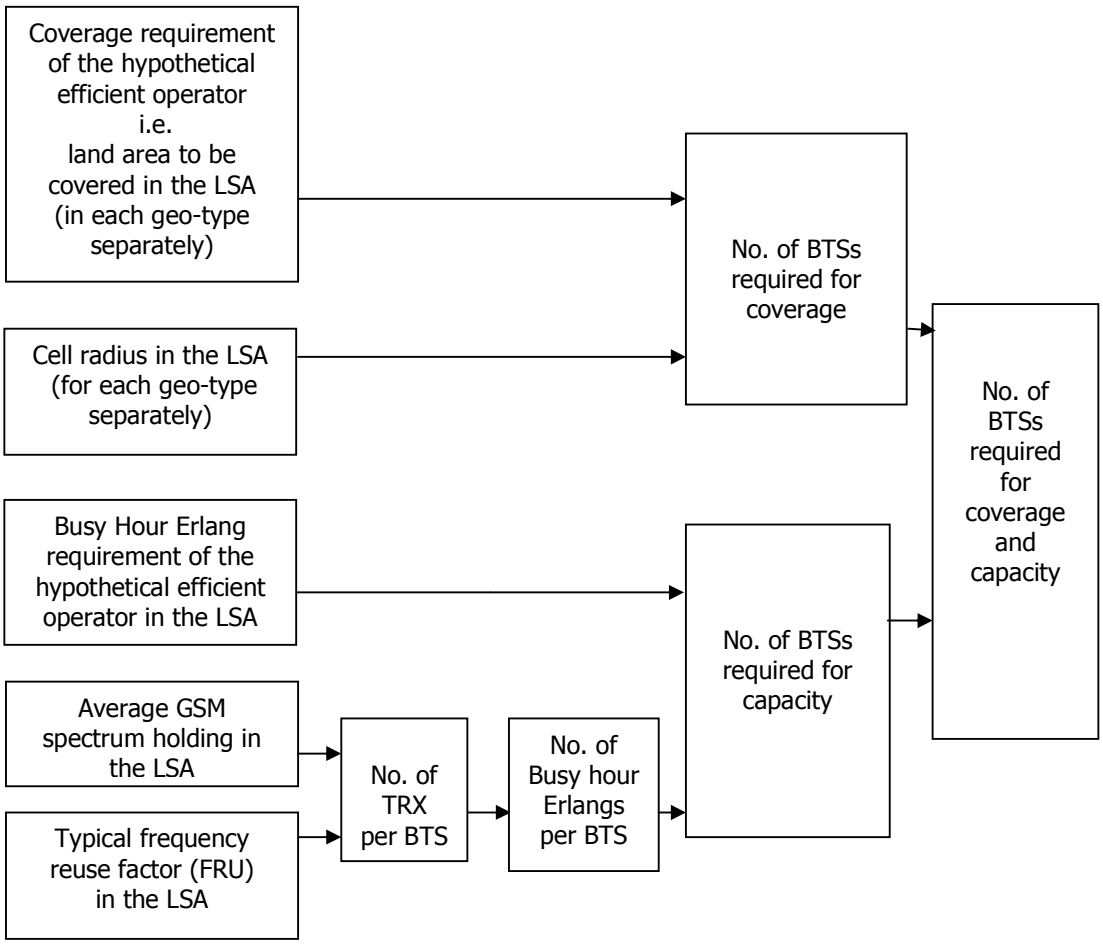
= Voice MOU + SMS converted to MOU + Data usage converted to MOU

13. Based on the hourly traffic information submitted by the operators, MOUs per month may be converted into busy hour Erlangs.

(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 hypothetical efficient operator in an LSA may be dimensioned as per the following block schematic diagram:

Block Schematic Diagram for Estimation of BTS Sites



15. **No. of BTSs required for coverage:** The cell radii of the hypothetical efficient operator for the various geo-types may be 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) may be estimated as below:

    No. of BTSs required for coverage

    $= \sum_{i=1} (A_i)/ (1.95*r_i^2)$

    Where A_i is the land area of the i^{th} geo-type and r_i is the cell radius in the i^{th} geo-type.

16. **No. of BTSs required for capacity:** The spectrum holding of the hypothetical efficient operator in an LSA may be estimated as an average of the spectrum held by the various GSM operators in the LSA. This together with the frequency reuse factor may be used to estimate the number of TRXs per BTS and, in turn, the number of busy hour Erlangs per BTS. Subsequently, the number of BTSs required for capacity may be computed from the total busy hour Erlangs requirement of the LSA and busy hour Erlangs per BTS.

17. **No. of BTSs required for coverage and capacity in an LSA:** From (i) number of BTSs required for coverage and (ii) no. of BTSs required for capacity, the number of BTSs required for coverage and capacity may be computed.

18. **No. of other Network elements in an LSA:** On the basis of subscriber base and number of BTSs required for a hypothetical efficient operator, the information on network design furnished by the operators and industry benchmarks, the number of following network elements in an LSA may be 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) No. of SMSC, GSN, HLR and Ins etc.

(4) Network Valuation

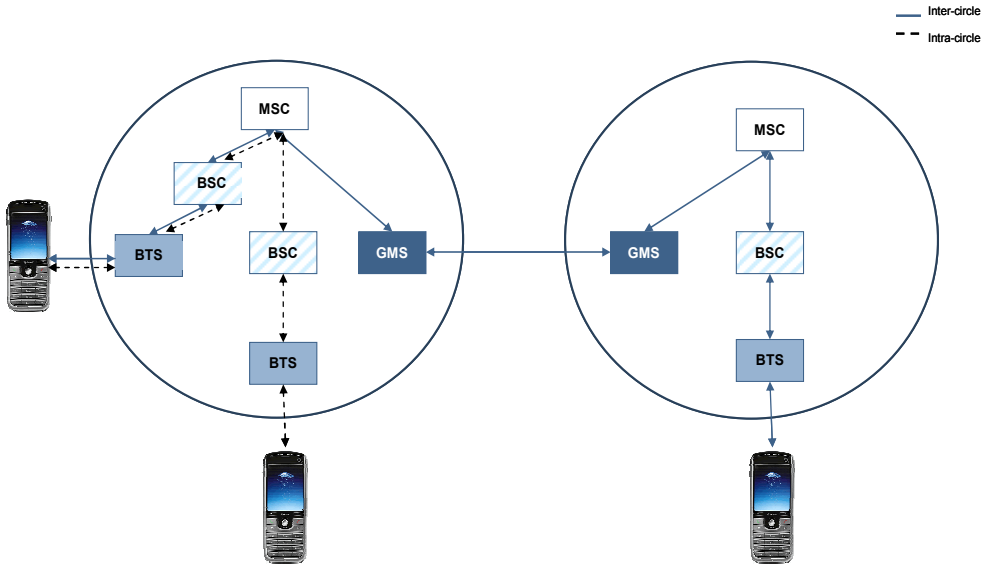
19. The annualized CAPEX and OPEX of each network element (viz. BTS, BSC, BTS to BSC link, MSC etc.) may be computed on the basis of the information on the capital cost, useful life and operating cost of the network elements furnished by the operators. The annualized CAPEX may be computed on the basis of annual depreciation (using straight line method of depreciation) and weighted average cost of capital (WACC) @ 15% per annum.

(5) Allocation of costs towards mobile termination service

20. The voice calls may be categorized as 'on-net calls' and 'off-net calls'. An on-net call is a call between the same network i.e. both calling party and called party in the call are on the same network. On the other hand, an off-net call is a call between different 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. The segregation of voice MOU into on-net, off-net incoming and off-net outgoing calls may be carried out on the basis of the information regarding traffic for the quarter ending March 2014, as furnished by the operators.

21. In order to allocate the network related costs to the off-net incoming calls, a routing table may be used. The following diagram illustrates the equipment used in various types of calls:

Equipment Used in Various Types of Calls



22. The following routing table has been evolved for allocation of costs towards termination service, after discussions with several service providers at various stages.

Routing Table

Service Types	**BTS**	**BTS-BSC**	**BSC**	**BSC-MSC**	**MSC**	**MSC-GMSC**	**GMSC POI**	**SMSC**	**GSN**	**NMS**	**HLR**	**IN**
Voice on-net	2	2	2	2	1.673	0.372	0.372			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

23. The annualized CAPEX and OPEX costs determined in the previous stage may be allocated to the off-net incoming minutes with the help of the afore-mentioned routing table. The Mobile Termination Cost may be 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 LSAs (in terms of off-net incoming MOU) may be used to compute the pan-India Mobile Termination Cost. The Mobile Termination Cost so computed would be the outcome of the LRIC model.