WITHOUT PREJUDICE

TVR/VEL/060 18 May 2011

The Telecom Regulatory Authority of India
Mahanagar Doorsanchar Bhawan
Jawahar Lal Nehru Marg (Old Minto Road)
Next to Zakir Hussain College
New Delhi 110002

Dear Sirs,

TRAI Consultation Paper on Review of Interconnection Usage Charges

Please find enclosed the detailed response of Vodafone Essar Limited to the above Consultation Paper.

In addition we would like reiterate our submission and contentions contained in our ongoing submissions to the Authority and request that the same be treated as a part of our response to the above consultation.

We look forward to the early completion of the process in consonance with the judgment of the Hon'ble TDSAT dated 29 September 2010 and the timelines laid down by the Hon'ble Supreme Court on 4 February 2011.

Kind regards,

Sincerely yours,
T V Ramachandran
Resident Director
Regulatory Affairs & Government Relations

18th May'2011

VODAFONE ESSAR LIMITED (VEL) RESPONSE TO TRAI CONSULTATION PAPER ON REVIEW OF INTERCONNECTION USAGE CHARGES (IUC), 27 APRIL 2011

I. DISCLAIMER

At the outset it may be noted that Vodafone Essar (VE) has filed an Application in TDSAT, being M. A. No. 153/2011 in Appeal No. 04/2009 challenging the TRAI Consultation process to the extent that it is in contravention of the judgment dated 29 September 2010 of the Hon'ble TDSAT and seeks to reopen issues/raise questions that have already been settled/answered by the Hon'ble Tribunal.

The said application was heard on 12 May 2011 and Order has been reserved on the same.

We reiterate all our submissions made in the said Application and our response to this Consultation Paper is without prejudice to our rights and contentions in this regard.

II. KEY POINTS:

VE submits that the approach adopted by the Authority with respect to IUC must be consistent with the overall telecommunications policy objective of the Indian Government. The central objective of the Government continues to be the reduction of the digital divide and extending the benefits of telecommunications to rural India and low income subscribers.

VE submits that before the Authority amends the IUC Regulation it must understand how the impugned IUC 2009 affected the industry and therefore, whether it assisted or detracted from Government policy.

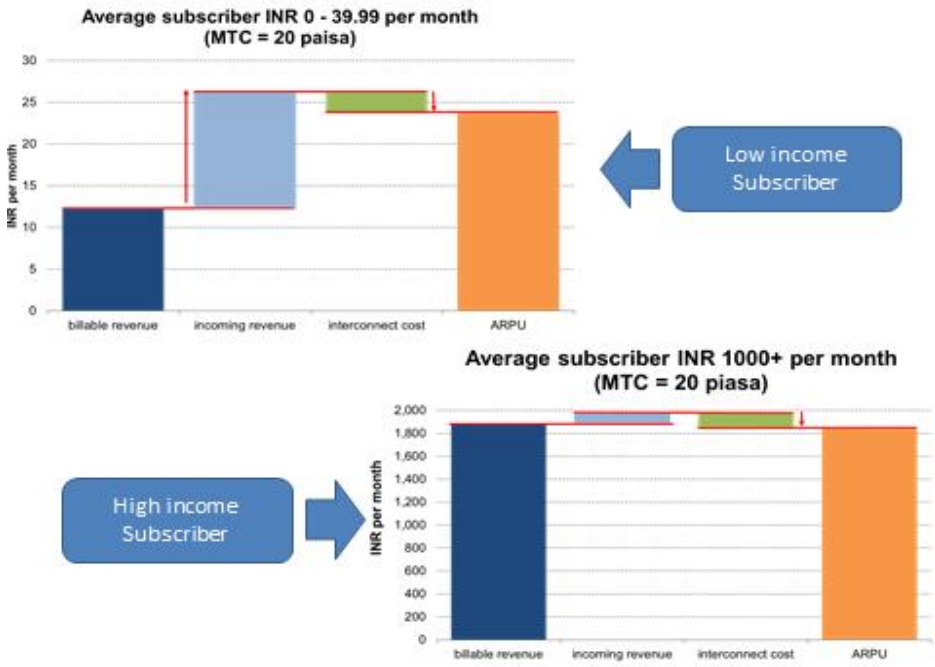
Before we address that issue, let us first recap how IUC affects the telecommunications industry.

How does IUC affect the telecommunications industry?

It is important to recognise that the mobile termination charge (MTC) component of IUC is **vital** in the economics of low user low income subscribers. That is, absent cost-based MTC, low income subscribers would become unattractive. This is easily shown through revenue analysis that VE submitted to the Authority at the beginning of the 2009 IUC Regulation consultation (**Figure 1**).[1]

[1] Refer to Vodafone Essar submission to TRAI Consultation for 2009 IUC Regulations.

Figure 1



It can easily be seen that average revenue from the low income subscriber relies heavily on the level of incoming revenue. And because low income subscribers receive more calls than they make, the net revenue from interconnect (revenue minus interconnect cost) is positive. On the other hand, interconnect revenue is a much smaller percentage of the high income subscriber – and the net income from interconnect is negative as they make more calls than receive.

This implies that should an operator have a business case targeting only high income urban subscribers (cream skimming), it would be commercially advantageous to obtain below cost or zero (bill and keep) interconnection/termination charges. On the other hand, if the operator wanted to acquire low income subscribers (who are typically more prevalent in rural areas); incoming revenue is a vital component to their commercial viability. It makes sense that these operators would seek MTC that cover the cost of service.

It is through this commercial reality that decisions on the level of IUC affect the telecommunications industry. VE has consistently advocated before the Authority that IUC must be set at a level consistent with the broader telecommunications policy of the Indian Government. The Hon'ble Tribunal has agreed with VE that the Authority must set IUC consistent with policy.

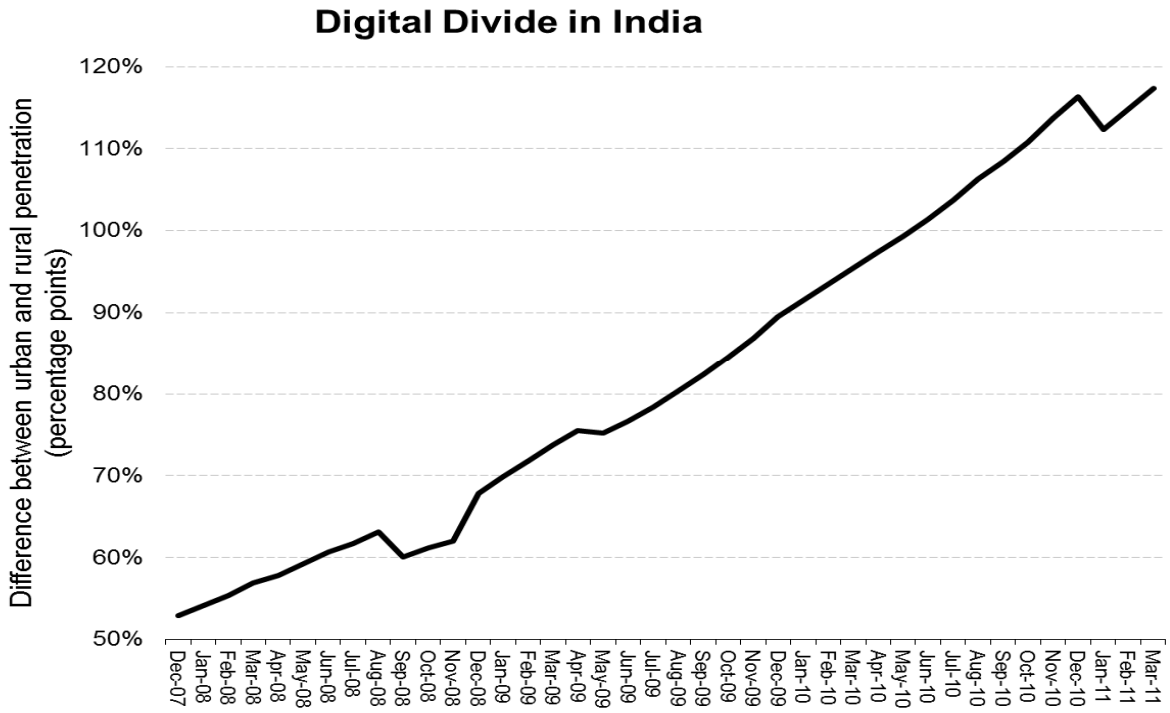
The first step for this consultation is to review whether IUC 2009 has promoted or hindered the telecommunications policy of the Indian Government.

Has IUC 2009 achieved the objectives of the Indian Government?

As noted above, the central objective of the Government continues to be the reduction of the digital divide and extending the benefits of telecommunications to rural India and low income subscribers.

First, we test whether the IUC policy has affected the digital divide – that is, the difference between urban penetration and rural penetration. Using DoT subscriber data, we can show how the digital divide has moved since Dec 2007 until March 2011 (**Error! Reference source not found.**).

Figure 2



The gap between urban and rural tele density in India is clearly widening at a rapid pace. Indeed, since April 2009 (after implementation of the IUC Regulations which set MTC at 20 paisa/minute), rural penetration has increased by 18 percentage points, whereas urban penetration has increased by 61 penetration points. That is, urban tele density has grown by more than 3 times rural tele density.

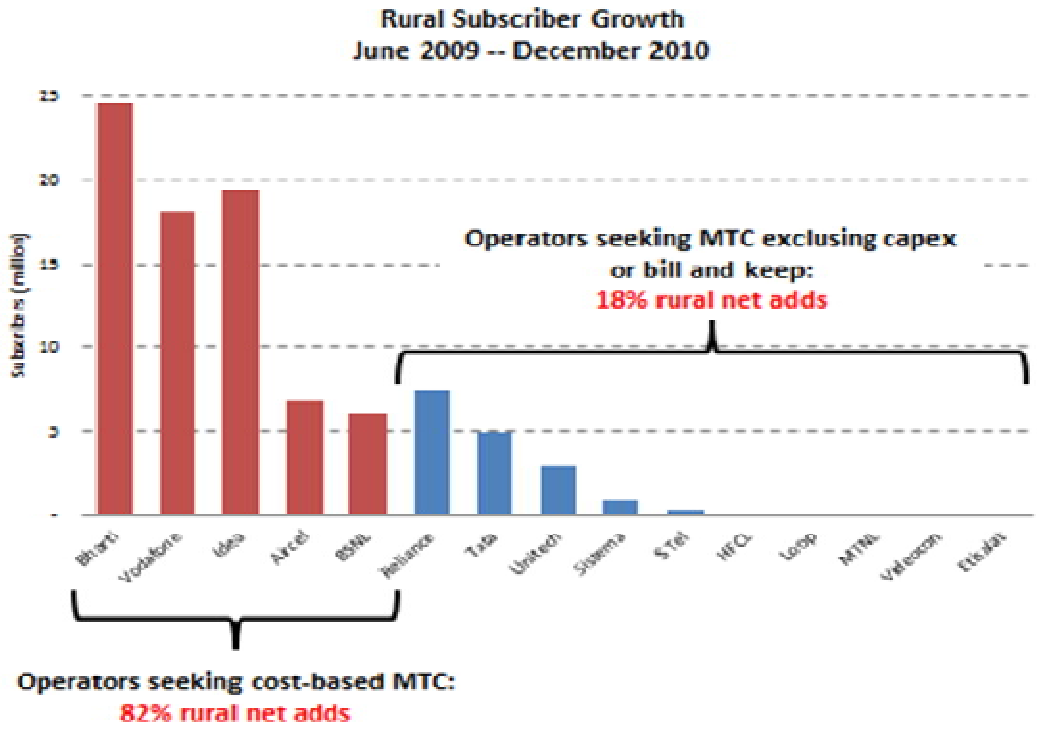
The main drivers of the continual increase of the digital divide has been

- introduction of 3 times the number of operators than has proved sustainable in any other market (regardless of scale whether measured by land area, population, revenue or profit).
- the consistent policy preferences granted to new entrant whom have focused primarily on urban competition and acquisition of urban subscribers. These operators have focused only on short-term price competition in urban areas, driving multiple SIMs in urban markets rather than incremental market growth; and

- setting of below cost mobile termination rates through the internationally unprecedented disallowance of recovery of capital costs (referred to as capex) through regulated mobile termination rates.

This has facilitated and encouraged the price wars in urban markets while removing the incentives for operators to invest in higher cost rural areas and poorer customers who receive more calls than they make. VE notes that since implementation of the latest IUC regulation (June 2009), the vast majority of rural net additions have come from operators seeking cost-based IUC (including capital costs). See **Figure 3** below.

Figure 3



Not surprisingly, it is the operators who pursue an urban-centric cream skimming approach that are asking for below-cost IUC /MTC and seeking an artificial cross subsidy from operators who service ALL Indians, particularly the common man. This is the complete opposite of what is required by the Indian Government telecommunications policy.

The 2009 IUC Regulations are providing a subsidy <u>from</u> rural operators to <u>urban</u> operators.

VE, being one of the few mobile operators who are genuinely committed to expanding into rural markets can attest that rural expansion result in:

- incremental capital and operating costs increase;

- incremental revenues decrease;
- subscribers tend to receive more calls than they make; and
- the proportion of revenues from non-voice services decreases.

The single most important investment signal for an operator contemplating adding incremental sites in rural and poorer areas, and connecting more rural and poorer customers, is the level at which the mobile termination charge is set. The level of MTC therefore fundamentally determines if operators are able to cover their operating costs, let alone their capital costs (i.e., earning a reasonable rate of return which provides an incentive to invest).

If the objectives of NTP-99, the narrowing of the digital divide, and true communications and therefore economic opportunities are to be made available to the common man, the mobile termination charge must be set on a rational basis which is consistent with the decision of the Hon'ble TDSAT, which reflects capital costs, and which is consistent with the weight of expert opinion and ensures that legitimate costs are recovered.

We hope that the Authority will not make its decisions in furtherance of some operators' strategy of seeking artificially low termination rates in order to support their urban-focused strategy of short-term price competition. This would not be in the long term interests of Indian subscribers or the economy.

We note at the outset that many of the questions asked and options canvassed by the Authority in the Consultation Paper do not seem consistent with the Hon'ble TDSAT and Hon'ble Supreme Court directions. We indicate below where this is the case. We request the Authority to run the consultation and make a decision consistent with the Hon'ble TDSAT's orders.

We have by our letter of 18 May 2011 provided detailed cost information, a roadmap by which standard international conversion of data to costing according to a Fully Allocated Cost (FAC) model can and should be undertaken in accordance with the principles set out by the Hon'ble TDSAT, and an FAC model reconciled with our Accounting Separation Reports (ASRs). We provide further responses to other questions below.

III. GENERAL COMMENTS

We note that the Consultation Paper has canvassed a wide range of issues which are not directly concerned with regulation of Interconnection Usage Charges (IUC). The Authority goes on to consider much broader issues related to regulation of retail tariffs, of national roaming tariffs and so on. We respectfully submit that these issues cannot and should not be addressed unless and until the basic interconnection framework has been settled. Regulation should be applied as far upstream as possible since this puts in place the fundamental environment on top of which other services compete. Only then can it be determined whether there are other competition issues which need to be addressed. To consider them without settling the competition framework would be premature and risk imposing regulatory constraints and obligations on issues and services which do not require them.

We are also disappointed to note that some operators are making submissions in these proceedings which are directly inconsistent with their stated positions in other markets. Although Vodafone operates in many countries,

Vodafone's position on interconnection has been very consistent since it took a controlling interest in Vodafone Essar, and very consistent with Vodafone's longstanding international position. Uninor, however, has submitted in the current review that it favours an avoidable cost approach (otherwise known as "pure LRIC"). We do not support such an approach as it fails to promote investment in mobile networks, which is important in any market, but critical in India where the market is at a critical juncture in market development.

We note that exactly these concerns were raised by Telenor (Uninor's major shareholder), in a recent Norwegian consultation. Telenor stated that pure LRIC does not promote investment in mobile networks since:[2]

> *"Platforms will over time be upgraded and/or replaced. By ignoring joint and common costs, pure avoidable costs* [pure LRIC] *will not provide such incentives"* (p.4)

Moreover, as noted by Dr. Parsons in "Using Accounting Data to Estimate the Cost of Call Termination in Telecommunications Networks":

> *"For termination charges, part of the problem for regulators is that a calculation of pure LRIC or pure FLLRIC is only the first in a two-step process to determine a call termination rate. That is, FLLRIC becomes the lower bound for the call termination rate, not the rate itself. The second step is to determine the degree to which the actual call termination rate will exceed the FLLRIC. Economists generally favor Ramsey-Pricing approaches[3], in which the rate exceeds FLLRIC to an extent in reverse relationship to the relative elasticity of demand of the termination service. Regulators around the world have generally been reluctant to embrace Ramsey-Pricing.[4]"*

The Authority must thus ignore positions which are clearly driven by short term commercial objectives rather than coherent principles. As shown above, operators who seek MTC below cost are those operators that cream skim and ignore rural India. This is not consistent with the policy of the Indian Government.

We note that we have yet again sought opinions and inputs from some of the most experienced and reputable international economists on the questions before the Authority, particularly Dr. Steve Parsons Ph.D. We offer the Authority and any other stakeholders the opportunity to cross-examine Dr. Parsons (on reasonable notice) in order to test the robustness and veracity of his inputs.

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[2] http://www.npt.no/ikbViewer/Content/112155/Telenor_OFF.pdf

[3] The genesis of this concept generally attributed to Frank P. Ramsey, *A Contribution to the Theory of Taxation*, 37 Econ. J. 47 (1927).

[4] For example, the U.S. FCC found "For example, we conclude that an allocation methodology that relies exclusively on allocating common costs in inverse proportion to the sensitivity of demand for various network elements and services may not be used."(In Re Implementation of the Local Competition Provisions in the Telecommunications Act of 1996 (CC Docket No. 96-98) rel Aug. 2006, para. 696). The notable exception was New Zealand, which had employed a variant of the Efficient Components Pricing Rule (ECPR) that was, in my opinion, tantamount to a Ramsey-Pricing rule. However, the 2001 NZ Telecommunications Act specifically rejected Ramsey-Pricing/ECPR.

IV. ISSUE-WISE RESPONSE TO THE AUTHORITY'S QUESTIONS:

1. Do you agree that the IUC regime determined through this consultative process should be applicable for 3 years? If not please indicate yourpreferred time period with justification.

We agree that it is important to specify the time-period for which interconnection charges will be settled so that some degree of uncertainty can be removed from the industry. Certainty is required in an industry such a communications which is characterised by long-term fixed costs/sunk costs. Without certainty, and the appropriate incentives for investment, operators are unable to make such long term investments. A 3 year period would be consistent with international standards. We note that interconnection charges should never be revised retrospectively and should only apply prospectively. As noted above, any regulation which is to be applied must first be applied to the most fundamental level of the industry (wholesale/interconnection) since this is the foundational basis on which operators plan their investments. If interconnection charges are revised retrospectively, operators would have been investing on a basis which is then retrospectively changed, imposing an unacceptable level of uncertainty upon the industry.

2. Keeping in view the time period indicated by you in question 1, which of the following approaches would be most appropriate for the Indian telecom sector?

(a) Cost oriented or cost based;

(b) Bill and Keep;

Please provide justification in support of your answer. In case you feelthat the approach should vary according to service, please explain why?

We noted at the outset that many of the questions asked and options canvassed by the Authority in the Consultation Paper are not consistent with the Hon'ble TDSAT and Hon'ble Supreme Court directions. In particular, the judgment of the Hon'ble TDSAT specifically stated:

> *"…Its [TRAI's] jurisdiction being limited to determine the charges on cost based and work done principle …"* [101(5)].
>
> *"… components of IUC namely, Origination charge, carriage charge and termination charge must be held to be the established principle of cost based determination therefor"* [114(12)].
>
> *It is not in controversy that the service providers are required to be compensated for the resources used by other service providers." (114(12))*

Under these circumstances, we respectfully submit that consideration of Bill and Keep (zero charge) approach for any component of IUC is simply no longer an option available to the Authority since this is by definition inconsistent with the principles of cost based and work done. The Hon'ble TDSAT has clearly directed that IUC/MTC should be cost based and include all costs – capex, opex and depreciation.

We request the Authority to run the consultation and make a decision consistent with the Hon'ble TDSAT's orders.

In this regard, VEL has submitted substantial evidence to the effect that there is a firm consensus amongst international regulators and experts that charges should not be set below cost, and the Hon'ble TDSAT similarly declared that:

> "*It is not in controversy that cost would include CAPEX/OPEX and depreciation*". 114(12)
>
> *"It must not be forgotten that every operator must keep its network maintained for use by its own subscribers as well as by subscribers of another operators on equal basis. If that be so, we fail to see any reason as to why the traffic sensitive cost contained in CAPEX should be kept out of consideration"* 114(12).

Further, the Hon'ble TDSAT has mandated the Authority to take account of expert evidence, yet VEL has not received any indication that the expert evidence submitted by VEL has been considered. The Authority must articulate its consideration of the expert evidence submitted and also justify why it makes any deviation from the same.

We note that we have yet again sought opinions and inputs from some of the most experienced and reputable international economists on the questions before the Authority, particularly Dr. Steve Parsons Ph.D.

VEL has also offered to make its experts available to the Authority and other operators for cross-examination in several forums, but we note that this offer has never been taken up. We renew this offer and will make our experts available on reasonable notice to ensure that their evidence can be heard and any challenges/queries answered.

In addition to the cost based approach being directed by the Hon'ble TDSAT and being in consonance with the weight of international evidence, we submit that a cost based MTC is also necessary and desirable for meeting the Government's objectives on rural tele density as already brought out in Section II.

It is reiterated that Bill and Keep is contrary to and inconsistent with a cost based approach directed by the Hon'ble TDSAT. We also note that there has been no change in circumstances since 2009 and the arguments tabled by the Authority to reject Bill & Keep in 2009 are valid even today. The Authority has given no reasoning or justification to consider this approach in the present review.

We are also disappointed to note that some operators are making submissions in these proceedings which are directly inconsistent with their stated positions in other markets. Although Vodafone operates in many countries, Vodafone's position on interconnection has been very consistent since it took a controlling interest in Vodafone Essar, and very consistent with Vodafone's longstanding international position. Uninor, however, has submitted in the current review that it favours an avoidable cost approach (otherwise known as "pure LRIC"). We do not support such an approach as it fails to promote investment in mobile networks, which is important in any market, but critical in India where the market is at a critical juncture in market development. Moreover, as noted by Dr. Parsons in "Using Accounting Data to Estimate the Cost of Call Termination in Telecommunications Networks":

> *"For termination charges, part of the problem for regulators is that a calculation of pure LRIC or pure FLLRIC is only the first in a two-step process to determine a call termination rate. That is, FLLRIC becomes the lower bound for the call termination rate, not the rate itself. The second step is to determine the degree to which the actual call termination rate will exceed the FLLRIC. Economists generally favor Ramsey-Pricing*

approaches[5], in which the rate exceeds FLLRIC to an extent in reverse relationship to the relative elasticity of demand of the termination service. Regulators around the world have generally been reluctant to embrace Ramsey-Pricing.[6]"

We note that exactly these concerns were raised by Telenor (Uninor's major shareholder), in a recent Norwegian consultation. Telenor stated that pure LRIC does not promote investment in mobile networks since:[7]

"Platforms will over time be upgraded and/or replaced. By ignoring joint and common costs, pure avoidable costs [pure LRIC] *will not provide such incentives"* (p.4)

The Authority must ignore positions which are clearly driven by short term commercial objectives rather than coherent principles. As shown above, operators who seek MTC below cost are those operators that cream skim and ignore rural India. This is not consistent with the policy of the Indian Government.

3. In case your answer to question 2 above favours the cost oriented approach, would it be appropriate to permit Bill and Keep between service providers who have symmetric traffic?

In addition to the fact that the Hon'ble TDSAT has directed that IUC should be cost based, we submit that the Authority cannot adopt different approaches for different sets of operators.

In fact, the Authority itself has taken the position before the Tribunal that it is bound to apply a uniform rate. [Ref Para 20 of the Hon'ble TDSAT judgment]

[Mr. C.S. Vaidyanathan, the learned Senior Counsel appearing on behalf of the respondent, TRAI as also Mr. Saket Singh, on the other hand, submitted :-

.....(e) TRAI in making regulation in relation to fixation of Interconnect Usage Charges was bound to apply a uniform rate which having been done, no exception can be taken in regard thereto. (20)

Without prejudice to our contention that the Authority cannot consider Bill & Keep, it may be noted that in case it were to do so, it may, as a logical corollary, necessarily need to consider at the same time a variation consultation question 6, viz. "Do you agree that with exclusion of OPEX in the calculation oftermination charges ((since B&K implies a zero call termination rate, and hence complete exclusion of OPEX in the call termination rate), that retail tariffs should be INCREASED by regulatory Intervention (to account for the loss of OPEX in the call termination rate)? If not, please give reasons."

[5] The genesis of this concept generally attributed to Frank P. Ramsey, *A Contribution to the Theory of Taxation*, 37 Econ. J. 47 (1927).

[6] For example, the U.S. FCC found "For example, we conclude that an allocation methodology that relies exclusively on allocating common costs in inverse proportion to the sensitivity of demand for various network elements and services may not be used."(In Re Implementation of the Local Competition Provisions in the Telecommunications Act of 1996 (CC Docket No. 96-98) rel Aug. 2006, para. 696). The notable exception was New Zealand, which had employed a variant of the Efficient Components Pricing Rule (ECPR) that was, in my opinion, tantamount to a Ramsey-Pricing rule. However, the 2001 NZ Telecommunications Act specifically rejected Ramsey-Pricing/ECPR.

[7] http://www.npt.no/ikbViewer/Content/112155/Telenor_OFF.pdf

4. If the cost-oriented or cost based approach is used for InterconnectionUsage Charges, do you agree that fully allocated cost can be used with historical cost data submitted by various service providers in their audited Accounting Separation reports, published documents or any other information submitted to TRAI? If not, please give your alternate solution with explanation, required data and proper justification.

The Authority was directed by the Hon'ble TDSAT to clearly outline its proposed approach to cost. We can only assume that the Authority is specifically mentioning historic cost FAC for the reason that it is the proposed methodology. If this is not the case, this needs to be clarified immediately.

The most important aspects of regulatory cost based price setting are:

- A clear commitment to setting genuinely cost based prices;
- Inclusion of all legitimate costs which are necessary for provision of the service including capex/capital costs;
- Articulation of a clear and robust cost model which is consistent with international regulatory practice and expert advice;
- Providing operators with sufficient notice of the cost modelling approach in sufficient detail such that operators can meaningfully comment upon the approach. It is not sufficient for example, to merely propose a LRIC approach or FAC approach since there are a number of critical assumptions which are usually followed by international regulators and experts and it is not possible to fully understand the Authority's proposal without understanding more about the exact approach which is proposed (see below);
- Explaining where and why the Authority proposes to deviate from international regulatory practice and expert advice, making out a case based on sound reasoning and rationality and after direct engagement with the experts to test and understand their views;

The above steps are essential whether the Authority chooses to adopt a forward-looking long run incremental approach or a historic fully allocated cost approach.

The Authority already has on record the comprehensive LRIC modelling undertaken by Spectrum Value Partners (SVP). Since the results from a LRIC approach do not vary substantially over short periods of time, we submit that the Authority may refer to this model in the event that it intends to adopt a LRIC approach.

However, if the Authority now prefers to use a FAC approach, we have no per se objection to the same, provided the exact approach is clearly articulated in sufficient detail for stakeholders to understand exactly what is proposed, and the approach is consistent with international regulatory practice and expert advice. However, we would need to understand the Authority's proposed approach to the following critical issues and assumptions in undertaking an FAC approach.

As explained above, IUC rate must reflect the cost based and work done principle. VE submits that the most simple and most verifiable form of cost model is a fully allocated cost (FAC) model utilising the Accounting Separation Report (ASR) data that all operators have been submitting to the Authority since 2005.

Vodafone has commissioned international expert Dr. Steve Parsons, Ph.D. to prepare a document outlining how one would transform the current ASR structure (as outlined in the ASR Regulations) into a working FAC model that estimates the network cost of IUC. This is attached in our separate letter of 18 May 2011.

In addition, VE reminds the Authority that since 2008/9, it has held in its possession a long-run incremental cost (LRIC) model utilising aggregated data from industry players demonstrating the cost of MTC to be 35 paisa per minute. Since the results from a LRIC approach do not vary substantially over short periods of time, we submit that the Authority may refer to this model in the event that it intends to adopt a LRIC approach.

When choosing a method to estimate cost-based IUC rates, the Authority must choose between various modelling approaches, each with unique benefits and drawbacks. There is no one perfect method to adopt, and holding out until a perfect method can be found will cause unnecessary delay and damage to the industry. In a similar vein, holding out for an approach and data that enables ultra-precise estimations and is still simple enough to be understood and used may be a futile search. It must be remembered that precision and simplicity are often conflicting aims – the challenge when adopting a modelling approach is to balance these aims.

Table 1 below summarises the advantages and disadvantages of four modelling methods, discussed in the current IUC debate. A down arrow indicates the method fails to meet the criteria; an up arrow indicates the method scores well against the criteria; and a dot indicates the method has drawbacks against the criteria.

VE has chosen the key criteria which have been laid out in the decision of the Hon'ble Tribunal in its Order of 29.9.2010. The key criteria are:

1. Cost-based
2. Reconcilable with audited financial reports
3. Promote further growth of subscribers
4. Promote rural roll-out and network investment

Table 1 – Comparing different cost-based modeling approaches

Criteria	*ASR-based FAC*	*Hybrid-LRIC+*	*BU-LRIC+*	*Pure-LRIC*
Cost-based	▲	▲	●	▼
Reconcilable with audited financial reports	▲	●	●	▼
Promote further growth of subscribers	▲	▲	●	▼
Promote rural roll-out and network investments	▲	▲	●	▼

We explain assessment against each criterion in more detail below.

1. Cost-based criterion

The first criterion to be complied with is that the model must ensure outputs reflect the cost based and work done principle. Artificial cross-subsidies between services, or between wholesale and retail services, are not permitted – that means, for example, one cannot price wholesale services below cost with an expectation that retail costs will increase to cover lost revenue.

The ASR-based FAC and Hybrid-LRIC+ approaches score well against this criterion as they reflect costs incurred and are verifiable against actual financial data. Further, both methods allow the recovery of all efficiently incurred costs – and through the use of cost-based allocation methods ensures that the cost per service reflects the network elements involved in producing that service.

On the other hand, BU-LRIC+ and pure LRIC methods may score less well against the cost-based criteria (depending on how the study is performed and assumptions employed). Due to the hypothetical nature of the bottom-up approach in the BU-LRIC+ (with relation to network design and costs) there is no guarantee that cost recovery will occur for real world operators. Pure LRIC is an even more extreme version, which specifically excludes legitimate cost elements for inclusion in MTC. Pure LRIC does not result in cost recovery, and if all services were priced on a pure LRIC basis, network cost recovery would not occur. Cost recovery will only occur if charges other than MTC were allowed to increase significantly to offset the cost foregone.

Moreover, as noted above in the quote from Dr. Parsons, pure LRIC properly establishes only the price floor for the call termination rate, not the rate itself.

2. Reconcilable with financial reports

Both the Authority and the Tribunal have expressed a preference for the cost model to be reconciled with audited financial reports.

VE notes that only the ASR-based FAC model provides for full reconciliation with cost allocation and audited financial reports. This is mainly due to the requirements outlined in the *Reporting System on Accounting Separation Regulation, 2004* (4 of 2004), which states that:

> "*Accounting shall be reconciled with the Annual Financial Statement of the service provider prepared under Section 211 of the Companies Act, 1956.*" (p.6)

The allocation method used in the ASR-based FAC model also ensures that all cost and traffic allocations can be traced back to independently verifiable sources. VE submits that this makes this method the most rigorous with respect to reconciliation with financial reports.

A Hybrid-LRIC+ model can also contain elements that enable verification against audited financial statements. However, the nature of LRIC modelling that requires a building of a hypothetical representative network minimises the ability to have a direct, clear and observable link between the cost inputs used in the model and financial reports. These amendments include:

- use of hypothetical new entrant operator, which market share of $1/n$ (n = number of operators)
- forward looking cost estimates, including cost trends
- economic depreciation that allocates costs across future years
- use of uncertain future market forecasts, with high probability of inaccuracy.

The above factors are mitigated through a proper industry consultation process (such as that undertaken by COAI in the development of the SVP Hybrid-LRIC+ model) that results in accurate calibration of the model to real world networks. This ensures that the network design reflects the networks of real world operators. However, because no one operator is specifically modelled, the end result will be quite difficult to verify against real world financial data.

The limitations of the Hybrid-LRIC+ model are magnified in BU-LRIC+ models. The main difference between the two approaches is the use of calibration in top-down models. Hybrid-LRIC+ models are calibrated with respect to network elements (so as to ensure hypothetical network reflects real world deployments) and financial inputs (specifically, operating costs and unit costs). BU-LRIC+ models on the other hand, do not undertake this calibration and as such, the network design and costs are completely at the whim of the model designer. As such, it is not possible to reconcile the BU-LRIC+ approach with audited financial records of the industry.

It would not be possible to reconcile cost estimates from a pure LRIC to financial data. This is due to the hypothetical network underlying the pure LRIC approach, as well as simply discounting or ignoring real costs for a real network provider.

As noted above, a key result of the pure LRIC approach is that the sum of the costs of all services is less than the cost of the network, so cost recovery is not possible. Hence Dr. Parsons admonition to not accept the pure LRIC result as the call termination rate, rather as the lower bound for the rate itself. It is this relationship, and the disconnect with economic and accounting principles that results in pure LRIC not being reconcilable.

3 & 4. Promote further growth of subscribers and rural investment

The modelling methodology adopted by the Authority must also be consistent with the policy objectives of removing the rural digital divide, encouraging rural investment and the continuing penetration of mobile phones. VE notes that the central plank of success in India has been the adoption of the pre-paid retail structure –with some 98% of subscribers using the benefit of pre-paid.

It is widely recognised that the rate at which MTC is set has an important impact. A recent study conducted for the European Commission on future interconnect pricing (in a world of complete penetration, complete networks, and all next generation technologies) reviewed empirical evidence on the relationship between cost methodologies and mobile penetration[8]. The study concluded:

> *"Results obtained so far tend nevertheless to show that BAK + RPP has been more detrimental to mobile phone penetration in the phase of mobile services take-up and subsequent diffusion that 'CPNP with access mark-ups + CPP' …" (p.103)*

The key reason for the conclusion was the existence of "mark-ups" – the + in LRIC+ models. Removing common cost "mark-ups" has been econometrically proven to be detrimental to mobile phone diffusion and penetration.

[8] http://ec.europa.eu/information_society/policy/ecomm/doc/library/ext_studies/2009_70_mr_final_study_report_F_101123.pdf

VE submits that the Authority must keep this in mind when determining the appropriate cost-based methodology.

The ASR-based FAC and Hybrid-LRIC+ method ensure cost recovery and contain common cost allocation. As such, these methods are best at ensuring that the MTC estimate meets these policy objectives. VE notes that the BU-LRIC+ would also meet this criterion but for the nature of the bottom-up method, which does not guarantee the costs of coverage in the real world are fully reflected in the cost estimates.

VE further notes that the most egregious method on this criterion is the pure LRIC method, developed by the European Commission. This method explicitly excludes common costs and coverage costs – it is closer to BAK than other forms of cost models. VE submits that the Authority should understand the particular European circumstances that lead to the development of pure LRIC. And these reasons do not apply in India – making pure LRIC very unsuitable.

The regulatory authorities (and their advisors) around Europe have recognised that while an argument might be made for pure LRIC in fully developed and saturated mobile networks, the case is substantially weaker where there are significant coverage issues and low penetration.

Thus, pure LRIC may be suitable for some European markets that have fully invested in mobile networks, have saturation for both mobile and fixed, and have high enough incomes where affordability is not the key policy concern.

VE submits that none of these facts hold in India, and as such, adoption of pure LRIC would likely lead to lower rural investment and lower penetration.

VE notes that such concerns were raised by Telenor (Uninor's owners), in recent Norwegian consultation. Telenor stated that pure LRIC does not promote investment in mobile networks:[9]

> *"Platforms will over time be upgraded and/or replaced. By ignoring joint and common costs, pure avoidable costs* [pure LRIC] *will not provide such incentives"* (p.4)

Recommended approach

For the aforementioned reasons, VE submits that in the current circumstances adoption of an ASR-based FAC model would be the best option. VE notes that the most pertinent policy concern in India is the need for further investment in new technologies, and increasing the availability of services to rural India. A costing methodology that reflects the actual cost base of operators in India would best ensure that costs are recovered so as to ensure continual investment and re-investment.

The ASR-based FAC approach also has the significant advantage of the Authority already having the data from all operators at hand – and within the same format. VE notes that operators are required to comply with the *Reporting System on Accounting Separation Regulation, 2004 (4 of 2004)* and subsequent amendments.

In the event that the Authority prefers to adopt the Hybrid-LRIC+ methodology, VE notes that such a model already exists and has been in the possession of the Authority since early 2009. VE refers the Authority to the COAI model previously submitted.

[9] http://www.npt.no/ikbViewer/Content/112155/Telenor_OFF.pdf

To further assist the Authority to complete the modelling process in the limited timeframe required by the Hon'ble Supreme Court, we have engaged international costing expert Dr Steve Parsons to analyse the VE ASRs submitted for 2009-10 and develop a template model.

The analysis of Dr Parsons is contained in our separate letter of 18 May 2011 and his report attached in **ANNEXURE A.**

VE respectfully submits that the template model developed by Dr Parsons be applied to the ASR data provided by other operators in India. VE recommends that the Authority develop an industry model, where the aggregate relevant costs of the industry are divided by the aggregated minutes of the industry.

5. Should CAPEX be included in calculating/ estimating terminationcharge? If so, which network elements from the ASR data should beincluded in the cost base?

It is first submitted that the issue has been framed incorrectly. The Tribunal has rightly noted that *"Framing a wrong question, it is trite, would lead to a wrong answer. It could not have misdirected itself in law" (101(4)*

The Hon'ble Tribunal has clearly recorded that capital costs have to be included. The Tribunal has also correctly noted the adverse implications of the partial opex approach hitherto followed by the Authority.

> *"It is not in controversy that cost would include CAPEX/OPEX and depreciation". 114(12)*
>
> *"However, a question remains as to whether TRAI was justified in taking into consideration only OPEX for the purpose of determining charges of termination by observing that the CAPEX / OPEX should be realized by service provider from their own customers and partial OPEX from other operators. (114(12)*
>
> *"It must not be forgotten that every operator must keep its network maintained for use by its own subscribers as well as by subscribers of another operators on equal basis. If that be so, we fail to see any reason as to why the traffic sensitive cost contained in CAPEX should be kept out of consideration" 114(12)*
>
> *"TRAI failed to take a very significant aspect of the matter into consideration, namely, those who are making investments for infrastructure and those who are hiring them out." 114(12)*
>
> *"If annualized capital cost is also taken into consideration along with OPEX for calculating the network usage charges payable by the subscribers of all the operators irrespective of the fact as to whom they belong to, could lead to the determination of fair amount of compensation irrespective of any [business] model taken by any operator." 114(12)*

By framing the issue of capex as an open issue, the Authority is inviting responses that are not open for it to consider (and therefore an exercise in futility) or will result in a contravention of the Hon'ble TDSAT's judgment.

Thus, we answer this issue on the premise that based on the Hon'ble TDSAT's judgment; capex is to be included for the estimation of MTC.

As regards the network elements from the ASR data that should be included in the cost base, the same is outlined in VE 's submission of18 May 2011.

6. Do you agree that with inclusion of CAPEX in the calculation of termination charges, rental/ administrative or any other fixed charge component should be removed from the retail tariff by regulatoryintervention? If not, please give reasons.

VE is somewhat confused by this consultation question. First and foremost, origination charges (and other retail charges) are under forbearance by the Authority. This means that there is no regulatory intervention in the setting of charges. If the Authority were considering regulating retail tariffs, this must be preceded by a considered consultation process which examines the costs and benefits of doing so. We believe that there are far more of the former than the latter involved in retail regulation in a highly competitive market.

As submitted above, regulation of retail tariffs cannot and should not be addressed as a part of the present consultation which deals regulation of wholesale rates, and definitely not unless and until the basic interconnection framework has been settled. Regulation should be applied as far upstream as possible since this puts in place the fundamental environment on top of which other services compete. Only then can it be determined whether there are other competition issues which need to be addressed. To consider them without settling the competition framework would be premature and risk imposing regulatory constraints and obligations on issues and services which do not require them.

However, if the Authority considers this question at the same time as the interconnection framework, we note that there is a fundamental flaw contained in the question above. If properly conducted, the determination of cost based interconnection charges never accounts for or attributes100% of an operator's capex/capital costs to the termination service. As outlined by Dr Steve Parsons in Annexure A, a factor is determined by which only a proportion of the capex costs are rationally allocated to the termination service. The Authority therefore cannot assume for the purposes of retail regulation than all capex costs are recovered elsewhere and retail rates therefore need to be adjusted accordingly.

Regulation of retail prices is a drastic regulatory intervention which is usually undertaken only with extreme caution and only once it has been established in a structure and transparent process that there is a competition problem in the retail market. Regulators and experts routinely caution against undertaking intervention in the retail market. The ITU / InfoDev "ICT Regulation Toolkit" for example clearly states that:

> *"Regulation has potentially high costs. Among other things, it substitutes the regulator's judgment for market interactions. No matter how capable and well intentioned regulators are, they will never be able to produce outcomes as efficient as a well-functioning market.*
>
> *Regulators should therefore forebear from interfering in pricing decisions unless regulation is justified. That is, unless the expected benefits from regulating prices outweigh the expected costs from doing so."*[10]

Further, retail tariffs should only be regulated where there is a clear and compelling competition issue which needs to be addressed, namely the presence of operators with significant market power. In the absence of any such

[10] http://www.ictregulationtoolkit.org/en/Section.2150.html

competition problem, there is no justification for regulation. Given the substantial evidence that the retail market in India is probably the most competitive communications retail market in the world, characterised by an unprecedented numbers of competitors, dynamic and low retail pricing and otherwise healthy and robust competition, there is no case for retail regulation. This is particularly the case following the introduction of mobile number portability. Competitive processes in India will constrain the behavior of the market participants over the long run since customers can choose between multiple providers. In contrast, a network provider has no choice as to which network it may terminate a specific call; therefore there is a separate and distinct rationale for the regulation of call termination rates which does not apply to retail rates. The key to sound policy in this regard is to establish the wholesale call termination rate at its costs (no less, no more), and let retail competitive markets perform their functions. Rather than consider arbitrarily reducing tariff ceilings, the Authority should conduct a separate consultation on the need for removal and/or relaxation of existing retail regulation.

By the same reasoning, if the Authority was continuing to consider Bill and Keep as the basis for interconnection rates, we assume that the Authority would, by its own reasoning, increase retail tariff ceilings or even impose a retail price floor given the competitiveness of the retail market to ensure that operators can recover 100% of their capex from retail rates? Unless the Authority is prepared to consider the converse, the Authority should refrain from linking the regulation of wholesale rates to the regulation of retail rates.

Even if the Authority believes there is an issue which concerns retail tariffs, it should not consider introducing regulation into the retail market through interconnection regulations. VE submits that this question must be subject of a separate consultation.

7. Should TRAI continue with the existing rate of return of around 15% in the form of pre tax WACC as adopted in other regulations? If you do not agree with the above, please state what should be the rate of pretax WACC, along with justification for your proposed rate.

The estimation of the appropriate value of the weighted average cost of capital (WACC) is an empirical question which can be answered through some basic analysis. VE submits that it is not sufficient for the Authority to abdicate from undertaking the analysis and choose a WACC value just because it has been accepted before.

Vodafone has requested international telecommunications expert Dr Steve Parsons and Jim Ramsey from Parsons Applied Economics to review the approach to WACC used in India, and to estimate a range of reasonable WACC values that should be used in the current IUC / MTC review.

VE notes that Dr. Steve Parsons was specifically mentioned by the Hon'ble Tribunal as an expert whose views should be listened to by the Authority. The report is attached in **ANNEXURE B.**

Using world best practice, the following reasonable range of WACC values has been estimated.

Table 2 – Pre-tax nominal WACC for India Telecom Industry

	Low	Mid	High
10 yr Indian Government Bond Rate	16.05%	19.86%	28.12%
Academic estimated risk-free rate	15.88%	21.65%	29.96%
International country risk premium	12.98%	15.70%	17.65%
Average value	14.97%	**19.07%**	25.24%

The expert authors employ three sets of assumptions/data sources to estimate a telecoms India WACC. They further show a low, mid, and high with the ranges reflecting different beta estimates. The mid-value is the weighted average industry value for the firms in the Indian telecom industry. The low-value is the lowest equity beta of the industry; and the high-value is the highest equity beta of the industry.

VE notes that it is accepted international best practice (see for example, ITU or BEREC-IRG guidance on this issue[11]) to use an industry-wide value when estimating an industry wide IUC rate (or MTC rate). Vodafone also notes that it is accepted regulatory practice to adopt 10 year Government Bond rate as the relevant estimate of risk-free return.

The discussion above, and the analysis in ANNEXURE B implies that a WACC value around 19% be adopted for IUC.

VE therefore submits that the Authority should adopt a WACC around 19% for IUC.

8. Would it be appropriate to adopt Straight Line Method with an average life of 10 years for all network elements for taking into account depreciation? If you do not agree with this proposal, please give youralternative method with justification.

Ideally, the calculation would reflect the economic lives of the assets employed and the change in the market value of those assets over the relevant period. There are actually two subparts to this question: a) straight-line depreciation; and b) 10-year life.

a) Straight-line depreciation is a reasonable approximation if employed correctly.

b) Ideally, the economic lives of the assets would be used. 10 years may be somewhat too long for the electronic-intensive components in a mobile network, and too short for other assets. However, on balance, 10 years is a reasonable approximation.

[11]See the discussion in ANNEXURE B.

Dr. Parsons concluded the following ("Using Accounting Data to Estimate the Cost of Call Termination in Telecommunications Networks" Section IX, describing the excel templates for ASR-based FAC):

> "Row 4: Estimated Economic Life. We assumed a 10 year economic life as reasonable to represent Vodafone assets in general. The user can adjust this value. Consider the following implied accounting lives for the following key asset categories (plant and computers comprise approximately 95% of the assets on the Mumbai ASR):
>
> Bldg = 8.75 [apparently no bldgs are owned – all short leases]
> Computer = 10 [combination of hardwave & software]
> Furniture = 13.5
> Motor Veh = 6
> Office Equip = 11.3
> Plant & Machinery = 9.8"

How the lives and depreciation is applied is critical. Dr. Parsons discusses this at Section III ("Using Accounting Data to Estimate the Cost of Call Termination in Telecommunications Networks" One method is to use the reported depreciation per period, and apply the WACC to the net (net of past depreciation) book value of the relevant capital assets. With this method, the depreciation reported for the period already employs the booked lives of the capital assets. Alternatively, one can start with the gross-book investments (which have not subtracted past depreciation), assume a straight-line depreciation and an average life (such as 10 years), and calculate a relevant depreciation per year.

With either approach, one could then perform a levelized calculation of the WACC; in essence creating an annuity value over the life of the asset that would yield a stream of revenue that would (in present value) equal the present value of the costs of capital. Such a levelized calculation would be approximately equal to the WACC near the mid-point of the lives of the capital assets.

9. Do you agree with the proposal for treatment of the cost items as indicated in Table 3.2? If not, please give your proposal with justification.

Theoretically, some (likely small) proportion of sales and marketing would be wholesale related. However, excluding sales and marketing (i.e., including it in retail/customer/line related costs) is a reasonable first approximation. The other categories of costs are germane to the calculation of a call termination cost.However, the approach indicated in the consultation paper including Table 3.2 represents only a very high level view of the modelling approach. Our full views in relation to the use of accounting data for the determination of cost based interconnection charges are set out in Dr Parsons' expert report "Using Accounting Data to Estimate the Cost of Call Termination in Telecommunications Networks".

10. Do you agree that revenue can be used as a driver for segregating the cost pertaining to VAS services from the total cost indicated in the ASRs? If not, please provide a template with appropriate method for separating the cost items for value added services from the cost data provided in the ASR.

Revenue can be used as a driver only for a limited set of very specific costs for which revenue is actually the driver of such costs, such as sales-based taxes or the costs of bad debt expenses. In general revenue is an inappropriate method by which to allocate costs, particularly when the Authority is in possession of detailed accounting information and detailed LRIC and FAC cost models which properly allocate costs to the services in question – interconnection services. In particular revenue is a poor approach by which to allocate costs to VAS services. VAS costs should be determined on a cost causative basis, and those direct costs should be used to ensure that VAS receives their appropriate pro-rated share of the allocation of common costs.

As detailed in Annexure A, the approach to determination of cost based interconnection charges can and should be undertaken separately. Only then should the Authority consider whether there is a compelling case to regulate retail services such as VAS, which decision should be undertaken with extreme caution given the healthy competitive state of the Indian retail communications market.

Regulatory best practice requires that costs be allocated on a cost causation basis – that is, the factor that drives the cost of the service, and the judgment of the Hon'ble TDSAT requires that any regulated interconnection charges be set on the basis of work done. Allocating costs which are not driven by revenue, and doing so on the basis of revenue, would clearly be inconsistent with the judgement of the Hon'ble TDSAT.

11. Should termination charges be asymmetric in respect of existing operators and new entrants or between different types of networks? What should be the criteria to distinguish between an existing operator and a new entrant? Please justify your answer.

Asymmetric termination charges would amount to a cross-subsidy between operators. We do not believe that this is in the interests of competition as it would create artificial advantages for one set of operators.

Furthermore, the Authority's second question reveals the inherent impossibility of implementing asymmetric charges in an industry which has seen gradual entry of up to 14 operators per circle over a period of 17 years. It is simply impossible in such an environment to find any rational principle according to which it would be possible to fairly distinguish between "new" and "existing" operators.

It would also be entirely inappropriate to make any decisions intended to benefit operators licensed in 2008 given that they are currently under detailed scrutiny in multiple forafor basic errors and omissions in license applications, serious failure to meet rollout obligations in multiple circles for a sustained period of time and other issues. It would be highly controversial to consider granting those operators additional subsidies when they are currently under scrutiny for having received subsidies in the form of artificially low entry prices.

We note that we only received spectrum and commenced operation in 7 of our circles in 2007/8, and as such would be a beneficiary of any asymmetric rates. However, we reject the argument for asymmetric rates on the basis that they would be economically inefficient and would distort competition. We also note that our rollout our and success in those 7 circles has been achieved without any subsidy.

It would also be entirely inappropriate to grant any subsidy to dual-technology operators since those operators already pay much lower spectrum usage charges as a result of artificial separation of charges for GSM and CDMA spectrum which is substitutable and which is used to compete in the same retail market.

12. Should the TRAI treat the work done in origination and termination of a call as identical for the purpose of determining termination charges? If not, please provide justification in support of your answer.

The Authority must clarify what type of cost it is referring to when asking whether origination and termination have similar costs. If the Authority is looking at network costs only, it is likely that those costs are similar. However, this does not mean that the prices in the market or a regulated price will or should be similar. One must remember that the total price of retail services must contain the retail specific costs that are excluded in network cost models (such as the ASR-based FAC outlined above). This is explained below.

The network costs to terminate a call may be different than the costs to originate a call. In particular, if interconnection occurs on a "hot-potato" basis (in which the originating network passes off the call at the nearest POI point of interconnection), the costs of termination can be greater than the costs of origination. With "cold-potato" routing (where the originating network retains the call until it reaches the POI closest to the final termination destination) the costs of origination can be greater than the costs of termination. In some instances, even with hot potato routing, some networks may retain calls for a longer distance in order to take advantage of perceived differentials in network quality.

At any rate, the differential between the network costs of originating and terminating traffic is not likely to be great. In the absence of additional information on any differentials in the costs of origination v termination, it is reasonable to assume that the costs of origination and termination are the same and treat the minutes symmetrically.

However, the network cost of traffic **excludes** retail specific costs. Using the recent ASR data, it is estimated this can be around 40-50% of operating costs. These costs would therefore lie on top of the network costs of retail services. Therefore, the total cost of retail traffic (incl. origination) is significantly greater than the network cost of traffic.

13. What should be the criteria to estimate the traffic minutes for the fixed line network as actual traffic minutes for the fixed network are not available with TRAI? Please provide justification in support of your answer.

The Authority should not base its decisions for mobile networks on actual data and its decisions on fixed line network on estimated data. This would be an entirely inconsistent approach. The mobile operators are submitting MOUs to the Authority and fixed line operators should be required to do the same.

The Hon'ble TDSAT has noted that "*TRAI indisputably can take recourse to and in our opinion, should issue appropriate direction(s) as provided for in Section 12 of the Act, asking the operators to furnish such data or disclose such documents which according to it would be necessary*."

14. Do you agree with the policy that origination charge should be under forbearance? Please provide justification in support of your view.

As noted above, it is highly inappropriate for the Authority to consider regulating retail tariffs within a regulation for wholesale interconnect rates. Such an approach would be without precedent anywhere in the world.

Notwithstanding the procedural flaws with asking such a question, VE notes that there is absolutely no evidence to suggest the market is failing to a degree that justified regulatory intervention. VE notes that the following comments by the Infodev/ITU regarding retail regulation:[12]

> *"Regulation has potentially high costs. Among other things, it substitutes the regulator's judgment for market interactions. No matter how capable and well intentioned regulators are, they will never be able to produce outcomes as efficient as a well-functioning market.*
>
> ***Regulators should therefore forebear from interfering in pricing decisions unless regulation is justified**. That is, unless the expected benefits from regulating prices outweigh the expected costs from doing so.*

VE notes that no such analysis has been undertaken by the Authority. In the absence of such analysis, it is clearly against international regulatory principles to intervene in the retail market. We believe that the degree of competition in the retail communications market in India requires a review of retail regulation, but with the focus of identifying areas in which existing regulation can and should be withdrawn or modified.

15. Which of the following is the best option for International TerminationCharge?

(a) Left for mutual negotiation between access providers and ILDO(b) Reciprocal arrangements with other countries(c) Higher than the domestic termination charge(d) Same as domestic termination charge

As noted above, we believe that the Authority should ensure that its thinking and conclusions are consistent with the judgment of the Hon'ble TDSAT.

16. Is there a need to specify separate ceilings for carriage charges forremote and hilly areas? If yes, how should the costs corresponding toremote/ hilly areas be segregated for carriage charges to/ fromremote/ hilly areas, as the Accounting Separation Reports of the NLDoperators provide only a consolidated cost for pan India operations?

If the Authority is considering this approach, it should request NLD operators to provide the relevant data.

Hon'ble TDSAT has noted that "*TRAI indisputably can take recourse to and in our opinion, should issue appropriate direction(s) as provided for in Section 12 of the Act, asking the operators to furnish such data or disclose such documents which according to it would be necessary*."

[12] http://www.ictregulationtoolkit.org/en/Section.2150.html

17. Do you feel that TRAI should intervene in the matter of International Settlement Rates? If so, what should be the basis to determine International Settlement Rates?

Provided the Authority has dealt with termination charges for international calls, there should be no need to intervene in the matter of international settlement rates.

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

Please see answer below:

19. If the cost of all relevant network elements are taken into account inthe 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.

It is first submitted that there is no per se reason why the market for the provision of carriage services should not be competitive (as opposed to voice termination which we accept is not subject to competition since there is only one possible provider).

However, there is an issue in relation to one operator which is bundling the carriage service with the termination service and thereby leveraging its monopoly in termination to artificially create a monopoly in carriage as well, i.e. BSNL is treating the intra circle carriage charge (earlier called TAX carriage and now called transit carriage) as a de facto termination charge as it claims a monopoly to carry calls terminating on its fixed line network from the Level II TAX to the terminating SDCA and refuses to let other operators provide that carriage service.

The Authority has two choices open to it:

- clarify that if this charge is a carriage charge, then operators should have the freedom to choose the NLD operator to carry that call to the terminating SDCA ;
- alternatively if Level II TAX is designated as the handover point for termination of a call then there is no justification to have a separate transit carriage charge and only the fixed termination charge should be applicable, i.e. in the case where one operator insists on a monopoly on the use of transit services because it is not able or willing to provide the requisite direct termination service, such an operator should be required to bear any incremental costs of transit from the point of handover and should only be entitled to termination charges.

Either of these approaches removes the need for determining a separate transit carriage charge. Under the first approach the carriage service would be subject to competitive forces, which would remove the need for regulated pricing. Under the second approach, there would be no separate charge and it would be a part of the termination charges.

20. Is there a need to regulate the TAX transit charges or should it be leftfor mutual negotiations? In the event transit charge is to be regulated,please provide complete data and methodology to calculate TAX transitcharges.

It is first submitted that the issue of transit charges is pending consideration before the Hon'ble Supreme Court. Thus, our submissions on this issue are without prejudice to our contentions as contained in the proceedings before the Hon'ble Supreme Court on the Transit Charge matter.

The Hon'ble TDSAT in its judgment dated 29 September 2010 has asked the Authority to reconsider the issue of transit charges, opining that if direct connectivity has been achieved, TRAI need not have fixed any charges in respect thereof.

In this regard, it is submitted that the transit service is used when two operators lack direct connectivity and use a third operator's TAX to connect calls to each other's networks. This involves routing an incoming call from one operator to the correct terminating operator via a third operator's switch. The transit of calls is also required when the capacity of the direct connectivity route has been fully utilized. The latter case is applicable only in the case of BSNL where the overflow traffic required to be terminating on CellOne is routed via the TAX switch of BSNL.

The Hon'ble TDSAT in its judgment dated 29 September 2010 has addressed only the latter scenario and not the former where direct connectivity is still to be achieved.

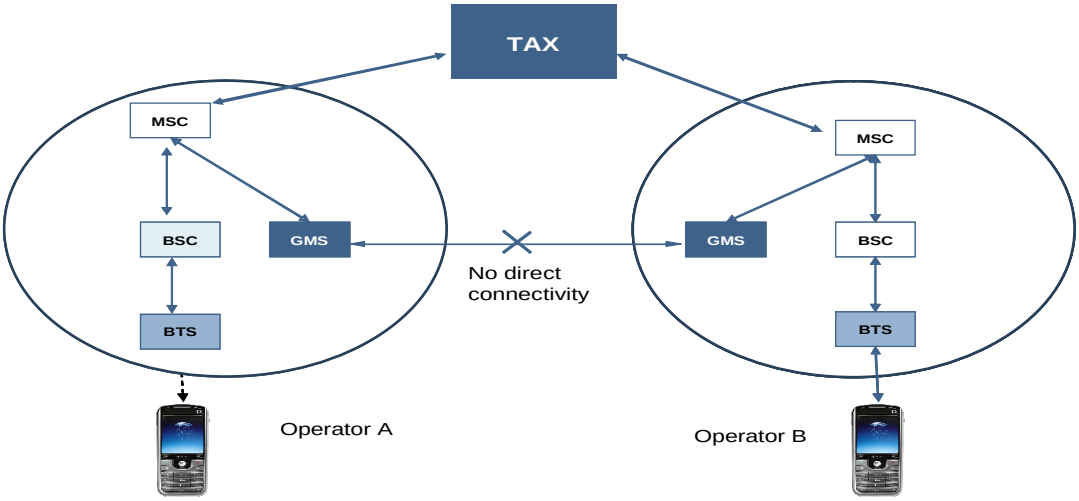
Consistent with our response to question 19 above, there are two choices available to the Authority:

- ensure that the transit services are open to competition and not artificially restricted to one provider (ie there should be no mandate that only BSNL PSTN facilities can be used to transit the call to BSNL CellOne) in which case the need for determining transit charges is removed since they are subject to competitive forces. This will not only give operators the freedom of choice but will also result in a more optimum use of resources; or

- if the Authority is not willing to ensure that they are open to competition, a transit charge will need to be determined. This must be done on the cost based and work done principles that have been enunciated by the Hon'ble TDSAT.

It is further submitted that whether it is the case of an absence of direct connectivity or a case of traffic overflow (which effectively amounts to an absence of direct connectivity) the TAX transit facility is used when the two operators who need to terminate calls on each other's networks, use their points of interconnection with a third operator to transfer calls between each other.

This is illustrated through the following diagram.



In the above figure, operators A and B lack direct connectivity and hence traffic originating from operator A and terminating on operator B's network or vice versa must transit via a third operator's exchange. The links between operators' GMSC and the TAX are owned/leased by the respective operators. As such, the third operator does not carry transit traffic, it simply performs the required switching and routing function.

Based on the above facts, we believe the cost for transit facility should be based solely on the cost of switching/routing a transit call since this is the only service required of an operator providing transit facility.

We note that the Authority is its IUC Regulation 2009 has provided that transit charges "shall be less than Re.0.15 (Fifteen paise only) per minute and, subject to the said limit, may be decided by the concerned service providers through mutual commercial arrangement."

Accordingly, BSNL is charging for transit facility at 14p/minute.

It is submitted that that since the cost of transit which essentially entails only a switching/routing function is a fraction of the costs involved in terminating a call, the mobile termination charges ought to be set at several-fold the level of transit charges. That is, if the transit facility can be charged up to 14p/minute, the regulated price of the termination service must be far higher than 20p/minute or even 37p/minute. If the price of the termination service is regulated at 20p/minute or 30p/minute, then the transit charge should be set at a far lower rate than 15p/minute.

21. Is there any need to prescribe separate termination charges / carriagecharges for video calls? If yes, how should this charge be calculated inthe absence of cost data? Please provide the methodology and data tobe used.

VE submits that in most jurisdictions worldwide, video calls are not subject to the same regulation as applied to voice termination. For example, under the UK regulation of mobile termination, a call is specifically defined as a voice call:

> *""Call" means a voice call which originates on a public electronic communications network (whether fixed or mobile) and is terminated to a mobile number within a number range allocated to the dominant provider"*[13]

Similar definitions are also used in most markets. VE further notes that in markets worldwide that have established 3G networks, video calls still comprise a relatively insignificant volume of traffic compared to voice and data traffic.

In saying that, however, on a pure network basis, video calls do require greater network resources than voice calls. This is due to the different rate at which voice and video are carried over the network. VE refers the Authority to the 2007 Ofcom Hybrid-LRIC+ model[14] which separately identifies video calls as a service. Note that this is the last model to have done so, and the latest generation of Hybrid-LRIC+ models ignore video calling as a service.

Voice over the 3G network used a 12.2kbps call data rate, whereas video uses a 64kbpscall data rate. Using these data rates, we can covert a minute of voice and a minute of video to equivalent mbps throughput[15]. This allows us to directly compare the relative network usage of voice and video.

The conversion, as undertaken in the 2007 UK Hybrid-LRIC+ model[16] calculates the network throughput of one3G voice minute as 0.0002033 kbps and one video call minute as 0.0010667 kbps. Thus, one minute of video uses approximately 5 times network capacity than one minute of voice.

This network usage flows through to the final service cost estimates, where the real [non-adjusted for inflation] service cost of 3G video termination for 2010-11 is GBP0.20. For the same year, 3G voice termination is estimated at GBP0.048[17].

Network cost models show that the cost of video termination is around 5 times the cost of voice termination.

[13] Schedule 2, Part 1, Notification under section 48(1) and 79(4) of the Communications Act 2003.http://stakeholders.ofcom.org.uk/binaries/consultations/mtr/statement/MCT_Statement_Annex_1.pdf
[14] http://www.ofcom.org.uk/static/LRIC_files/index.html
[15] Where the conversion equals call data rate / 60 [convert from minute to second] / 1000 [convert from kb to mb]
[16] See 2-network.xls, sheet costdrivers, cell G37:G51.
[17] See 4-economic.xls, sheet service costing, cell Y60 & Y63.

22. Do you agree that a deterrent termination charge should be imposedfor commercial SMS? In your view, what would be the mostappropriate level of termination charge for commercial SMS?

If were possible to find a workable mechanism to charge just for commercial SMS, VE would support such a mechanism. However, we do not believe that it is possible to find a robust and workable mechanism to differentiate between commercial and peer to peer SMS. However, peer-to-peer SMS is invariably balanced traffic. This means that a single termination rate applied to all traffic will broadly "net out" for peer to peer SMS, while imposing a price on commercial SMS which tends to be imbalanced in nature.

We have signed agreements with some operators at 10 paisa per SMS which we believe is a level which would act as sufficient deterrent to spam. This price is also well below international benchmarks for SMS termination pricing whether regulated or commercially agreed.

Vodafone commissioned international renowned regulatory economic experts Competition Economists Group (CEG) to review the approach to SMS termination around the world (**ANNEXURE C**). CEG found that the average commercially negotiated SMS termination rate is Rs1.56. The average regulated SMS termination rate was Rs 0.51.

VE further notes that CEG found substantial errors in the table on p.69 of the IUC Consultation document, purportedly showing international approaches to SMS and voice termination. CEG has corrected the errors in the table (see Error! Reference source not found. below). CEG concludes that:

> *In a smaller number of countries the regulator sets the SMS termination charge. However, in our research to date, **we have not found any country that regulates SMS termination charges at zero, i.e. bill and keep**.* (p.8)

VE submits that the proposed commercial interconnection of 10p is among the lowest in the world. Allowing such negotiated rates would solve the issue of SMS SPAM and would not impose any financial difficulties on operators with peer to peer SMS due to the balanced nature of SMS traffic.

Table 3: TRAI interconnection usage table

Country	MTC/FTC Regulated	Approach	Costing Methodology	Retail charging method	SMS termination charge
Australia	Yes	Cost based/cost oriented	TSLRIC+	CPP	Commercially negotiated
Brazil	Yes	Cost based	FAC/LRIC	CPP	[unknown]
Canada	MNOs not regulated/FTC regulated	Cost based for FTC	IC for FTC	RPP	Commercially negotiated
China	Yes	Cost based	[unknown]	RPP	[unknown]
Egypt	Yes	Retail price linked	65% of on-net revenue per minute	CPP	Commercially negotiated
France	Yes	Cost based	LRIC	CPP	Regulated price cap
Germany	Yes	Cost based	LRIC+	CPP	Commercially negotiated
Hong Kong	FTM unregulated/MTM no charge	Commercially negotiated/Bill and Keep	Negotiated	RPP	Commercially negotiated
Italy	Yes	Cost based	LRIC+	CPP	Commercially negotiated
Korea	Yes	Cost based	LRIC+	CPP	[unknown]
Malaysia	Yes	Cost based/Cost oriented	LRIC+	CPP	Regulated LRIC+
Pakistan	Yes	Cost based/Cost oriented	FAC	CPP	(Termination charge proposed following regulator's consultation)
South Africa	Yes	Cost based	LRIC+	CPP	Commercially negotiated
UK	Yes	Cost based	LRIC	CPP	Not regulated /Commercially negotiated
USA	Yes, except M2M	Reciprocal/M2M commercially negotiated	Telric/B&K	RPP	Commercially negotiated

Notes: Highlighted table entries are differences to the Table on p.69 of TRAI's consultation paper. The sources for the last column are shown in Table 3. The sources for the other differences are: Analysys, Case studies of mobile termination regimes in Canada, Hong Kong, Singapore and the USA, 2008; ITU Regulatory Issues – Interconnection with Mobile Networks; and Vodafone's Annual Report 2010 – Regulation.

23. Do you agree that Bill and Keep regime should be put in place for othertypes of SMS (non-commercial SMS)? Please provide justification foryour response.

No. See above. We do not believe that this is workable. It offers unacceptable arbitrage opportunities to originating operators who will have a strong incentive to reroute or disguise commercial traffic. Since peer to peer traffic tends to be more or less in balance, a single reciprocal rate would impose little net cost on operators, yet effectively target commercial SMS.

As discussed earlier, VE believes that market participants should be allowed to voluntarily determine rates for the mutual exchange of traffic, including a voluntary participation in bill and keep arrangements. However, in instances in which the parties cannot voluntarily agree to a commercial arrangement for the mutual termination of traffic, VE favours (a) cost oriented or cost based approach.

Mandatory bill and keep regimes, in a calling-party-pays environment, punishes those networks terminate a large proportion of calls. It would create an incentive for networks to avoid customers that are net call terminators, and attract those that are net call originators. This would create a disincentive to serve lower income and more rural customers (that are likely net call terminators).

Note that bill and keep is more viable in a so-called receiving party pays environment, such as the U.S., since networks charge retail customers for both originating and receiving (terminating) calls.

With respect to regulated bull and keep, CEG found that:

> *"SMS termination charges are regulated in a number of countries. Our research could find* ***no country where regulators set a zero charge for SMS termination****. In most countries that regulate SMS termination, charges are generally set in line with some measure of costs."*

Several regulators worldwide have specifically looked at the issue of bill and keep for SMS interconnection (see discussion pages 5-7 of the CEG Report). Specifically, a report for the UK regulator Ofcom stated:

> *"In general, the consumers' objections to spam in these countries [i.e. bill and keep countries] is based more on nuisance and annoyance than on having to pay for unwanted calls. It is more common to have complaints about receiving spam SMS messages that are counted towards a subscriber's monthly allocation, as has been observed recently in Canada, and also in Hong Kong."*[18]

The New Zealand regulator also stated that:

[18] Analysys, *Case studies of mobile termination regimes in Canada, Hong Kong, Singapore and the USA*, 2008, p.5.

"while market conditions suggest that a BAK pricing principle is appropriate, in order to mitigate against the risk of SMS spam, the Commission has determined that a forward-looking cost-based price for SMS termination is appropriate."[19]

And finally, the European Commission commented:

"*Nevertheless, one should note that setting the price of any service at zero may cause distortionary behaviour, bring arbitrage opportunities, lead to inefficient traffic routing and inefficient network utilisation. For instance, a potentially problematic issue might be inefficient routing of traffic from operators not participating in the Bill and Keep scheme."*[20]

CEG conclude that SMS interconnection regulation should rarely be imposed, but if it is, the rate should be set at cost based level. CEG further note that setting SMS interconnection at bill and keep (ie zero) is likely to impose significant inefficiencies and risk increasing the level of SPAM:

In summary, we believe that regulation of interconnection should only be imposed in the event of demonstrable market failure and that, where regulation of interconnection charges is imposed, it should generally be at cost based levels with an additional mark-up being allowed where they would have fund the expansion of mobile ownership. The regulatory imposition of Bill and Keep carries potentially large inefficiencies from charges not being set in line with costs and from the risk of leading to a significant increase in SPAM messages. (p.7)

24. Is there any need to prescribe SMS carriage charges or should it be leftfor mutual negotiation? If SMS carriage charges are to becalculated, what methodology should be used to calculate thesecharges? Please provide all cost details and methodology.

As there are a large number of NLD operators who have the ability to carry SMS traffic, VE believes that the SMS carriage charges should be left under forbearance.

25. Do you agree that with the inclusion of all costs in the calculation of Interconnection Usage Charges, the item "incremental cost for roaming services" should be excluded from the computation of tariff ceiling for national roaming? If not, please give reasons.

We are given great hope by the fact that the Authority appears to confirm in this question that it intends to ensure that all legitimate costs are included in the regulated price of the mobile termination service.

[19] New Zealand Commerce Commission, Standard terms determination for the designated services of the mobile termination access services (MTAS), fixed to mobile voice (FTM), mobile-to-mobile voice (MTM) and short messaging service, 5 May 2011, p.iv.

[20] The European Commission made a similar finding in its Commission Staff Working Document accompanying the Commission Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU, 2009, p.30.

However, as stated in response to all questions which stray into regulation of retail services, we must caution the Authority that it would not be appropriate to use the review of the interconnection usage charges framework to also regulate retail services such as national roaming. The Authority should first clearly set out its proposals for interconnection, and only once those are settled move on to consider retail regulation.

In any case, to the extent that there are costs which are incremental to/driven by the provision of a separate service (national roaming), these costs would by definition not already be included in the costs of the provision of a different service (termination). Again we remind the Authority that when capex/capital costs are included in the cost base for the termination service, this does not mean that 100% of capex/capital or other fixed and common costs are attributed to the termination service and therefore do not need to be taken into account elsewhere. Only a proportion of those costs are allocated according to the methodology set out by Dr Parsons. Costs which are incremental to the provision of roaming services would therefore still need to be taken into account in any regulatory consideration of the cost and price for roaming services.

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ANNEXURE A

Using Accounting Data to Estimate the Cost of Call Termination in Telecommunications Networks

By Steve G. Parsons, Ph.D.[21]

I. Introduction

In most jurisdictions around the world, call termination rates are determined via estimates of the costs of terminating such calls. Such costs estimates tend to fall into two broad categories: Accounting-based (sometimes also called "Tops Down") approaches; and Engineering-Economic estimates (also often called "Long-Run Incremental Cost", LRIC, or Forward Looking LRIC, FL-LRIC, or bottoms-up).

Each approach has its advantages and disadvantages, which will not be considered in any detail here. Suffice it to say, that accounting-based approaches can, and have, been used to estimate call termination rates in many jurisdictions around the world. The intent here is to briefly describe the key principles underlying such calculations, and to describe the steps that are necessary in order to properly utilize accounting data for these purposes. The Steps are:

Step 1: Assign Assets and Operating Expenses to the Following Four Categories on the Basis of the Cost Causation Principle:

A) Voice Traffic Sensitive.
B) Caused by Other by Factors (e.g., lines, customers).
C) Wholesale-specific costs.
D) Truly Common Costs.

Step 2: Include Capital Costs

2A: Include Economic Depreciation
2B: Include WACC

Step 3: Include Operating Expenses

Step 4:Include any Wholesale-Specific Costs

Step 5: Calculate and Apply a Common Cost Adder.

Step 6: Apply a 12% License Fee

Step 7: Create a Common Denominator (i.e., Voice-Equivalent Minutes)

[21]Adjunct Professor, Washington University, St. Louis, Graduate School of Engineering; President, Parsons Applied Economics.

Step 7: Divide by Total Voice-Equivalent Minutes

We also produce an actual local call termination rate calculation, using Accounting Separations Regulation (ASR) filed by Vodafone, and create an excel ASR template.[22]

II. The Key Principle and First Step – Cost Causation

At the heart of any cost analysis, is the principle of cost causation. One should attempt to attribute costs, where possible, on the basis of what causes the costs. In telecommunications networks, costs may be caused by traffic (minutes of usage), by lines or customer counts, or other factors. Other costs will be truly common (e.g., tax preparation), that are not caused by any particular activity but rather are "caused" by the existence of the telecommunications provider in total.

Therefore, the first step in utilizing accounting data for estimating a call termination rate is to assign accounting categories by relevant cost causation. If a cost study were to be performed for multiple purposes, it may be important to identify each major form of cost causation. However, here the purpose is to describe a process by which to calculate a voice call termination rate. As such the following categories should be used:

Step 1: Assign Assets and Operating Expenses to the Following Four Categories on the Basis of the Cost Causation Principle:

A) Voice Traffic Sensitive. These include switching and local transport network costs.
B) Caused by Other by Factors. The other factors could be lines, customers or other factors, other than voice traffic. These include non-traffic sensitive line costs in a land-line network, handsets, and the vast majority of the costs of customer-related activities such as marketing, billing and collection, and customer care.
C) Wholesale-specific costs. This category is listed largely for theoretical completeness; for most operators, these costs would be relatively small, but would include those employees responsible for interconnection, or the costs of a wholesale-only billing system (if one existed).
D) Truly Common Costs. These costs are not caused by any particular activity and may include some types of "overhead" executive and administrative costs such as finance and accounting or human resources.[23]

[22] The excel file was produced jointly by myself and Jim Ramsey, senior cost consultant Parsons Applied Economics (previously VP Taylor Nelson Suffres/Indetec, and former cost analyst at Pacific Bell Telephone).
[23] One likely could, with additional effort, pare down the size of the common costs by performing special studies to determine what factors cause at least some portions of the accounts that appear to be common costs. However,

How then should each of these categories be considered and used. The key principle of cost causation dictates their use in the calculation of a call termination rate.

Category A should be attributed to all traffic volumes: 1) on-net originating; 2) on-net terminating; and 3) off-net terminating.

Category B should be excluded from the call termination cost.

Category C should be attributed completely to the termination rate.

Category D, when used in a fully allocated cost method, should be allocated to A, B and C above.

While easy to state, the application of the cost causation principle may require significant time and/or judgment in evaluating individual components of the ASRs. The specific categorization can be seen in excel ASR template.

III. Capital Costs[24]

Telecommunications network providers must make capital investments, and these investments have a very real opportunity cost. This is likely one of the reasons why telecommunications regulators around the world have embraced long-run costs, in which all inputs (all resources) are assumed to vary.[25] This concept is also embodied in Fully Allocated Costs (FAC, also called Fully Distributed Costs, FDC).[26] Indeed, the very terminology of "Fully" allocating or distributing costs means that all costs are fully accounted for; i.e., all costs, including all capital costs, are included in the cost calculation. Therefore, cost calculations performed for the purpose of establishing cost-based call termination rates in telecommunications always include capital costs, regardless of the cost approach employed. All major telecommunications regulatory and advisory bodies worldwide (of which we are aware) include capital costs (depreciation and return on capital)[27] in their regulated wholesale termination prices. These bodies include the U.S.

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absent such studies, and when collecting data from multiple companies, as a practical matter, there will likely be accounting categories that can only be considered common.

[24] In this section I borrow heavily from "Statement on the Proper Treatment of Capital Costs for a Cost-Based Mobile Termination Charge (MTC)", submitted by Vodafone and signed by multiple experts, including myself.

[25] *See* virtually any text on the principles of economics, intermediate microeconomics, or managerial economics, *e.g.*, W. BRUCE ALLEN, et. Al, MANAGERIAL ECONOMICS: THEORY, APPLICATIONS AND CASES, 2005 (6th ed) pages 336-339

[26] FAC or FDC generally rely upon accounting data, and often there is no attempt in a FAC or FDC study to make the accounting measures of costs forward looking (i.e., to reflect the current value of assets).

[27] And associated taxes.

Federal Communications Commission (FCC),[28] the UK regulator Ofcom,[29] the European Commission,[30] International Telecommunications Union,[31] and the World Bank.[32] The World Bank has issued Principles for Efficient Interconnection Price Structures, of which the first bullet point states that interconnection charges should be cost based, including cost of capital "since these costs are necessarily incurred by the operator providing the facilities".[33]

Capital related costs are comprised of: i) depreciation; and ii) the return on capital, including associated taxes.[34] Economic depreciation should reflect the change in the value of the asset over time. That is, the asset is put to one use (rather than using the resources elsewhere) for some period of time, and because of that use, there is a loss of value in the asset.[35] Economic depreciation is tied to the economic life of an asset (and the rate it which its economic value changes over time), and it may diverge from accounting depreciation (which may be driven by tax implications, rather than economic lives).

In addition to depreciation, there is the opportunity cost of having monies tied up in capital assets.[36] This reflects the lost opportunity to have earned a return from another investment. Like depreciation, this a valid, and very real, opportunity cost. This opportunity cost is also referred to as the weighted average costs of capital (WACC), which I discuss in some detail in a separate document ("*WACC Concepts, Best Practices, Calculation & Data*").

Step 2: Include Capital Costs

[28] *See, eg.*,*In re* Implementation of the Local Competition Provisions in the Telecommunications Act of 1996 (FCC 96-325, CC Docket No. 96-98, 95-185). (FCC, released August 8, 1996), as codified in Title 47, Code of Federal Regulations, particularly § 51.505 Forward-Looking Economic Costs.

[29] Ofcom, "Mobile call termination", 27 March 2007, A5.2, A5.7, *available at*http://www.ofcom.org.uk/consult/condocs/mobile_call_term/statement/, at A5.14.

[30] European Commission, "Commission Recommendation of 7.5.2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU".

[31] The ITUs Information and Communications Technology (ICT) Regulation Toolkit states: "Incremental cost is usually considered over the long run — long-run incremental cost (LRIC)is the cost of producing a given increment of output, including an allowance for an appropriate return on capital to reflect the costs of financing investment in facilities used for interconnection, as well as the capital costs of those facilities." *Available at*http://www.ictregulationtoolkit.org/en/Section.2164.html

[32] World Bank, 2000, *Telecommunications Regulation Handbook*, Washington. Available at http://www.infodev.org/en/Publication.22.html

[33] *Id.*, p.3-26, and stating at p. B-11 "Because the telecommunications industry is capital intensive, the cost of capital is a critical issue in determining telecommunications costs, regardless of the costing methodology used. The main point to recall is that **the regulator has to incorporate the correct measure of the cost of capital in its costing methodology in order for the regulated operator to recover all of its efficient capital costs, including its equity and debt costs**." (emphasis added).

[34] Often, taxes are broken out as a third category of costs.

[36] It is determined by the time value of money, as determined in the markets for debt and equity capital.

The ability to properly include capital costs occurs via step 1, in which both operating expenses and assets are placed into the four categories listed. In essence, the capital costs associated with any category of costs (e.g., traffic sensitive costs) are no different than other operating expenses.[37] For the strict calculation of a call termination rate, the most important capital costs are those associated with category A, traffic sensitive costs and assets. Other categories of capital costs are germane only for the purpose of the calculation of the common cost adder.

2A: Include Economic Depreciation

There are two methods by which to include depreciation:

2A.1 Use of the current period depreciation; or

2A.2 Use of gross booked investment, employing an economic life.[38]

2B: Include WACC

To include WACC, one must first estimate, or obtain an estimate of, the relevant WACC. In a separate document, we estimate the WACC for the telecoms industry in India to be 19.07%; this is the value we use in the excel ASR example. There are two methods by which to include WACC:

2B.1 Apply the WACC to the current net book values of the relevant assets;

2B.2 Apply the WACC to a "midpoint" of the value of a gross-book calculation.[39]

Approaches 1 (2A.1 and 2B.1) relying on current depreciation have the advantages of simplicity, and perhaps better reflecting the costs and market values of assets at a particular point in time, if depreciation rates (and therefore net book values) are designed to match the change in market values of assets. . However, depreciation rates are generally chosen for tax purposes, and not to reflect the market values of assets. Moreover, approaches 2 (2A.2 and 2B.2) utilizing gross book values will tend to be more stable over time and better reflect long-run concepts and the costs of an ongoing concern.

Either approach could be used. In our excel file template, we employed gross book values (2A.2 and 2B.2).

[37] Technically, most accountants and accounting systems include depreciation as an operating expense, i.e., it is part of Opex. WACC on the other hand is not included by

[38] One could either use straight-line depreciation, or levelize (creating an annuity value over the life of the capital asset). The two approaches yield similar values, and the straight-line depreciation method is much easier to apply.

[39] Technically, one would utilize the economic life of the asset, its economic depreciation schedule, and levelize the WACC over the life of the asset (i.e., create a constant nominal annuity value that would just equal the present value of the stream of the WACC over the life of the asset). As a practical matter, one can produce a first approximation of this value by applying the WACC to the midpoint of the life. This value will be somewhat smaller than the levelized annuity value.

Since a common cost factor will be applied (see section V below), the capital costs for all four categories (discussed in section II, step 1, above) should be included.

IV. Operating Expenses[40]

In contrast to capital costs, operating expenses are more obvious and intuitive. The key is to identify and separate the operating expenses into the four categories described in section II (step 1). For a call termination rate, the key operating expenses are those related to the radio network for network repairs and maintenance, operating cost such as power and fuel, and network administration costs (in contrast to overhead administration) such as network maintenance centers and their associated costs. Other operating expenses are only important to consider for the calculation of the common cost adder (see section V below).

Step 3 Include Operating Expenses

V. Wholesale-Specific Costs

As noted above, this category is listed largely for theoretical completeness; for most operators, these costs would be relatively small, but would include those employees responsible for interconnection, or the costs of a wholesale-only billing system (if one existed).

Step 4 Include Any Wholesale-Specific Costs

In our excel template we provide a user-adjustable cell to allow for the inclusion of any wholesale-specific costs. However, we conservatively assume that value is zero.

VI. The Treatment of Common Costs, Fully Allocated Costs

The issue of dealing with common costs arises whether one is using a engineering-economics (bottoms-up) approach or a accounting-based (tops-down) approach.

Technically, Incremental Cost (IC) or LRIC is the lower bound for subsidy-free prices; stand alone cost becomes the upper bound for subsidy-free pricing.[41] It is well known that in the

[40] Technically, depreciation is treated in most accounting systems as an operating expense. However, here the term "operating expenses" is being used to refer to all other non-capital costs.
[41] *See, e.g.*, my own article, Steve G. Parsons, *Cross-Subsidization in Telecommunications*, JOURNAL OF REGULATORY ECONOMICS, 13 (March 1998).

presence of common costs firms cannot survive by pricing services at LRIC; hence the range of subsidy-free prices is determined by the size of common costs.[42]

For termination charges, part of the problem for regulators is that a calculation of pure LRIC or pure FLLRIC is only the first in a two-step process to determine a call termination rate. That is, FLLRIC becomes the *lower bound* for the call termination rate, not the rate itself. The second step is to determine the degree to which the actual call termination rate will exceed the FLLRIC. Economists generally favor Ramsey-Pricing approaches[43], in which the rate exceeds FLLRIC to an extent in reverse relationship to the relative elasticity of demand of the termination service. Regulators around the world have generally been reluctant to embrace Ramsey-Pricing.[44]

Therefore, the vast majority of regulators have side-stepped the 2-part pricing issue by employing some mark-up/adder to recover common costs; this is true even for jurisdictions that have employed FLLRIC methodologies. For example, the FCC found:[45]

> "We conclude that forward-looking common costs shall be allocated among elements and services in a reasonable manner, consistent with the pro-competitive goals of the 1996 Act. One reasonable allocation method would be to allocate common costs using a fixed allocator, such as a percentage markup over the directly attributable forward-looking costs."

As indicated in the passage above, what is sometimes called the "equi-proportional" allocation rule appears to be the most popular. That is an allocation of shared/common/joint costs based on the direct costs or FLLRIC in question.

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[42] And while the seminal work on subsidy-free pricing does not explicitly state that the cost values were to be forward looking, economists generally expect and prefer forward-looking costs. One could, then as a practical matter in the telecommunications industry, substitute the term Forward-Looking LRIC (FLLRIC) for IC or LRIC in the statements above.

[43] The genesis of this concept generally attributed to Frank P. Ramsey, *A Contribution to the Theory of Taxation*, 37 Econ. J. 47 (1927).

[44] For example, the U.S. FCC found "For example, we conclude that an allocation methodology that relies exclusively on allocating common costs in inverse proportion to the sensitivity of demand for various network elements and services may not be used."(In Re Implementation of the Local Competition Provisions in the Telecommunications Act of 1996 (CC Docket No. 96-98) rel Aug. 2006, para. 696). The notable exception was New Zealand, which had employed a variant of the Efficient Components Pricing Rule (ECPR) that was, in my opinion, tantamount to a Ramsey-Pricing rule. However, the 2001 NZ Telecommunications Act specifically rejected Ramsey-Pricing/ECPR.

[45] In Re Implementation of the Local Competition Provisions in the Telecommunications Act of 1996 (CC Docket No. 96-98) rel Aug. 2006, para 696. Also, stating: "More broadly, certain shared costs that have conventionally been treated as common costs (or overheads) shall be attributed directly to the individual elements to the greatest extent possible." (para 682). The implication of paragraph 682 is that the proportion of calculated "common" costs will tend to be smaller than what many accounting systems would include as overhead costs (a portion of the overhead costs being considered directly attributable).

Step 5: Calculate and Apply a Common Cost Adder.[46]

Mathematically, using the categories from step 1 above:

Common cost adder = D/(A+B+C).

This implies that the common costs (category D) are allocated to all non-common costs in the business. In essence, this assumes that all other costs (retail/line related as well as network costs) benefit from the common costs.

The size of the common cost adder will likely depend on the detail of the accounting records utilized. Highly aggregated data, such as the ASR Performa B, will tend to have insufficient detail to assign/allocate costs that might properly be considered network costs (appearing instead to be overhead costs, and placed in the common category). In building a template using detailed Vodafone data for Mumbai, a common cost adder of **[cic]** was calculated. However, when using much less detailed accounting classifications on Proforma B, the common cost adder was calculated as **[cic].**

This adder is then used at the end of the calculation of the direct cost of call termination to create a fully allocated call termination cost or call termination rate.

VII. The 12% Spectrum License Fee

The 12% spectrum license fee is akin to a 12% sales tax. Once the full costs of the call termination rate are calculated, the 12% spectrum license fee must be added.

Step 6: Apply a 12% License Fee

VIII. Costs per Minute

The ultimate objective of a call termination rate study is to derive a cost per minute to be applied to terminating traffic from another network operator. The process is therefore to create the cost numerator, then divide by a relevant measure of the traffic sensitive usage of the network. This usage of the network includes all voice minutes originating or terminating on the local network. These include on-net local calls, national and international long distance calls, and calls that are delivered to the voice mail system, or calls to pick up voice mail.

Some types of calls will tend to utilize the network more or less intensively than other types of calls. For example, a call delivered to the voice mail system will tend to use the network less

[46] Technically, it is better (in fact perhaps necessary) to perform this step after other steps discussed below; however, the flow of the discussion of the four categories of costs lent itself to discussing the common cost adder at this point.

intensively (use fewer segments of the network) than one that is delivered to subscriber's handset. Similarly, with hot-potato routing, a terminating call may use the network more intensively (use more segments of the network) than an originating call.

It is possible, with sufficient data, to perform a study of the differential uses of each type of call. However, absent such data, assuming all minutes have equal utilization of the network is reasonable for calculating a call termination rate.

SMS represents a special challenge however. An SMS message relies primarily on the signaling network, and not the circuit switched network that conveys a minute of voice traffic.

Step 7: Create a Common Denominator (i.e., Voice-Equivalent Minutes)

For SMS Vodafone provided a calculation of the bytes utilization of a typical SMS and the level of utilization of a voice channel that would occur if SMS were provided over the voice network (rather than the signaling network). That value was 329 SMS = 1 minute of a voice channel.

We used this conversion factor (329-to-1) in our excel template, but this conversion factor can be adjusted by the user.

Step 8: Divide by Total Voice-Equivalent Minutes

The final step is to divide the total (fully allocated, with a share of common costs and spectrum license fee) traffic sensitive costs by the voice equivalent minutes. In this way, each use of the traffic sensitive network (i.e., the voice equivalent minutes) implicitly receives its pro-rated share of the cost. The result is the call termination rate.

IX. Excel Template

In this section I describe three call termination rate calculations, using three different sets of ASR data filed by Vodafone with TRAI. In each case, the calculations were performed in Microsoft Excel, and two versions of the excel files are provided: 1) a confidential full calculation with Vodafone data, to be provided to TRAI; and 2) an template that shows ASR row and column headings and cell references, but with Vodafone data expurgated.

A. Mumbai Detailed

In this file, our intent is to use ASR data from one specific circle, and to use as much data from that file as necessary to calculate the costs of call termination. This included data from the following ASR tabs: 1) "Dist" (traffic tab); 2) "Proforma I" (gross and net investments); 3)

"Proforma D" (network costs by category); and 4) Stage_! (a very detailed cost allocation & categorization tab).

The confidential summary tab (which shows the call termination rate calculation itself) is shown below.

Mobile Termination Charge (MTC)		Approach using the best ASR data available for network costs.
User Inputs	**Value**	**Description**
Estimated Economic Life	10	Weighted average economic life for assets
WACC (%)	19.07%	pre-tax weighted average cost of capital
Wholesale Cost Factor (%)	0%	Consideration for wholesale-specific costs such as for customer care, billing&collections, marketing, any other administration
Common Cost Factor (%)	[cic]	Includes accounting&finance, administration, head office, human resources, IT/EDP, legal&regulatory
License Fee Factor (%)	12.00%	License fees
Radio Network- Total		**Source (Sheet & Cell)**
MOUs	[cic]	Dist C69 (Total Network:Local+NLD/ILD + VAS+Wholesale)
Gross Book	[cic]	Proforma-I-Gross BlockL22
Net Book	[cic]	Proforma-I-Net BlockL22
Direct Opex	[cic]	Proforma-D-Total NetworkC90+D90-C59-G60 [subtracts out ASR depreciation]
Indirect Opex	[cic]	Proforma-D-Total Network E90-E88 [subtracts out ASR WACC]
Depreciation	[cic]	Line 13 / Line 4
WACC	[cic]	Line 13/2 * Line 5 [apply WACC to mid-point of gross book]
Total Annual Costs	[cic]	Sum Lines 15-18
Cost Per Minute	[cic]	Line 19/Line 12 (rounded)
Add Wholesale Costs	[cic]	Line 20 * 1+Line 6 (rounded)
Add Common Costs	[cic]	Line 21* (1+Line 7) (rounded)
Add License Fees	[cic]	Line 22 * (1+Line 8) (rounded)
Final FAC Cost Per Minute	[cic]	

A brief explanation of the cells and their descriptions follows.

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Row 4: Estimated Economic Life. We assumed a 10 year economic life as reasonable to represent Vodafone assets in general. The user can adjust this value. Consider the following implied accounting lives for the following key asset categories (plant and computers comprise approximately 95% of the assets on the Mumbai ASR):

Bldg = 8.75 [apparently no bldgs are owned – all short leases]
Computer = 10 [combination of hardwave& software]
Furniture = 13.5
Motor Veh = 6
OfcEq = 11.3
Plant & Machinery = 9.8

Row 5: WACC (%). We employed our estimated value of 19.07% as discussed in section III above.

Row 6: Wholesale Cost Factor. We conservatively assumed a value of 0%. Certainly, wholesale –specific costs exist, but the accounting records are generally insufficient to allow a reasonable estimate of the value. The user can adjust this value.

Row 7: Common Cost Factor (or Adder). As discussed in section VI above, we calculate the common cost factor as (total common costs)/((total network costs) + (total retail or line or customer costs) + (total wholesale costs). This step relies upon the detail available at the "Stage!" tab.

Row 8: License Fee Factor. We employed a 12% spectrum license fee.

Row 12: Minutes of Use (MOUs). As discussed in Section VIII above, we calculate the total voice equivalent minutes that use the network. This includes: On-net to On-net / originating/mobile to mobile same network; On-net to Off-net /originating/mobile to fixed or different mobile network; Off-net to On-net / terminating/ fixed or different mobile network to VF network; On-net to VMS /originating - (i.e., for purposes of this study calls terminating into voice mail use the same network resources as any other terminating call); Off-net to VMS /terminating; SMS; GPRS; Other VAS; (some of the calls in these categories can be origination or termination of National Long Distance (NLD), or International Long Distance calls; and any calls recorded separately as "wholesale". We employed a conversion of 329/1 for SMS to voice equivalent minutes; the user could modify this assumption. In this case, an overarching assumption is that the cost to make any call on a cellular network is the same as the cost of terminating a call from another network. Thus, total network minutes and costs are used.

Rows 13, 14: Gross & Net Book. Gross book investment is used to calculate WACC cost. Alternatively, net book investment could be used to calculate WACC so it is shown for that reason. The gross book amount is for total network. This includes all plant and machinery as well as the buildings that house it, computers, motor vehicles, etc.

Rows 15, 16: Opex – Direct and Indirect. This includes all relevant operating expenses for the network taken from the Proforma D tab. Because depreciation and WACC are being calculated separately with user inputs described above it is necessary to subtract the Proforma D depreciation.[47]

Row 17: Depreciation. This is a recalculation of the Proforma D depreciation using the straight-line method, a 10 year life for all network assets, and the gross book investments from row 13.

Row 18: WACC. This is multiplication of the WACC percentage (19.07% at row 5) * (one-half the gross book investment at row 13). This approximates the annuity value of leveling the WACC cost over the life of the capital asset.

Row 19: Total Annual Costs. The summation of opex, depreciation and WACC.

Row 20: Cost Per Minute. Total annual costs (row 19) divided by total network minutes of use (row 12).

Rows 21-23: Wholesale/Common/License Fees. These items (discussed above) are are "adders" or "loadings" to the direct cost per minute to arrive at the "fully allocated cost [FAC]" termination charge.

Row 24: Final FAC Per Minute

B. **Mumbai 3-Tab**

We also perform a calculation of the call termination rate using a more limited set of ASR data. If the "Stage!" tab is not consistent across network operators, an aggregated calculation of the call termination rate is still possible. In this calculation we use data only from the following three tabs: 1) "Dist" tab for MOUs; 2) Proforma I for Gross Book; and 3) Proforma B for costs. However, the "Stage!" Tab has significant information useful in assigning/allocating costs into

[47] Most accounting systems list depreciation as a component of operating expenses. They do not, however, include WACC as an operating expense.

the three categories: a) network; b) retail/customer/line and other direct; and c) common. In particular, Proforma B provides less detail than we would wish in order to distinguish between retail and genuinely common costs. Therefore, we calculate ratio of retail/common from the complete Mubai call termination rate study, using "Stage!"tab. We then apply that ratio to the overhead categories in order to separate the retail and common costs.

The row numbers, and their descriptions, follow those described above. The results are as follows.

Mobile Termination Charge (MTC)		***A "3-tab" approach that uses only the "Dist" tab for MOUs, Proforma I for Gross Book, and Proforma B for costs; also utilizes Mumbai ratio of retail/common from the Stage! tab.***
User Inputs	**Value**	**Description**
Estimated Economic Life	10	Weighted average economic life for assets
WACC (%)	19.07%	pre-tax weighted average cost of capital
Wholesale Cost Factor (%)	0%	Consideration for wholesale-specific costs such as for customer care, billing&collections, marketing, any other administration
Common Cost Factor (%)	[cic]	Includes accounting&finance, administration, head office, human resources, IT/EDP, legal&regulatory
License Fee Factor (%)	12.00%	License fees
Radio Network- Total		**Source (Calculation or Tab Name)**
MOUs	[cic]	"Dist" C69 (Total Network:Local+NLD/ILD + VAS+Wholesale)
Gross Book	[cic]	Proforma-I-Gross BlockL22
Net Book	[cic]	Proforma-I-Net BlockL22
Opex	[cic]	Proforma-B-C106+C117+G99 (maintenance with some employee cost added)
	[cic]	Network Opex is significantly less on Proforma B than Proforma D primarily because some Admin is assigned to network in D but there is no basis to do so when only using B. As a result, network costs are lower, common costs are higher, and the percentage markup for common cost is significanlty higher.
Depreciation	[cic]	Line 13 / Line 4
WACC	[cic]	Line 13/2 * Line 5 [apply WACC to mid-point of gross book]
Total Annual Costs	[cic]	Sum Lines 15-18
Cost Per Minute	[cic]	Line 19/Line 12 (rounded)
Add Wholesale Costs	[cic]	Line 20 * 1+Line 6 (rounded)

Add Common Costs	[cic]	Line 21* (1+Line 7) (rounded)
Add License Fees	[cic]	Line 22 * (1+Line 8) (rounded)
Final FAC Cost Per Minute	[cic]	See note above as to primary cause of difference between this result and that on the MTC tab.

C. Mumbai Comparison: Detail v 3-tab

First, to be clear, the detailed study relies upon more detailed data and is, in our opinions, superior to the 3-tab approach. However, note that the results are reasonably close; **[cic]**and **[cic]**. The 3-tab result is less than 2% different from the detailed calculation. The common cost adder is much larger in the 3-tab calculation; in essence, some of the network costs and retail costs that could be identified with greater detail in the first study, remain as part of the larger unassigned/unallocated common costs.

Vodafone India Total 3-Tab

Mobile Termination Charge (MTC)		*VF aggregated data all local circles. A "3-tab" approach that uses only the "Dist" tab for MOUs, Proforma I for Gross Book, and Proforma B for costs; also utilizes Mumbai ratio of retail/common from Stage! tab.*
User Inputs	Value	Description
Estimated Economic Life	10	Average life for all network assets and other assets like computers/buildings/motor vehicles
WACC (%)	0.1907	Average pre-tax weighted average cost of capital
Wholesale Cost Factor (%)	0	Consideration for wholesale related customer care, billing&collections, marketing, any other administration
Common Cost % Markup	[cic]	Includes accounting&finance, administration, head office, human resources, IT/EDP, legal&regulatory (Source, Prof B, H31, and retail/common ratio Stage! Mumbai)
License Fee Factor (%)	0.12	License fees
Radio Network		Source (Calculation or Tab Name)
MOUs	[cic]	Vodafone_INDIA_MOUs D17 (Local + VAS+Wholesale) with SMS messages converted to minutes (Source: "Dist"
Gross Book	[cic]	Vodafone_INDIA_Gross Book E6
Net Book	[cic]	
Total Opex	[cic]	Vodafone_INDIA_ProformaB F25 with employee costs distributed to network maintenance
	[cic]	

Depreciation	[cic]	Line 13/Line 1
Wacc	[cic]	Line 13/2 * Line 5 [apply WACC to mid-point of gross book]
Total Annual Costs	[cic]	Sum Lines 15-17
Cost Per Minute	[cic]	Line 18/Line 12
Add Wholesale Costs	[cic]	Line 19 * 1+Line 6
Add Common Costs	[cic]	Line 20 * 1+Line 7
Add License Fees	[cic]	Line 21 * 1+Line 8
Final FAC Cost Per Minute	0.3685	

This study relies on the aggregation of ASR data for all Vodafone circles for the Tabs: Proforma B, Proforma I, and "Dist". This study employs the same methodology as that for Mumbai 3-tab. It does also employ a Mumbai "Stage!" tab calculation of the ratio of retail/common.

As can be seen, the final call termination rate (fully allocated cost) is Rs0.3685 per minute. As we expected, this value is higher than the Mumbai value (a circle that has greater economies of density).

X. Conclusion

Many call termination rates around the world have a been established using accounting data to calculate a fully distributed cost. The first part of this paper described the key steps (and their conceptual foundation) for calculating a call termination rate. The later sections of the paper described three specific call termination rate calculations using Vodafone ASR data. The later two calculations employed data from only three ASR tabs (and a side calculation of a retail/common ratio).

ANNEXURE B

Weighted Average Cost of Capital (WACC)

Concepts, Best Practices, Calculations & Data

Parsons Applied Economics[48]

May 2011

I. Overview

This paper discusses the concepts and principles underlying weighted average cost of capital (WACC) and provides descriptions and sources that discuss international best practice related to WACC in telecommunications.

Moreover, we employ three forms of calculations consistent with best practices for the telecoms industry in India; a summary of the three calculations is shown below in table 1.

Table 4 – Pre-tax nominal WACC for India Telecoms Industry

	Low	Mid	High
10 yr Indian Government Bond Rate	16.05%	19.86%	28.12%
Academic estimated risk-free rate	15.88%	21.65%	29.96%
International country risk premium	12.98%	15.70%	17.65%
Average value	14.97%	**19.07%**	25.24%

As explained in greater detail in section IV below, refinements to these calculations could be made with additional data. However, absent additional data, an average of the three approaches is a reasonable choice for the WACC to be used in a calculation of an industry-wide call termination rate for India.

This paper is structured as follows:

[48]By Steve Parsons, Ph.D. (President Parsons Applied Economics, adjunct professor Washington University, St. Louis, Graduate School of Engineering) and Jim Ramsey (cost consultant, Parsons Applied Economics, previously cost analyst for Pacific Bell Telephone).

- Section II outlines relevant best practice documents related to the concepts of WACC and their calculation and application in telecommunications;
- Section III outlines the general principles of WACC and the CAPM approach generally used throughout the world;
- Section IV describes in more detail our estimates of a range of reasonable WACC values for the Indian telecommunications industry.
- Section V outlines the best practice principles outlined by the Independent Regulators Group.

II. Relevant Best Practice Documents

We identify two important best practice documents that describe the concepts underlying WACC and their application in telecommunications regulation.
The first document comes from the Body of European Regulators for Electronic Communications and the Independent Regulators Group, representing 34 European telecommunications regulators.

- Regulatory Accounting Principles of Implementation and Best Practice for WACC calculation February 2007
  http://www.erg.eu.int/doc/publications/erg_07_05_pib_s_on_wacc.pdf

This document is relatively exhaustive in its treatment of the relevant topics. Some of the more important principles of implementation and best practice (PIBs) are listed in section V below.
The second document comes from the International Telecommunication Union (ITU) and is a training document presented by the ITU in November 2010 for Asia and Pacific countries. This power point presentation provides short descriptions of many of the key theoretical constructs. In addition, it provides many examples of gearing ratios, risk free returns, beta coefficients for telecom companies or weighted averages for the telecom sector, equity risk premiums, country risk premiums, and complete pre-tax WACCs.

- ITU expert-level training on network cost modeling for Asia and Pacific countries, Cost of Capital – WACC Mobile networks, November 2010

  http://www.itu.int/ITU-D/finance/work-cost-tariffs/events/tariff-seminars/Bangkok-10/pdf/part_2_cost_accounting_model_wacc.pdf

A third document is useful, which describes in detail the calculation of nominal pretax WACC for mobile telecoms in Finland. Later, we use this document as a template for calculating the WACC for the telecoms industry in India.
http://www.google.com/search?q=estimating_the_cost_of_capital_for_finnish_mobile_telecommunications.pdf%2F&rls=com.microsoft:en-us&ie=UTF-8&oe=UTF-8&startIndex=&startPage=1&rlz=1I7GFRC_en

III. General Concepts

Weighted Average Cost of Capital (WACC) is the full opportunity cost of money for investments. It is the minimum return that a company must earn on an existing asset base to satisfy its creditors, owners, and other providers of capital, or they will invest elsewhere.

For a simplified description of pre and post-tax WACC, see slide 4 of the ITU, 2010 power point file.[49]This states:

$$WACC_{pre-tax} = \frac{R_e}{(1-t)}\left(\frac{E}{(D+E)}\right) + R_d\left(\frac{D}{(D+E)}\right) \qquad \textbf{(Equation 1)}^{50}$$

Where:

> R_e is the expected rate of return of equity, R_d is the rate of return for debt, D is the value of debt, E is the value of equity, and t is the tax rate.

[49] http://www.itu.int/ITU-D/finance/work-cost-tariffs/events/tariff-seminars/Bangkok-10/pdf/part_2_cost_accounting_model_wacc.pdf

[50] Wikipedia provides (http://en.wikipedia.org/wiki/Weighted_average_cost_of_capital) a more general presentation allowing for multiple types of securities (e.g., preferred stock, and multiple types of debt), but in more complex form: $\mathrm{WACC} = \frac{\sum_{i=1}^{N} r_i \cdot MV_i}{\sum_{i=1}^{N} MV_i}$ where N is the number of sources of capital (securities, types of liabilities); r_i is the required rate of return for security i; MV_i is the market value of all outstanding securities i. It is best to think of this equation as representing the ***post-tax WACC*** (and would also represent the special case if the income tax rate were zero). That is, it is best to think of r_i as the required return after all other business expenses are incurred, including the payment of income taxes.

Somewhat more specifically, the Capital Asset Pricing Model (CAPM) to is the most common tool used to estimate the cost of equity component of the WACC, and is consistent with international best practice. The CAPM approach to estimating cost of equity is estimated as follows:

$$R_e = R_f + \beta_i(E(R_m - R_f)) \qquad \textbf{(Equation 2)}$$

Where:

> $R_e$is the expected rate of return for the equity asset; R_f is the risk free rate of return, which is typically the rate on government bond; β_i is the asset beta; and $E(R_m - R_f)$ is the market risk premium, which is the rate of return the investors need (expect) to earn over and above the risk free rate.

Equation 1 represents the ***Pre-tax WACC*** and is computed as a weighted average of the cost of debt and the tax-adjusted cost of equity (cost of equity divided by 100 minus the percentage effective tax rate). [51]

A cost calculation (such as for call termination rate) should utilize either: 1) the post-tax WACC (which includes the full payment to debt, and the required post-tax return to equity), then explicitly add the cost of associated income taxes; or 2) use a pre-tax WACC in which the income taxes are already implicitly included in the WACC value.

Calculation of the WACC involve several choices between alternative approached. These choices are outlined below.

Pre-tax or Post-tax WACC

One valid method is to utilize the post-tax WACC, and then explicitly add the income taxes that would accrue if earnings were just equal to the level that would yield that return to equity. Alternatively, one can utilize the pre-tax WACC, and the relevant tax costs are already implicitly included in the WACC value.

In telecommunications, the majority of reported and calculated WACCs around the world are nominal pre-tax WACCs. The major exception to the use of pre-tax WACC is the United States. In the U.S., the tradition has been to calculate, employ, and discuss **post**-income-tax

[51] See for example, UK Competition Commission "WACC and Tax Adjustments" Appendix 8.3, available at http://www.competition-commission.org.uk/rep_pub/reports/2000/fulltext/445a8.3.pdf

WACCs, and separately include the costs of taxes. The reason for this is likely that there are different jurisdictions in the U.S. having different income tax rates. The federal income tax rate is consistent across the U.S., but each state has a different income tax rate (from 0.0% to over 9.0%), and some municipalities also employ an income tax (e.g., the city of St. Louis has a 1.0% income tax rate). Therefore, the FCC established an 11.25% after-tax WACC, but, essentially, left the inclusion of income tax to the individual states.

When WACC is used to set actual market prices, it is appropriate to use pre-tax WACC as this represents the revenue needed prior to taxation to cover the cost of capital.

Choice of the Tax Rate

The relevant tax rate is that which would accrue if the firm were just covering its costs and earning its required return on equity. In a more detailed fashion, one could consider the probability distribution of returns that would exist for a given level of risk for the firm, and integrate across the range of equity return (i.e. determine a probability weighted tax rate). It is possible that riskier firms (with higher cost of equity) could have a higher associated tax rate. An additional complication arises due to the higher corporate tax rate for foreign-own companies in India. It is our understanding that the current domestic corporate income tax rate is about 33.6% with a foreign rate of about 41.7% (averaging two different sources with slightly different rates).[52] For the illustrative calculation, we approximate the weighted average tax rate of 35.5% using the proportion of subscribers for Vodafone and Aircel as a weighting factor.

WACC Weighting

The WACC as shown in Equation 1 yields a WACC for a specific company. To estimate an industry WACC (as required when setting an industry-wide call termination rate), one would need to weight firm-specific values to calculate the relevant industry metric.

If only one termination rate is calculated (for both mobile and fixed), then only one industry (for both mobile and fixed) WACC would be appropriate; employing a weighted average of the WACCs of all the telecommunications industry. If a separate mobile termination rate (separate from a fixed termination rate) were calculated, then the relevant WACC would be the weighted average of the individual mobile companies WACCs only (excluding land-line companies).

There are several approaches that can be adopted to do this weighting. For example, one may use market capitalization (using concept of firm market valuation use some measure of past

[52] Two different sources show similar, but slightly different values. http://www.taxrates.cc/html/india-tax-rates.htmldomestic rate = 33.99%, foreign = 42.23%; and http://en.wikipedia.org/wiki/Income_tax_in_India "yielding effective tax rates of 33.2175% for domestic companies and 41.2% for foreign companies.

investments,[53] or market capitalization[54]), but a difficulty lies with the fact that not all firms are listed within India. For simplicity, in associated excel file, we used the proportion of subscribers by company as our weighting factor in a calculation of an "industry" WACC.

Gearing Ratio

Often WACC calculations will use what is frequently referred to as the "gearing" ratio. "The gearing is a measure of the ratio of debt to company value (the latter being equivalent to the sum of debt (D) and equity (E)) and is defined as: Gearing = D/(D+E)."[55] In theory, the possible methods (or sources of data) for the gearing ratio are: 1) book values, 2) market values, and/or 3) subjective estimates of optimal/efficient financial structures. As the gearing rises (as the proportion of financing from debt rises) the costs of debt and equity both rise. From the debt holder's prospective, more debt means there are more claimants to the asset at the same place in "line"; hence their risk is greater. From the equity holder's prospective, more debt means there are more claimants to the asset that have moved ahead of them in "line"; hence their risk is greater. The net effect is that while gearing has a significant influence on the costs of the individual costs of debt and equity the total cost of capital (WACC) is likely to be relatively constant over certain ranges of gearing.[56]

[53] E.g., net book value. This implicitly assumes that any divergence between market value of the investments of the companies and the net book values (which might diverge due to tax advantages of rapid depreciation for example) is consistent across companies.
[54] Market cap, by definition, excludes the debt component of the investments of the company; using this measure is
[55] Independent Regulators Group (IRG) – Regulatory Accounting, Principles of Implementation and Best Practice for WACC calculation, February 2007, (sec 3.2) available at http://www.erg.eu.int/doc/publications/erg_07_05_pib_s_on_wacc.pdf
[56] See, Modigliani, F.; Miller, M. (1958). "The Cost of Capital, Corporation Finance and the Theory of Investment," American Economic Review48 (3): 261–297.

Real or Nominal WACCs?

In theory one could calculate or employ nominal or a real (inflation-adjusted WACC). "Hence, the real WACC shows the WACC excluding the impact of inflation."[57] If one wished to decompose the inflation risk from the debt and equity premiums (see below), and one had confidence in future rates of inflation, then one could, at least in theory, estimate and employ a real (inflation adjusted) WACC then separately add the effects of forecasted inflation. And, while economists may wish to consider the influences of factors after removing inflation effects, the real world is dominated by nominal values. For example, income taxes are calculated using nominal, not real, revenues and tax-deductible costs.

As a practical matter, virtually all WACCs calculated and employed for regulated call termination rates are nominal WACCs. Like the termination rate in the great majority of other countries, the call termination rate(s) in India should be calculated using a nominal WACC.

Estimating the Cost of Debt

The cost of debt can be estimated from: 1) a weighting of the accounting measures of the cost of each of the debt instruments (weighted by the proportion of debt each comprises); 2) attempting to "decompose" the cost of debt into the underlying risk free cost plus a company-specific debt risk (the "default risk", that will depend in part on the gearing ratio)[58]; 3) subjectively attempting to determine an efficient cost of debt. The first approach has the advantage of more readily available data.

Beta and Estimating the Cost of Equity

While there are different methods by which to estimate the cost of equity, by far the most common is the Capital Asset Pricing Model (CAPM) – see equation 2.

A key element of this is β (beta coefficient), which is a measure of the extent to which returns on a company's shares co-vary with the returns on the market as a whole; and ERP - the equity risk premium required for investing in the equity market compared with risk free investments ($R_m - R_f$).

Beta reflects the risks of a particular (company) equity investment vis-à-vis market investments in general. The weighted average beta across all equity investments is 1.0. A beta for a particular company greater than 1.0 indicates an investment that is higher risk than other equity investments. A beta less than 1.0 indicates a lower risk investment.

[57] IRG – Regulatory Accounting, Principles of Implementation and Best Practice for WACC calculation, February 2007, (sec 3.1) available at http://www.erg.eu.int/doc/publications/erg_07_05_pib_s_on_wacc.pdf

[58] See, e.g., IRG – Regulatory Accounting, Principles of Implementation and Best Practice for WACC calculation, February 2007, (sec 3.3) available at http://www.erg.eu.int/doc/publications/erg_07_05_pib_s_on_wacc.pdf

This approach essentially "decomposes" the return on equity into a risk free component and a component for the risk of equity investments, adjusted by the beta of a specific company.

Decomposing Beta and Country Risk

In theory, one can "decompose" the risk related to both debt and equity investments into various categories, e.g., default risk, currency risk, risk of capital funding, risks associated with changes in technology, and even regulatory risk. As a practical matter, such decomposition is limited to the types of data available, and the purpose for the calculation. For example, for some academic investigations, it may be important to separately identify the risks associated with inflation, while for other purposes separately identifying this source of risk or influence is not important.

When comparing the cost of debt and equity across countries, one of the most important influences is country risk. Often the comparisons will use the U.S. equities market as the base (in part because of the size of that market) assigning a country risk of 0.0% (i.e., the equity risk premium for U.S. equities becomes the benchmark). Alternatively, a weighted average mix of major industrialized countries may be used. In Latin America, for example, country risk is a critical determinant of the WACC.

One measure of the country risk for India is provided by data from New York University, with a value of 3.6%.[59]

IV. Calculating WACC for India TelecomsIndustry

The calculation of a WACC for the Indian telecom industry is in the attached exc el file titled "WACC_India_Telecom_Example_3_19_11.xls"

In this file we utilize available information to produce a template for computing a telecoms nominal pre-tax WACC for India. It begins with a tab replicating the Finnish example.

The last tab shows references to calculated betas for the major telecommunications companies, for ease of comparison. The last tab (India_beta_by_co) references calculated betas for the major telecom companies in India. In some cases we used one companies' beta as a proxy for another. More complete data would obviously be preferred. Note, one should weight the individual company betas by the market value of the assets of the companies. As an approximation, we used the number of subscribers as the weighting factor. The highest and lowest company-specific betas were used in calculating a high and low scenario WACC.

[59] http://pages.stern.nyu.edu/~adamodar/ - Updated Data/Data Sets/Risk Premiums for Other Markets/Country Default Spreads and Risk Premiums table

The second tab (WACC_Table_India ERP) uses data on India 10 year bonds as the risk free premium, then uses information from two papers that calculate the equity risk premium specifically in India (http://www.vccircle.com/columns/what-is-real-cost-equity-india by SaurabhMukherjea, and http://www.iimahd.ernet.in/publications/data/2006-06-04jrvarma.pdf by Varma and Barua). A range of low/mid/high values is created by: 1) the low, weighted average, and high betas for telecom companies; and 2) the equity risk premiums calculated in the two papers. The results are:

Table 5 – Risk-free rate equals Indian Government 10 year bond rate

	Low	Mid	High
Nominal pre-tax WACC	16.05 %	19.86%	28.12%

The third tab (WACC_Table_India ERP2) employs the same approach as in the second tab, except that risk free rates used are those employed in the specific papers (rather than the 10 year bond rate). The results are:

Table 6 – Research estimated risk-free rate

	Low	Mid	High
Nominal pre-tax WACC	15.88 %	21.65%	29.96%

While the mid points are within the range of our expectations, the upper values seem unreasonably high. We therefore employed another set of data, from a researcher at New York University (AswathDamodaran, Finance at the Stern School of Business) on tab WACC_Table_India_CRP. On this tab, we use the decomposed equity risk premium (discussed below in more detail) with a current U.S. equity premium, and then adding a country risk premium calculated by professor Damodaran for India. The India equity risk premium is calculated from the other data sources. The low/mid/high variations are created only by the choice of betas. The results are:

Table 7 – New York University estimates of risk-free rate

	Low	Mid	High
Nominal pre-tax WACC	12.89 %	15.70%	17.65%

The results here yield costs of equity that appear, in our opinion, too close (i.e., too low) compared to the cost of debt in India for the "low" scenario.

The three sets of calculations above should be considered as an illustration, not as a definitive calculation; more data, and more careful review of the date would be necessary to create a definitive calculation.[60]

V. BEREC- IRG PIBs

For convenience, we have copied the twelve PIBs (principles of implementation and best practice) from the BEREC-Independent Regulators Group document. More important conclusions are in yellow highlights:

http://www.erg.eu.int/doc/publications/erg_07_05_pib_s_on_wacc.pdf

PIB 1:

IRG acknowledges that the WACC is a widely accepted methodology to calculate the cost of capital, understood by both the finance community and the industry, and already used by many regulators.

PIB 2:
In the view of IRG, the level of gearing should be determined using a method consistent with the relevant cost base and the availability of information, although some adjustments may be introduced, if required.

PIB 3:
IRG acknowledges that the cost of debt can be calculated: *i*) using accounting data, such as the current loan book to derive the interest rate; *ii*) by the regulator calculating an efficient borrowing level and the associated cost of debt; *iii*) using the sum of the risk free rate and the appropriate company specific debt premium. These approaches should consider the quality and relevance of the information available in order to obtain an estimate as appropriate as possible.

PIB 5:
IRG acknowledges that the use of CAPM as a method to estimate the cost of equity is supported by its relatively simple implementation and by its wide use among regulators and practitioners.

[60] For example, we did not have sufficient data to compute a beta for some of the companies in the industry.

PIB 6:
IRG considers that the return on freely traded investment-grade government bonds can generally be used as a proxy for the risk free rate.
The relevant market, the maturity of those bonds and the kind of information to use (current/historical values, average, short/long period…) should be defined considering the circumstances of the local markets.

PIB 7:
Estimating the equity risk premium can be made through the use of one or more of the following approaches:
- historical premium
- adjusted historical premium
- survey premium
- benchmark
- implied premium
These approached should be balanced considering the quality and relevance of the information available in order to obtain an estimate as appropriate as possible.

PIB 8:
The estimation of the firm's beta can basically be made through the use of historical information, benchmark or through the definition of a target beta. The choice of the approach depends on local market conditions, whether the firm is quoted and on the amount and quality of information available.

PIB 9:
Estimation of the tax rate should give due consideration to the company's effective tax rate and any specific attributes which give rise to a likely permanent difference to the headline tax rate.

PIB 10:
IRG recognizes that in theory the adoption of a differentiated WACC is reasonable from a regulatory point of view. However, the lack of capital market information at divisional level makes the theoretically correct determination of beta in some cases difficult.

PIB 11:
IRG is of the opinion that every proposed methodology to calculate a divisional WACC has its pro and cons. Therefore, the best approach for NRAs is to compare the results obtained using the different methodologies prior to selecting a final value.

PIB 12:
IRG believes that, when estimating the cost of capital for non-quoted companies or companies which did not issue debt securities, or when estimating cost of capital in young financial markets, NRAs should use proxies, benchmarks and peer group analysis, taking into account country specific conditions. A number of issues should be considered, including:
- what the appropriate comparator companies are, considering a number of relevant criteria for selection;
- performing a high/low scenario approach and sensitivity analysis to average out possible errors in individual parameters' estimation.

ANNEXURE C

Benchmarking SMS termination rates

A report for Vodafone

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1. Summary

1. The Telecom Regulatory Authority of India (TRAI) released its Consultation Paper on Review of Interconnection Usage Charges on 27 April 2011 ('the Consultation Paper"). Vodafone has requested CEG Asia Pacific to comment on the consultation paper, particularly the review of the international experience on SMS termination charges.

2. CEG is an economic and financial consultancy with particular expertise in relation to competition and regulatory issues affecting the communications sector. CEG has advised regulators, operators and industry associations on the analysis of communications markets. CEG has been ranked by Global Competition Review as among the leading economic consultancies globally.

3. The TRAI recognises that efficient interconnection arrangements are important to promote network investment, competition and the supply of innovative and attractive services. As the TRAI is contemplating further regulation of interconnection charges, it should ensure that such regulation is designed to maximise benefits and avoid unnecessarily imposing costs. Any regulatory obligation imposed should be proportionate to the problem such as to limit the risk of excessing pricing and should avoid unnecessarily restricting the flexibility of operators to deal with potentially harmful risks such as inefficient arbitrage and SPAM.

4. In relation to SMS termination charges in particular, we note that most international regulators have decided that SMS termination charges **should not** be regulated. In particular, the commercial supply of SMS services has been successful with growing service volumes and the level of charges has not been identified as a significant barrier to usage. SMS has also contributed to operators' overall cost recovery which is critical for ongoing investment in the sector. As SMS services are generally exchanged between two mobile operators, there has also not been the argument made by fixed operators in relation to the level of mobile voice termination charges that it distorts competition between fixed and mobile operators.

5. One specific concern in relation to SMS termination charges is the need to avoid customers being subjected to unwanted SMS messages (SPAM). This both directly imposes annoyance costs on customers as well as risking behavioural responses such as customers turning their phones off which can degrade the overall utility of their mobile service. Further, if operators are forced to carry SMS messages to their customers at a price below the cost of termination then they can also risk having large costs imposed upon them by SPAM messages – such costs can lead to higher prices for other mobile services as these would then have to cross-subsidise the cost of the SMS service. Ensuring that SMS termination charges cover the cost of SMS termination is an important means of limiting SPAM messages.

6. A focus of our report is on the international experience in relation to SMS termination. We note that a variety of interconnection arrangements exist for SMS services. In countries

where SMS terminations are not regulated there is generally a positive charge between operators, though operators would have the option to negotiate a zero charge (Bill and Keep arrangement) if that were commercially sensible for both operators and where traffic exchanged between the operators remains reasonably balanced.

7. SMS termination charges are regulated in a number of countries. **Our research could find no country where regulators set a zero charge for SMS termination.** In most countries that regulate SMS termination, charges are generally set in line with some measure of costs.

8. Our research found that for countries where SMS is regulated the average termination charge for 2010/2011 was Rs0.51 and the average termination charge in all countries where a positive termination charge was identified was Rs1.56.

2. Efficient pricing principles and SMS interconnection

9. This section provides an overview of efficient pricing principles of interconnection and examines their specific application to SMS interconnection.

10. Interconnection regulation, as with regulation generally, should only be imposed where there is clear evidence of a market failure and where that regulation is expected to bring greater benefits than costs. This recognises that regulatory intervention is always risky and if the wrong regulatory settings are applied investment can be harmed and the development of services hindered.

11. In many cases, interconnection arrangements work well with no regulatory intervention. For instance, today's Internet has developed with limited regulation. The interconnection arrangements underlying the Internet include Bill and Keep between Internet backbone operators where traffic is roughly balanced and receiving network party pays where traffic is imbalanced. Various charging arrangements apply as between interconnection at different levels.[61] In a number of countries such as the US, interconnection between two mobile operators is also unregulated.

12. The European regulatory regime for electronic communications provides an example of a robust approach to determining where regulation is appropriate and where it is not required. First, European regulators must assess the level of competition in relation to specific communications markets. Second, where competition is shown to be ineffective and an operator is found to have significant market power, proportionate regulatory obligations can be imposed. These regulatory obligations can include a requirement to provide access to the operator's services, the imposition of non-discriminatory obligations and the requirement for access prices to be cost reflective. It should be noted that any regulatory obligation that is imposed is required to be specifically justified. This recognises that such obligations can carry costs as well as benefits.[62]

13. It should be noted that the European Commission declined to identify SMS termination as one of the markets that it believes was susceptible for ex ante regulation. The European Commission appeared to believe that in negotiating SMS termination rates between each other, operators could have sufficiently equal bargaining power as to keep rates from being set at inefficient levels. In particular, the European Commission commented:

> *"The decisions of some national appeals bodies have highlighted the potential bargaining that may occur due to countervailing buyer power. Whilst not stating that the*

[61] The arrangements underlying the Internet are discussed in the Economic Study on IP Interworking, 2007, a report prepared by CEG and Gilbert and Tobin for the GSM Association.

[62] For example, even a non-discriminatory obligation can be harmful to consumers if it prevents firms from offering price discounts. Firms may find it too costly to reduce all prices at once and allowing for some price discounts may actually help drive a greater overall level of price competition so that all consumers are better off over time than would be the case under non-discrimination obligations. As such, non-discrimination obligations should be limited to only cases where there would otherwise be significant harm to competition such as where a fixed incumbent operator might favour its own retail operations.

level of termination rates is the result of a bargaining process, these decisions point to the need to fully examine the issue of countervailing buyer power on a case-by-case basis when analysing the existence of SMP on this market [i.e. the market for SMS termination]."[63]

14. In most countries where SMS interconnection charges are regulated, they are set in line with a measure of costs. Cost-based charges generally provide efficient signals for the use of services as customers will then only acquire the service where they value it by at least the value, i.e. the cost, of the resources used in supplying the service. Cost-based charges also promote efficient investment as operators are able to recover their network investments required for service provision.

15. In principle, adjustments to cost based charging will sometimes be justified where the supply of a service gives rise to externalities. For example, the UK regulator allowed a mark-up over voice termination charges for the network externality during the period when the UK mobile penetration was still growing.[64] In particular, by allowing a mark-up of termination, regulators can achieve slightly lower mobile retail prices which helps to expand the overall number of subscribers to the benefit of both those new subscribers and existing customers across the telecommunications sector can now communicate with the new subscribers on their mobile phones.

16. A different form of externality is the call externality which is the benefit to people receiving calls as a result of the decision of the other customer to call them. Generally, regulators have not considered that the call externality is relevant to price setting because it is likely to already be internalised by customers exchanging calls between themselves.[65]

17. An alternative to cost-based interconnection is Bill and Keep in which each operator bills their own customers and do not levy any termination charge on each other. It should be noted that when Bill and Keep arrangements are implemented commercially they generally require that traffic between operators is roughly balanced as we have discussed in relation to Bill and Keep for Internet backbone interconnection. Where there is the provision for charges to be levied where significant traffic imbalances exist then the interconnection arrangement is essentially a cost-based one and that it is only the fact of balanced traffic that means that no actual payments might be required.

18. We are unaware of any regulator having imposed Bill and Keep.[66] If Bill and Keep were to be imposed by regulation and to apply even where traffic was not balanced then this

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63 Commission Staff Working Document, Explanatory note accompanying the Commission Recommendation on Relevant Product and Services Markets, 2007, p.44.

64 See Ofcom, Wholesale mobile voice call termination – Statement, 1 June 2004, Annex D.

65 See, for instance, New Zealand Commerce Commission, Standard terms determination for the designated services of the mobile termination access services (MTAS), fixed to mobile voice (FTM), mobile-to-mobile voice (MTM) and short messaging service, 5 May 2011, para. 466 and Ofcom, Mobile voice call termination statement, March 2011, Annex 3, footnote 147.

66 The European Commission made a similar finding in its Commission Staff Working Document accompanying the Commission Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU, 2009, p.30.

would carry significant risks to efficiency and quality of service. For example, SPAM SMS messages is a serious problem for email communication as well as being a problem in countries that have Bill and Keep for SMS messages. A report for the UK regulator found that:

> *"In general, the consumers' objections to spam in these countries [i.e. bill and keep countries] is based more on nuisance and annoyance than on having to pay for unwanted calls. It is more common to have complaints about receiving spam SMS messages that are counted towards a subscriber's monthly allocation, as has been observed recently in Canada, and also in Hong Kong."*[67]

19. The New Zealand Commerce Commission also recognised the problem of SPAM in its recent decision:

> *"while market conditions suggest that a BAK pricing principle is appropriate, in order to mitigate against the risk of SMS spam, the Commission has determined that a forward-looking cost-based price for SMS termination is appropriate."*[68]

20. We note that the TRAI's Consultation Paper argues that "One way of resolving this problem is to prescribe a deterrent termination charge for commercial SMS and Bill and Keep for all other types of SMS." One concern with such an approach is that it may be undermined by arbitrage. In particular, SPAM providers may direct messages via another operator to try to take advantage of the zero rates for termination available for operator-to-operator interconnection. Thus, the solution could actually end up with both the problem of SPAM messages as well as the inefficiency of messages being routed via multiple operators. It is noteworthy that the European Commission commented generally on Bill and Keep that:

> "*Nevertheless, one should note that setting the price of any service at zero may cause distortionary behaviour, bring arbitrage opportunities, lead to inefficient traffic routing and inefficient network utilisation. For instance, a potentially problematic issue might be inefficient routing of traffic from operators not participating in the Bill and Keep scheme."*[69]

21. The problem of SPAM could be avoided by enabling operators to have Bill and Keep arrangements between themselves but to be able to charge where traffic is unbalanced as would arise if one operator were sending significant volumes of SPAM messages to another operator.

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[67] Analysys, *Case studies of mobile termination regimes in Canada, Hong Kong, Singapore and the USA*, 2008, p.5.

[68] New Zealand Commerce Commission, Standard terms determination for the designated services of the mobile termination access services (MTAS), fixed to mobile voice (FTM), mobile-to-mobile voice (MTM) and short messaging service, 5 May 2011, p.iv.

[69] The European Commission made a similar finding in its Commission Staff Working Document accompanying the Commission Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU, 2009, p.30.

22. In summary, we believe that regulation of interconnection should only be imposed in the event of demonstrable market failure and that, where regulation of interconnection charges is imposed, it should generally be at cost based levels with an additional mark-up being allowed where they would have fund the expansion of mobile ownership. The regulatory imposition of Bill and Keep carries potentially large inefficiencies from charges not being set in line with costs and from the risk of leading to a significant increase in SPAM messages.

3. International experience

23. Around the world there are a variety of approaches to setting SMS termination charge. The approaches can however be simply summarised by the following two characteristics:

    i. Whether or not the charge are set by the regulator or commercially agreed between operators; and

    ii. Whether a positive charge is levied between operators or a bill-and-keep (BAK) arrangement applies (ie, there is a zero charge between operators)[70].

24. In most countries SMS termination charges are commercially negotiated between operators. In most of those jurisdictions the SMS termination charge is agreed to be a positive amount per SMS. However, in other countries operators have commercially agreed a BAK arrangement although such an arrangement generally requires traffic between operators to be roughly in balance.

25. In a smaller number of countries the regulator sets the SMS termination charge. However, in our research to date, **we have not found any country that regulates SMS termination charges at zero, i.e. bill and keep**.

26. The following table provides a matrix of results from our research that simply classifies each country according to the key characteristics discussed above.

[70] Sometimes referred to as sender keeps all (SKA).

Table 8: Matrix of key features of SMS termination charges

	Zero charge or BAK	Positive charge
Commercially agreed	Canada Pakistan USA (for direct interconnection between mobile operators[71])	Australia Egypt Germany Greece Hong Kong Ireland Italy Netherlands Norway Portugal South Africa Spain Sweden United Kingdom
Set by regulator		Bahrain Denmark France Israel Kenya New Zealand Malaysia Poland

Note: Sources are shown in Table 3 below

27. The TRAI has provided a summary of interconnection charging regimes in a number of jurisdictions on page 69 of the Consultation Paper. Our research has identified a number of errors in the summary provided by the TRAI. We also note that the TRAI's summary has missing elements marked with a dash (-) that makes the conclusions ambiguous.

28. The following table is a 'corrected' and more complete version of the summary provided by the TRAI. We note that following our research there remains a small number of gaps in our understanding of the SMS termination charging arrangements in Brazil, China and Korea.

[71] A termination charge is sometimes levied for indirect interconnection (http://themicc.org/wp-content/uploads/2011/03/FCC-Ex-Parte-Sprint-Hike.pdf).

Table 9: TRAI interconnection usage table

Country	MTC/FTC Regulated	Approach	Costing Methodology	Retail charging method	SMS termination charge
Australia	Yes	Cost based/cost oriented	TSLRIC+	CPP	Commercially negotiated
Brazil	Yes	Cost based	FAC/LRIC	CPP	[unknown]
Canada	MNOs not regulated/FTC regulated	Cost based for FTC	IC for FTC	RPP	Commercially negotiated
China	Yes	Cost based	[unknown]	RPP	[unknown]
Egypt	Yes	Retail price linked	65% of on-net revenue per minute	CPP	Commercially negotiated
France	Yes	Cost based	LRIC	CPP	Regulated price cap
Germany	Yes	Cost based	LRIC+	CPP	Commercially negotiated
Hong Kong	FTM unregulated/MTM no charge	Commercially negotiated/Bill and Keep	Negotiated	RPP	Commercially negotiated
Italy	Yes	Cost based	LRIC+	CPP	Commercially negotiated
Korea	Yes	Cost based	LRIC+	CPP	[unknown]
Malaysia	Yes	Cost based/Cost oriented	LRIC+	CPP	Regulated LRIC+
Pakistan	Yes	Cost based/Cost oriented	FAC	CPP	(Termination charge proposed following regulator's consultation)
South Africa	Yes	Cost based	LRIC+	CPP	Commercially negotiated
UK	Yes	Cost based	LRIC	CPP	Not regulated /Commercially negotiated
USA	Yes, except M2M	Reciprocal/M2M commercially negotiated	Telric/B&K	RPP	Commercially negotiated

Notes: Highlighted table entries are differences to the Table on p.69 of TRAI's consultation paper. The sources for the last column are shown in Table 3. The sources for the other differences are: Analysys, Case studies of mobile termination regimes in Canada, Hong Kong, Singapore and the USA, 2008; ITU Regulatory Issues – Interconnection with Mobile Networks; and Vodafone's Annual Report 2010 – Regulation.

29. In our research we have found information on a number of additional countries to those surveyed by the TRAI. In some of those additional countries SMS termination charges are regulated, generally based on some form of cost-based approach.

Table 10: Detail of SMS termination charge setting

Jurisdiction	Regulated or commercially neg.	Basis on which rates are set	Summary of regulatory decision
Jurisdictions surveyed by TRAI			
Australia	Commercially negotiated	Positive charge	ACCC, Mobile Services Review, 2004
Brazil	[Unknown]	[Unknown]	[Unknown]
Canada	Commercially negotiated	BAK	
Egypt	Commercially negotiated	Positive charge	
France	Regulated	Cost based	Decision No. 2010-0892
Germany	Commercially negotiated	Positive charge	
Hong Kong	Commercially negotiated	Positive charge	
Italy	Commercially negotiated	Positive charge	
Korea	[unknown]	[Unknown]	[Unknown]
Malaysia	Regulated	LRIC	A report on Public Inquiry – Access Pricing (2005)
Pakistan	Commercially negotiated	BAK	2009-2010 Annual Report
South Africa	Commercially negotiated	Positive charge	Call Termination Regulation (2010)
United Kingdom	Commercially negotiated	Positive charge	Wholesale SMS termination review (2006)
USA	Commercially negotiated	BAK	
Additional jurisdictions surveyed by CEG			
Bahrain	Commercially negotiated, except dominant provider	Benchmark	The Regulation of Mobile Termination Services - Position Paper (2010)
Denmark	Regulated	LRAIC	Final decisions for wholesale termination of SMS (2010)
Greece	Commercially negotiated	Positive charge	
Ireland	Commercially negotiated	Positive charge	
Israel	Regulated	Price Control	Ministry of Communications to Reduce Mobile Termination Rates (2010)
Kenya	Regulated	Glide path to Pure LRIC	SMS interconnection termination rates determination (2010)
Netherlands	Commercially negotiated	Positive charge	
New Zealand	Regulated	Benchmark of forward looking cost-based prices	Determination for MTAS FTM, MTM and SMS (2011)
Norway	Commercially negotiated	Positive charge	
Poland	Regulated	Price control	Final decision on SMS regulation (2010)
Portugal	Commercially negotiated	Positive charge	
Spain	Commercially negotiated	Positive charge	
Sweden	Commercially negotiated	Positive charge	
Switzerland	Commercially negotiated	Positive charge	

Source: CEG research

30. The following table summarises the levels of mobile voice and SMS termination rates where known. Our research found that for countries where SMS is regulated the average termination charge for 2010/2011 was 0.51 paisa and the average termination charge in all countries where a positive termination charge was identified was 1.56 paisa.

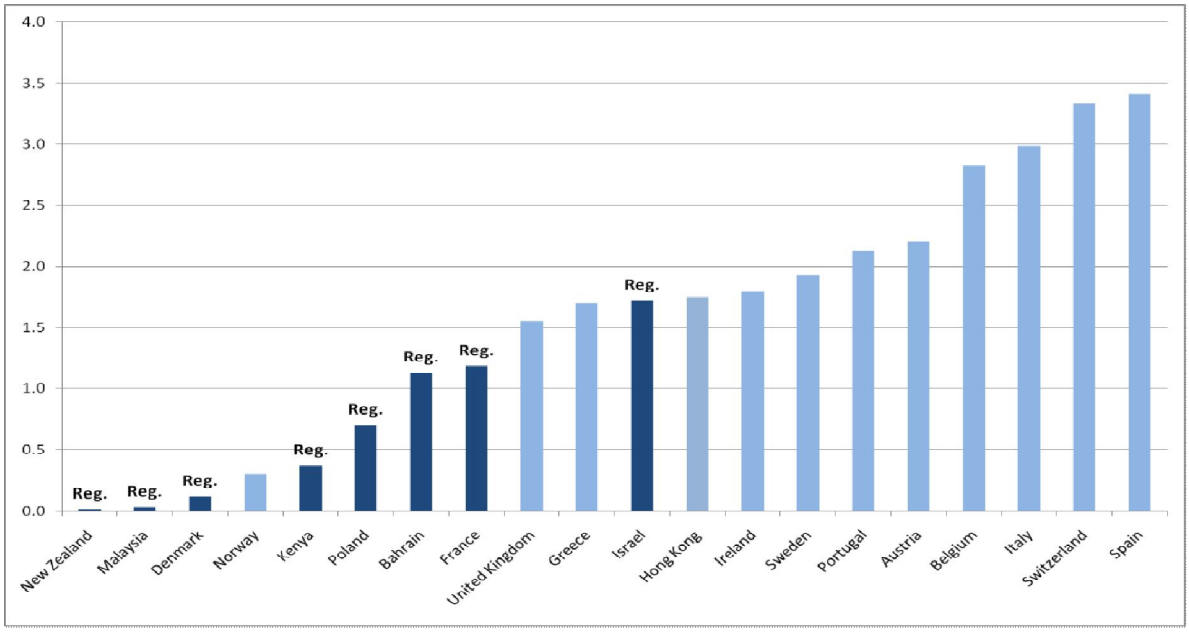
Table 11: Voice and SMS termination charges

Jurisdiction	Currency	Mobile voice termination (local)	Mobile voice termination charge (IND)	SMS termination (local)	SMS termination charge (IND)
Australia	AUD	0.09	3.05		
Austria	EUR	0.0251+	1.43	0.388*	2.20
Bahrain	BHD			0.0094*	1.13
Belgium	EUR	0.0251+	1.43	0.0496*	2.82
Brazil	USD	0.21	9.55		
Canada	CAD				
Denmark	DKK	0.44	3.35	0.016	0.12
Egypt	EGP	10.0	81.50		
France	EUR	0.0264	1.50	0.02085*	1.18
Germany	EUR	0.033	1.88		
Greece	EUR	0.0495+	2.81	0.03*	1.70
Hong Kong	HKD	0.15	0.88	0.3	1.75
Hungary	HUF	11.8600+	2.62		
Ireland	EUR	0.027	1.53	0.0317*	1.80
Israel	ILS	0.0687	0.74	0.16	1.72
Italy	EUR	0.028	1.59	0.0525*	2.98
Kenya	KES	2.21	1.36	0.6	0.37
Korea	KRW				
Malaysia	MYR	0.0877	1.11	0.0027	0.03
Netherlands	EUR	0.0240+	1.36		
New Zealand	NZD	0.0748	2.18	0.0006	0.02
Norway	NOK	0.4667+	3.28	0.0435*	0.31
Poland	PLN	0.0966	1.36	0.05	0.70
Portugal	EUR	0.04	2.27	0.0375*	2.13
Slovenia	EUR	0.0513+	2.91		
South Africa	ZAR	0.69	4.14		
Spain	EUR	0.0400+	2.27	0.06*	3.41
Sweden	SEK	0.2600+	1.57	0.0319*	1.93
Switzerland	EUR			0.0551*	3.33
Tanzania	USD	0.0732+	3.33		
United Kingdom	GBP	0.0526	4.11	0.0199*	1.55
USA	USD	0.01	0.45		
Average			5.20		1.56 (0.51*)

** Sourced from Cullen International March 2011 Update on SMS termination rates*
\+ Rates current at 30 September 2010 and converted to rupees based on average exchange rates over 10 years.

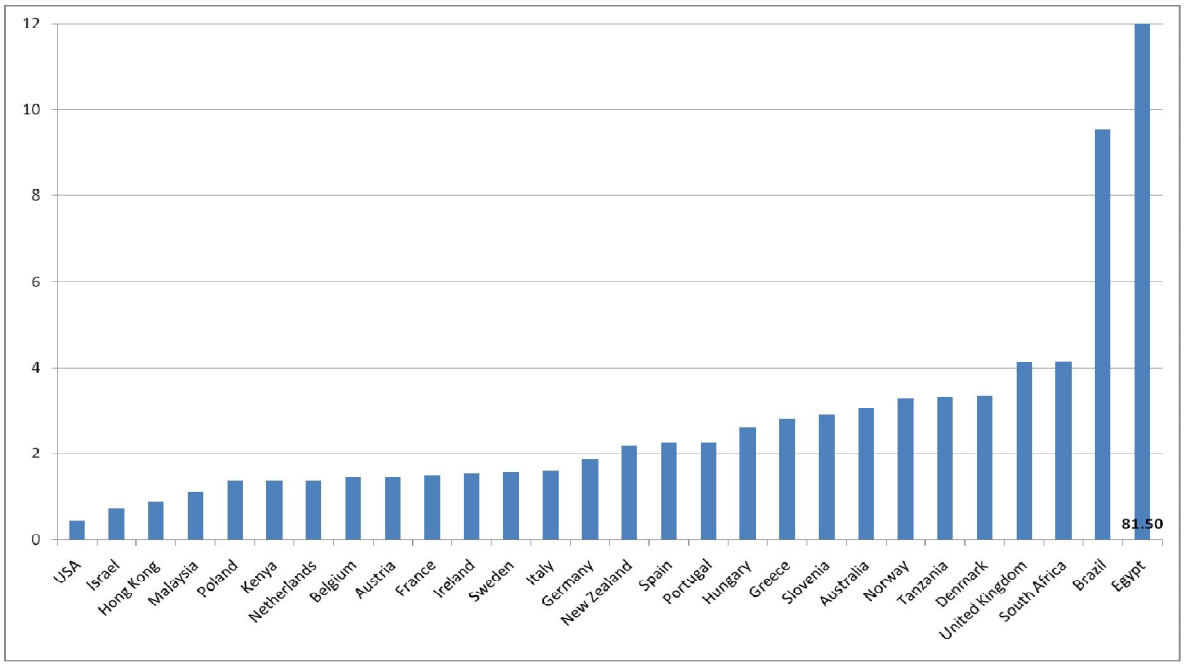
31. The data in the preceding table are summarised in the following figures.

Figure 1: SMS termination rates (Re)



Notes: Dark bars obtained from regulators websites, light bars from Cullen International. All rates are current as at 2010/2011, converted at market exchange rates averaged across 10 years to 11 May 2011.

Figure 2: Mobile voice termination rates (Re)



Notes: Rates obtained from regulators websites and from Vodafone. Rates are based on current prices, converted at market exchange rates averaged across 10 years to 11 May 2011.