ERG public consultation on a draft Common Position on symmetry of mobile/fixed call termination rates

Submission by Vodafone

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Contents

1. Executive Summary

Greater harmonisation of approaches in setting Mobile Termination Rates is a proper and welcome objective for the ERG. A common set of objectives, techniques and models are now available to all NRAs to deal with the issues in a consistent manner. This does not mean that the outputs will be the same, just that any differences will be treated consistently.

The key objective of the ERG must be to set rates based on the efficient forward looking network costs. This will result in termination rate symmetry between competing mobile operators in the same national market, and will allow price caps to be set for 4-5 years at a time. This will set the right incentives for operators, increase certainty for investors and reduce the overall burden of regulation on both operators and NRAs. The ERG should set itself the target under which all members set rates for the period 1 January 2010 to 1 January 2015, and eliminate remaining asymmetries by December 2010 at the latest.[1]

The ERG paper considers the arguments made for perpetuating asymmetries in termination rates between mobile operators within the same national markets. Vodafone shows that:

- frequency –related cost differences only apply in a very small number of markets where firms do not have access to 900 MHz spectrum. Even in those cases the differences exhaust at 3-4 million minutes per base station site, a level which has already been passed in most European markets today;

- any remaining frequency related differences should end with the introduction of spectrum trading from 2010;

- scale-related differences exhaust at less than 8 million subscribers in large European countries (and lower in smaller countries) – a threshold which has been easily passed by the 'small' operators in Germany, Italy, France and Spain. Operators with national roaming agreements have a lower threshold (i.e. can benefit from economies of scale at a lower market share);

- asymmetries for 'late entrants' are entirely subjective and have no justification at all. Worse, they discourage later entrants from growing;

- asymmetries cannot be remedy for on-net/off-net differentials between large and small networks, since they make the differentials larger not smaller;

- the ERG needs to be clear that on-net pricing should only be the basis for intervention if it is anti-competitive. The ERG has already rightly concluded that this is a matter of *ex poste* investigation, not something to be addressed by *ex ante* rules in termination rate setting;

- overall, the ERG should commit to the elimination of all existing MTR asymmetries by December 2010.

A consistent approach is also needed in the treatment of fixed and mobile networks. The principle that people who cause costs should generally be required to meet them is a good one. But costs are caused in different ways in mobile and fixed networks because more of the mobile network is shared amongst users whilst more of the fixed network is dedicated to individual users. That means that costs should be recovered differently. Trying to 'force' symmetry between fundamentally different

[1] New entrants might require additional provisions, but all asymmetries that remain in January 2008 should be eliminated by December 2010.

networks would produce perverse outcomes, with costly mobile services being under-priced and over-congested as a result.

2. Symmetry

2.1 The ERG must first agree common objectives

Without common objectives amongst NRAs when setting Mobile Termination Rates (MTRs),[2] there will be no prospect of harmonisation in Europe. The first objective of price regulation such as is applied to MTRs must be to encourage efficient entry and investment by efficient operators and, in so doing, to 'replicate' the competitive process in which all firms are price takers. The only costs that are relevant are those of an efficient operator – normally neither the market leader nor the laggard. In competitive markets, new entrants must set their prices to compete with the established firms if they are to win customers - even if their own costs are higher in the short run. The actual costs incurred by operators are therefore relevant only insofar as they help inform the likely level of efficient costs.[3]

Professor Valletti explains:

> *It is generally recognised that price controls need to be related to the costs achievable by efficient companies, not to the costs actually incurred by a company, regardless of efficiency. If the price controls on the termination charges are instead set to reflect the actual costs of each company, this will not provide the right incentives. A policy of setting asymmetric price controls in this way is likely to be to the detriment of customers in the longer term. Less efficient firms will have no incentives to become efficient. This is because they will see no need to innovate and become even more efficient. Since there will be less innovation in the cost-reducing activities, prices to customers which are expected to reflect costs in the industry will not move down quickly. The ultimate losers will be customers as a whole.*[4]

The common position that the ERG seeks must adhere to these principles. In practice, this means:

- termination rates must send the right economic signals for efficient use of the network. They must reflect the genuine incremental cost of network usage caused by terminating calls – no more *but no less either*;
- termination rates must be forward-looking not backward-looking. Today 11 NRA's still use top-down accounting data as the main tool for setting MTRs in the implied belief that the purpose of rate setting is to allow recovery of costs rather than the setting of efficient targets;
- termination rates must encourage companies that take appropriate innovation risk in new services or new network technologies such as 3G. An efficient operator will be

[2] The same applies to fixed termination rates.

[3] It can be presumed that, apart from differences in scale, mobile operators will indeed have achieved an efficient cost base, through the process of competition in outgoing services. Therefore, modelling an efficient cost base essentially requires modelling an operator with an "average" market share (e.g. 25% in a 4-operator market). This is an important point since it follows that a bottom-up cost model can legitimately be reconciled to certain elements of an operator's actual costs without compromising the efficiency objective.

[4] Valletti, T. "Asymmetric regulation of mobile termination rates", Imperial College London and University of Rome, December, 2006. See page 3.

one that introduces the best new technology for the whole scope of services that are demanded by consumers and not just the regulated services. It needs to receive a rate of return appropriate to the risk it has taken, and to have transitional costs taken into account. As Professor David Newbery explains:

> *Without a measured approach, regulators run the risk of creating an environment of asymmetric regulatory risk or bias, where successful commercial services are regulated at cost-orientated prices and unsuccessful commercial services ignored. This could seriously lower the expected return to uncertain innovations, to the point that they may be discouraged.*[5]

- price caps should maximise incentives for efficiency and minimise uncertainty and price shocks by fixing rates or rate glidepaths over a reasonably long period of time (e.g. 4-5 years). The certainty provided by setting forward looking rates benefits operators contemplating future investment and also ultimately consumers through the smoothing of any adjustments and the avoidance of 'rate shock' on changes that need to be made to outgoing mobile prices in response to changes in the MTR through the waterbed effect[6] .

Finally, the policy and economic rationale of a price control remedy applies equally to all operators in a national market – a logical consequence of the ERG's "single network monopoly" for call termination. Whilst this point is acknowledged by most NRAs, around one quarter of the NRAs responding to the ERG's survey did not impose price caps on all mobile network operators in their national market. The ERG should agree that where price controls are used, they must apply to all operators in the market since all should be set the same targets in terms of efficiency.

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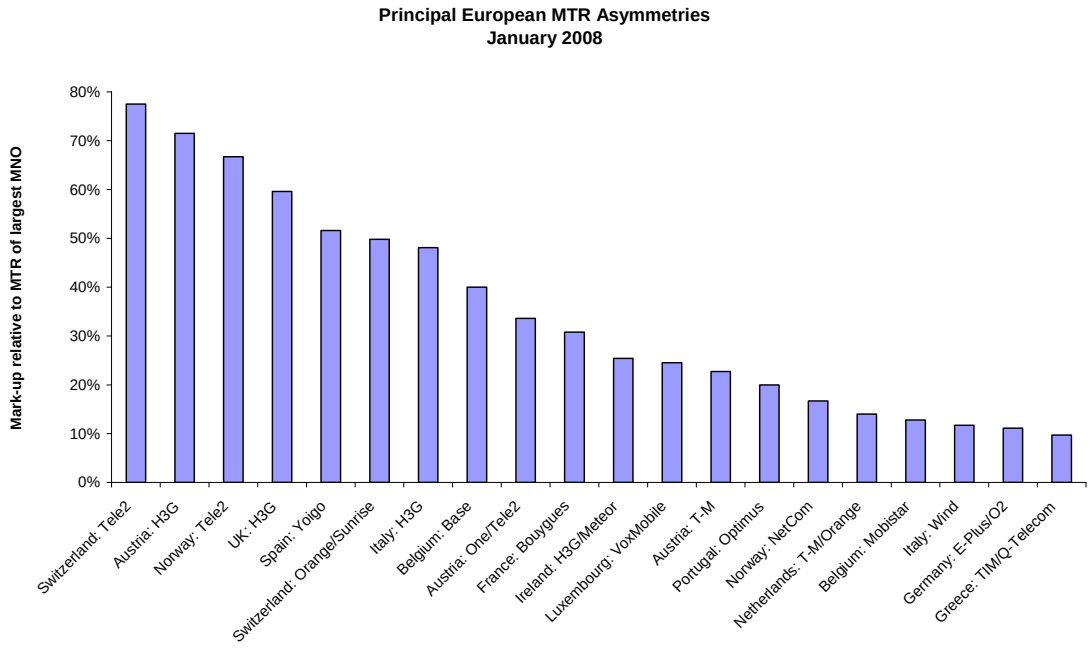
[5] David Newbery "Regulating technically dynamic industries: the case of 3G call termination**",** Department of Applied Economics, Cambridge University, October 2004.

[6] Vodafone has recently published new research on the waterbed effect, empirically verifying its existence – see, for example, Genakos, C and Valletti, T. "Testing the 'waterbed' effect in mobile telephony", Vodafone Policy Paper Series, Number 7, 2007.

2.2 *Symmetry of mobile termination rates*

Many smaller operators continue to benefit from very large asymmetries in Europe:

Chart 1:



Most of the NRAs concerned in setting the above rates regard asymmetric MTRs as a necessary – often temporary – evil. It is accepted that asymmetric MTRs distort competition – indeed they are intended to do so in order to 'compensate' for competitive disadvantages which small operators or recent entrants are otherwise claimed to face. If asymmetric MTRs had no impact upon competition then it is hard to see why NRAs would use them. But it is also claimed that the benefits arising from these asymmetries – in the form of increased competition provided by smaller network operators or new entrant who might otherwise exit the market – justify the intervention[7].

Professor Valletti explains the consequences of the intervention:

> *The less efficient operators would not only get their higher costs covered, they would pass on these higher costs to the other mobile operators who needed to terminate calls with their subscribers. Consequently, the costs of the more efficient operators would be improperly increased. In parallel, the costs of the less efficient operators would be reduced by the lower termination charges of the more efficient operators. These differentials in costs would in turn impact on prices to subscribers. This would further distort the pattern of competition between mobile operators, creating a vicious circle. Not only would the less efficient operators be protected against their lower efficiency, they would actually gain relative to the other more efficient operators.*
>
> *The asymmetric regulation of the larger networks, requiring them alone to reduce termination charges and inducing the smaller networks to set higher termination charges, therefore tends*

[7] This is considered in detailed modelling of authors such as Peitz (2005), who points to the fact that although asymmetric termination rates may encourage market entry, they result in a net loss of economic welfare and reduce investment incentives for the established firm. See Peitz, M. "Asymmetric regulation of access and price discrimination in telecommunications", International University in Germany, School of Business Administration, Working Paper 28/2005, January 2005. See Figure 3 in relation to economic welfare.

to distort the process of competition. No operator, ceteris paribus, will ever want to become bigger than the rivals, if by becoming big one ends up being penalised relative to the rivals. In a similar setting, competition for the market becomes muted, and prices to end users are higher.[8]

Valletti makes the important point that asymmetric MTRs do not encourage any of the operators to compete for market share. Smaller operators risk losing their subsidy if they grow, whilst large operators are penalised by NRAs for their scale. This should be sufficient to make the ERG very sceptical of asymmetric MTRs as a remedy, and suggests that once they are introduced they are unlikely to change competitive conditions in such a way as to facilitate their removal. A deliberate change in policy will be required to address this problem once it arises. The ERG Common Position is a welcome and important step in doing so.

The scale and the nature of the distortions created by asymmetric MTRs cause their advocates to recognise that some kind of 'objective' justification must be advanced in their support. The ERG paper considers the factors that are commonly used to justify asymmetries. Some of these – such as the 'recent entry' of firms are clearly without foundation today and have forced advocates to turn to more ingenious and complex justifications, such as the relationship between MTRs and on-net pricing differentials, and the relationship between on-net pricing differentials and competition between networks. Complexity does not make their arguments any more persuasive. We now consider each of these in turn:

Justification 1: Spectrum differences

Vodafone accepts that regulated MTRs should reflect unavoidable cost differences between networks. It is often argued that this should include the consequences of assignments of different ranges of the radio spectrum (e.g. 900MHz vs. 1800MHz). This is the case in a comparatively small number of European markets.[9] In most, MNOs have similar holdings of spectrum and so this issue simply does not arise at all.

At the most extreme level, these differences should never exceed 40%.[10] As shown in Chart 1, many countries still have significant asymmetries (above 40%) that appear totally unrelated to underlying efficient scale costs [how many of these don't have 900 in the first place?]. These should be removed immediately.

As traffic grows over the network, cost differences due to spectrum assignments reduce sharply. Increasingly cell splits due to growing mobile network traffic volumes mean a higher proportion of sites are capacity constrained (with correspondingly fewer coverage sites), and there is less effective cost difference between 900MHz and 1800MHz networks. In Vodafone's experience, cost differences between 900MHz and 1800MHz networks become minimal once traffic levels reach 3-4 million minutes per annum per base station site averaged across the whole network. Once this

[8] Valletti, T. "Asymmetric regulation of mobile termination rates", Imperial College London and University of Rome, December, 2006. See page 3.

[9] For example, in Ireland, Portugal and Switzerland, smaller operators benefit from asymmetric MTRs despite having access to 900MHz spectrum.

[10] For example, typical calculations using the Okumura and Hata models show that cell radii of 1800MHz networks are 40% less than those of 900MHz networks in urban environments, reducing to 25% less in open space rural areas. It is the latter figure that is relevant since urban cells will be capacity constrained. Therefore, cell coverage of 1800MHz networks in rural areas will be reduced by 44%, and RAN costs could consequently be 78% higher. Assuming RAN costs are half of total costs, 1800MHz networks could have an absolute maximum cost disadvantage of 39%, assuming no cells are capacity constrained (an extreme and unrealistic assumption).

threshold is reached, the proportion of capacity constrained cells dominates the overall network cost base. This is probably the case for most operators in European countries today.[11]

With the introduction of spectrum trading in Europe from around 2010 there will be no unavoidable cost implication of being initially granted only 1800MHz spectrum. All operators can obtain 900MHz by trading at market prices reflecting the true economic cost of the spectrum. Similarly, differences in costs between 900MHz and 1800MHz networks will be off-set by the corresponding differences in the valuation of the spectrum owned by the respective networks. Therefore, from 2010, asymmetries resulting from spectrum differences have no justification.

Similarly, spectrum trading means there is no longer a case for MTR asymmetries within a market according to how much individual operators paid. In practise, the historical amounts paid by most MNOs for 2G spectrum within the same markets was similar, and where differences exist can be explained by the cost of other obligations associated with the award (e.g. in the Netherlands the initial 2G spectrum was awarded at zero cost, but network operators had to invest in early network roll-out).

In summary, the case for asymmetries based on 900MHz vs 1800MHz spectrum assignment differences has become weaker and weaker over time:

- most European networks now average in excess of 3-4 million minutes per base station site, at which point frequency-related differences are eliminated;
- spectrum trading will further undermine the rationale for frequency-related differences from 2010.

Justification 2: Economies of Scale

Networks with a lower market share, even if efficient in all other respects, will tend to have higher unit costs than those with a larger share. It is often argued that this justifies termination rate asymmetries.

The first point to note is that this approach treats market share as a fixed variable that cannot be influenced by the operator and so creates some perverse consequences. Staying small is rewarded with subsidy, whilst growing is penalised.

Even if these perverse consequences are accepted, market share itself is no indicator of whether a network has achieved an efficient scale. In a large country, economies of scale are exhausted at lower market shares. Figure 18 of the ERG paper shows results from the ANRC's (now the ANRCTI) mobile network model indicating that in Romania, economies of scale are largely exhausted at a market share of 33%. This is equivalent to 7.8 million subscribers which, in the German market represents a share of only 8%.[12] Ignoring differences in coverage costs,[13] if economies of scale are

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11 For example, Ofcom's latest cost modelling concludes:

Ofcom's cost modelling indicates that the differences in network units costs between the two types of 2/3G operator [900/1800MHz vs. 1800MHz-only] have narrowed. The forecast unit cost difference is less than 0.3ppm in 2010/11 using economic depreciation under a medium voice and data traffic scenario.[11] Ofcom, "Mobile call termination, Statement", March 2007, paragraph 9.98.

In percentage terms, Ofcom's figures imply an 1800MHz cost uplift of less than 6%, a differential that is likely to be similar in a number of European markets with mixes of urban and sparsely populated rural and mountainous areas.

12 Calculated from Wireless Intelligence: subscribers in Romania and Germany are projected to be 23,777,613 and 97,996,315 respectively (2008 Q1).

exhausted at a 33% market share in Romania, then they are exhausted at an 8% market share in Germany. All German operators already have well in excess of this market share (O2 at 13%, and E-Plus at 15%), suggesting that this is a weak justification for any asymmetry in Germany.

The same approach applied to other major European countries gives a critical market share of 9% in Italy (substantially less than Wind's market share of 17%), 15% in France (less than Bouygues's market share of 18%), and 16% in Spain (less than Orange's market share of 22%).[14] **This again shows that differences in scale economies have already been exhausted in all of the large EC markets and that differentials which rely on this justification should be eliminated there.**

Justification 3: Late market entry

It is sometimes argued that MNOs that come late to the market are never able to gain sufficient market share without the assistance of a higher MTR. This may be for a number of non-scale related reasons, such as lack of existing brand, lack of access to the "best" transmission sites, or subscriber switching costs. Most of these barriers to entry are best addressed directly (e.g. via mandatory site sharing or portability obligations) rather than by MTR regulation. Most of these claims are subjective in nature, with no real evidence to support them.

Factors such as these are not unique to the mobile industry. New entrants in any industry need to compete against existing brands and overcome customer switching costs. Few of them get subsidies for doing so. As in any industry, a new entrant has the possibility to achieve an efficient scale of production by raising the necessary finance to incur losses in the earlier years until the barriers are overcome (or it is itself a beneficiary of them).

NRAs also need to consider "second mover advantages".[15] Late entrants in the mobile industry have advantages of moving directly to an efficient technology (e.g. larger switches), plan radio networks with a better understanding of the physical properties, access national roaming agreements rather than fully build their network and in some cases have immediate access to a better technology (e.g. WCDMA) without any legacy or migration costs. At the very least, these benefits need to be assessed and off-set any perceived "first mover advantages".

In the current context, it is clear that this justification becomes weaker by the day. Most beneficiaries of asymmetries in Europe today entered the market at least 5 years ago and NRAs have taken extensive measures to lower barriers to switching, as evidenced by high churn rates which persist throughout the sector. The only basis on which this justification could be used today would be if the ERG believed that NRAs should be targeting a particular market structure in the long term, in which all firms in the market achieve a form of competitive parity with similar market shares. This would be an extraordinary position for the ERG to take, being both one which is very unlikely to be realised in practice and one which is in any event likely to give rise to concerns about reductions rather than increases in competition overall. The ERG should explicitly reject any such objective in its Common Position and should make it clear that it is not seeking to oversee any particular market outcome. **Once it has done this, it becomes clear that subsidies for 'late entrants' based on subjective judgements have no place in today's markets.**

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[13] In theory, we would need to take account of differences in coverage before making such a comparison. However, as we pointed out above, coverage costs become less of any issue as network traffic expands, and economies of scale will be driven by total traffic alone.

[14] These critical market shares are not applicable to 3G-only networks, such as those of H3G. These networks do not provide full national (rural) coverage, but instead rely on national roaming with existing 2G networks. Therefore, they benefit from economies of scale on their host networks in rural areas, whilst being able to fully exploit their own economies of scale in urban areas.

[15] See Geroski, P. and Markides, C. "Fast Second", Wiely 2005.

Justification 4: Network effects induced by on-net pricing

Given the weakness of other arguments, it is now often suggested instead that the use of on-net pricing (particularly when on-net prices are set at a level below the MTR), confers an 'unfair' competitive advantage on larger networks. It is argued that a higher proportion of the larger network's subscriber base is able to benefit from lower on-net pricing, whilst the smaller network is unable to match the lower prices to so many subscribers because of the termination rates paid on off-net calls. A further argument is that smaller networks need to respond to on-net pricing by reducing their weighted average price (to below that of the large networks), thus stimulating a disproportionate volume of outgoing traffic and, as a consequence, suffering a net deficit in interconnection payments.

There are a number of responses to this argument.

The first is simply that asymmetric MTRs make the 'problem' worse not better, so cannot be the remedy. The ERG paper notes this on page 87. An asymmetric MTR means that other networks will be forced to increase prices for off-net calls to the network with the higher MTR, increasing the on-net/off-net differential. This will further reduce traffic volumes to the network with the high MTR and increase further any net deficit faced by the smaller network[16].

Second, the claim of unfair advantage in favour of larger networks is misplaced because it ignores incoming revenues. Even without any asymmetry in MTRs, smaller networks receive greater incoming revenue per subscriber than larger networks because a higher proportion of their calls are both made and received off-net. It is true that the smaller network incurs greater interconnection costs per subscriber, but also receives greater incoming interconnection revenues and is able to use this additional MTR revenue to either (1) offer lower on-net prices, (2) reduce monthly rentals where applicable, or (3) provide additional subscriber acquisition subsidies. Simple models, where all subscribers make equal numbers of calls proportionally to subscribers on both networks, show that networks of very different sizes are nonetheless able to offer exactly the same overall value to their subscribers. A larger network may offer on-net prices for a greater proportion of its subscribers' calls, but the smaller network is able to use its greater incoming revenue per subscriber to provide equivalent benefits to its subscribers through even lower on-net prices, or other reduced payments.

This is confirmed by the fact that we see smaller networks readily engaging in competition based on on-net pricing discounts, and in some instances may led the trend. An OVUM report for Vodafone[17] finds:

> *Where both large operators and small operators in a country offer on-net discounts, the discounts offered by the smaller operator, normally a newer entrant, are typically deeper... This is what we would expect in a competitive market.. The smallest operator carries a smaller proportion of on-net calls than the largest. So the costs of offering a given discount is less.*

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16 The draft also discussed another 'solution' to the 'on-net problem' as being setting MTRs 'at cost'. The implication in such proposals is that a regime in which MTRs are set at cost would eliminate on-net pricing differentials on the retail market. However, this is only plausible if 'cost' in this context is short run marginal cost (SRMC), since this serves as the floor for on-net pricing decisions in a competitive market. The ERG is rightly not proposing to abandon LRIC for SRMC as a pricing principle in setting termination rates – for the very good reason that it would likely bankrupt an industry which faces large and lumpy fixed costs. The confusion between the rules which should govern price setting in a competitive retail market and those which should inform the setting of regulated prices for a particular service is unhelpful but commonplace.

17 Ovum, "On-net call discounts, A Report for Vodafone", 23 September 2004. See page 7.

Again, it is very important in this context for the ERG to distinguish between competition and unfair competition. Competition from larger networks – including low prices for on-net calls – is certainly uncomfortable for smaller networks. It is intended to be - consumers benefit as a result. The question for the ERG is whether such action is actually anti-competitive and runs the risk of reducing competition in the market in the longer term. There is simply no evidence to support this claim, or to suggest that firms of the scale that we see throughout Europe today are in danger of exiting the market as a result of on-net pricing. The ERG's task is not to reduce competition in order to make life easier for particular firms – it is to safeguard the competitive process as a whole. If smaller operators believe that larger networks are engaged in anti-competitive conduct then they are able (and have shown themselves very willing) to bring a case before the relevant competition authorities. As the ERG's own "Revised Common Position on the approach to Appropriate remedies in the ECNS regulatory framework" acknowledges:

> *There is no presumption that any such on-net discounting will inevitably distort competition in this way even if it prevented particular competitors from offering the relevant package. Each case would need examination on its own merits. Nevertheless, where this was a legitimate concern, a non-discrimination obligation would be an ineffective means of dealing with it, unless complementary obligations were applied in the relevant retail market. (See page 114)*

2.3 Summary on justifications given for asymmetries

- Frequency –related cost differences only apply in a very small number of markets where firms do not have access to 900 MHz spectrum. Even in those cases the differences exhaust at 3-4 million minutes per base station site, a level which has already been passed in most European markets today;

- Any remaining frequency related differences should end with the introduction of spectrum trading from 2010;

- Scale-related differences are exhausted at less than 8 million subscribers in large European countries (and lower in smaller countries) – a threshold which has been easily passed by the 'small' operators in Germany, Italy, France and Spain. Even in larger countries, operators with national roaming agreements have lower thresholds, benefiting from economies of scale on their host network;

- Asymmetries for 'late entrants' are entirely subjective and have no justification at all. Worse, they discourage later entrants from growing;

- Asymmetries cannot be remedy for on-net/off-net differentials between large and small networks, since they make the differentials larger not smaller;

- The ERG needs to be clear that on-net pricing should only be the basis for intervention if it is anti-competitive. The ERG has already rightly concluded that this is a matter of *ex post* investigation, not something to be addressed by *ex ante* rules in termination rate setting;

- Overall, this leads Vodafone to conclude that the ERG should commit to the elimination of all existing MTR asymmetries by December 2010.

3. Fixed and mobile termination rates

The ERG paper addresses both fixed and mobile termination rates, and raises the question of whether symmetry should be sought between termination rates in the two sectors. Vodafone believes there is no case for doing so, for the reasons given below (Section 3.1). This does, however, also raise issues of how NRAs should deal with so-called fixed/mobile convergence services. This is addressed in Section 3.3.

3.1 Differences between fixed and mobile networks

Efficient termination rates must reflect the economic costs caused by the traffic from the originating network and arising from the decision of the originating caller to make the call. If callers do not face the costs of their decisions then resources will be inefficiently allocated and over- or under-consumption is likely to result. In the case of networks – as we have seen in the internet – incomplete or inappropriate pricing signals can lead to congestion and poor performance.

Applying this fundamental principle to mobile and fixed networks yields different conclusions because each requires a fundamentally different network and cost structure. This was noted in the report for the EC by Europe Economics, which states:

> *Many of the differences between mobile and fixed networks when thinking about costs arise because of the fact that mobile customers can access the network from anywhere, rather than from a dedicated point on the network. Mobile networks provide coverage.*[18]

A mobile network is essentially dimensioned by traffic volumes throughout the entire radio access network and has most of its cost driven by traffic volumes. A fixed network, on the other hand, has most of its access network costs largely independent of traffic volumes and driven by the decision of subscribers to join the fixed network. The same approach, when applied to different network cost structures, will give different answers. Both are economically correct.

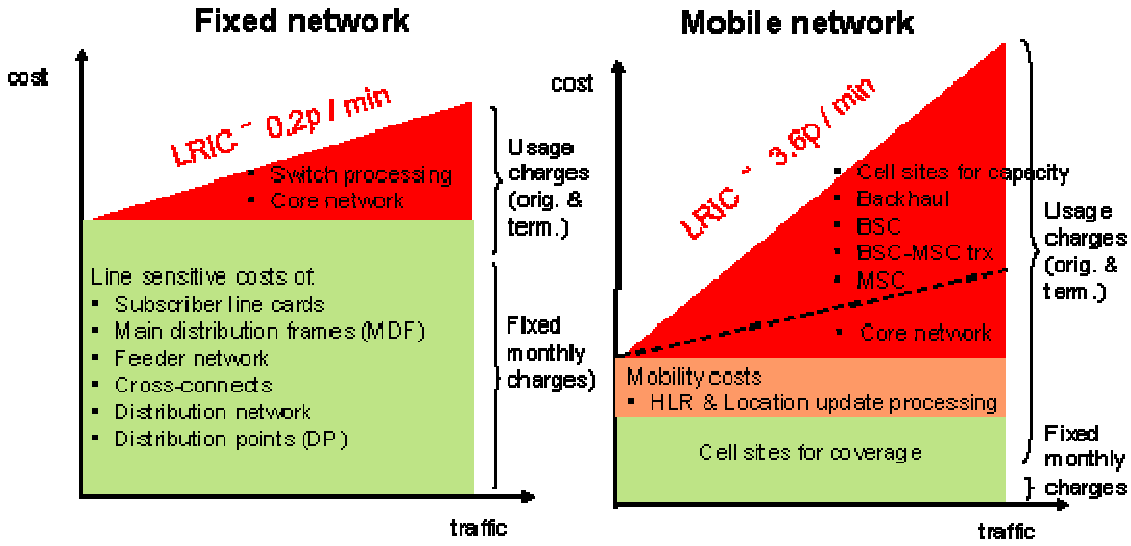
Annex 1 compares the cost structures of fixed and mobile telecommunication networks, in the context of the incremental cost for terminating traffic. The conclusions are schematically illustrated in Chart 2.

[18] See "Final Report for the European Commission by Europe Economics, Contract No. 48544, Cost Structures in Mobile Networks and their Relationship to Prices", 28 November 2001. See page ii.

Chart 2:

Network costs of interconnection for fixed and mobile networks

Long Run Incremental Costs (LRIC) differ between fixed and mobile networks



The incremental cost of terminating traffic on a mobile network (due to its requirement to be a wide area network capable of terminating a call anywhere within its geographical coverage area) will be fundamentally different (and higher) than in a fixed network. This conclusion is bourn out by every costing study of fixed and mobile networks undertaken, and consequently must be reflected in regulated termination rates. The economically efficient price must reflect this difference in costs.

Attempting to impose the same termination rate, on the other hand, will result in an incoherent difference where fixed network termination is set at cost, but MTRs are substantially below cost. This would likely lead to excessive use (and congestion) of the mobile access network, and/or underutilisation of the fixed access network.

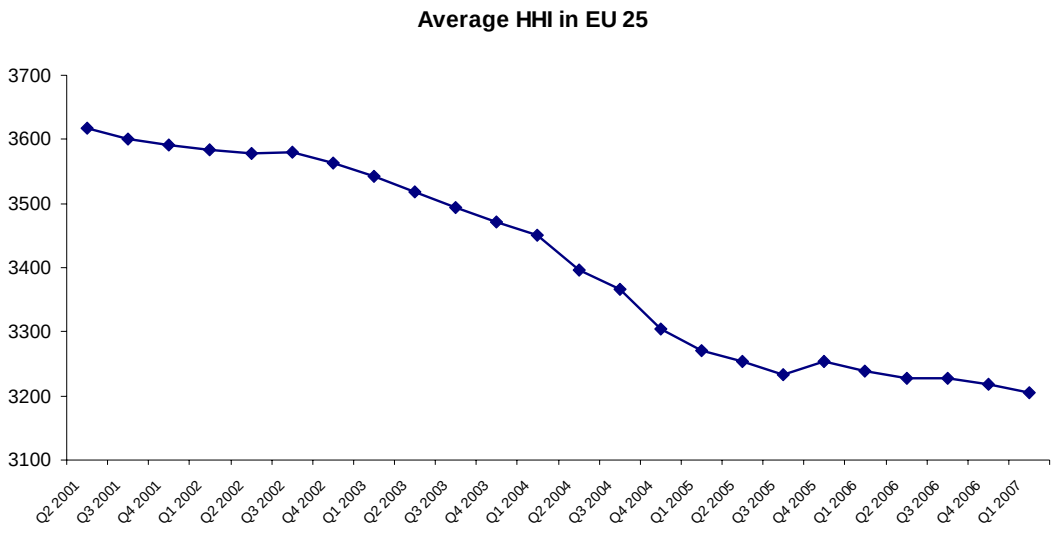
There is therefore no case for seeking symmetry between mobile and fixed networks. To do so would actually require that an inconsistent approach is taken to each.

3.2 Comparison to asymmetries in fixed network termination rates

The ERG paper suggests that the case for asymmetries is stronger in the mobile case than the fixed because, for example, of unavoidable spectrum costs differences (see page 36). Vodafone has already given its reasons for disagreeing with this. Furthermore, there are other reasons why mobile asymmetries should be lower between mobile networks. In the case of fixed networks, Table 5 of the ERG's consultation paper shows that in only 5 out of the 22 countries covered does a competitive fixed network operator have a market share of more than 10% - the highest being 17% in Romania. The average country fixed sector HHI calculated from the data of the ERG's Table 5 is 8,000. The mobile sector, by contrast, has an average HHI of around 3,100, and falling over time as competitors progressively gain more market share (see Chart 3).

If termination rates asymmetries were to be pursed at all, it seems that the case is stronger in the fixed market sector than the mobile.

Chart 3:



Source: Vodafone calculations

3.3 Fixed and mobile convergence

The ERG paper raises the issue of termination rates in the context of converged fixed and mobile networks. Both fixed and mobile network operators are providing these services, typically using wholesale agreements to provide network elements they do not possess themselves. A call dialled to a geographic number may then be terminated on either a fixed or a mobile network[19].

Vodafone does not recognise some of the concerns raised in the ERG Draft. Where converged services are provided through geographical network number ranges, these receive a fixed termination rate irrespective of the network over which they are terminated.[20] Vodafone is not aware of any cases where an MTR is received on a call to a geographic number as a consequence of the call ultimately terminating on a mobile network, nor has Vodafone ever proposed that this be the case.[21]

The ERG also raises a second issue - of *"misbalanced competition"* between fixed and mobile network operators due to differences in wholesale revenues and a risk that higher mobile termination rates may be used to 'subsidize' retail prices in the fixed telephony market. This concern would only arise if the ERG believed that the costs of providing termination services over fixed and mobile networks were the same – we have shown above that they are not – or that NRAs had failed to properly determine the costs of termination in one case and not the other. Whilst it is clear that NRAs have taken different approaches to setting price caps in the past – something which this ERG process should address directly – there is no evidence to suggest that this has not also applied in the fixed sector in the past. Again, the ERG must not confuse the growth of mobile services with a conclusion that such success must automatically arise as a result of 'unfair' or 'misbalanced' competition. Changing consumer demands and innovation are driving convergence. Whilst there is always room for anti-competitive conduct in these circumstances, it is quite wrong for the ERG to assume that this

[19] This also reflects the ERG's position on Voice over IP services where geographic numbers are to be made available more widely for nomadic services.

[20] See ERG Draft, page 25, 3rd paragraph.

[21] In cases where the call is subsequently diverted onto a mobile network - for example for wide area delivery of a call to a geographic number - it is the mobile subscriber who pays for the diversion as a consequence of the additional flexibility to receive the call outside their home or office location.

is what they are observing or that *ex ante* interventions are required to 'rebalance' (in practice distort) the competitive playing field.[22]

4. Setting industry wide MTRs

4.1 Cost Modelling

The ERG correctly notes that harmonisation of network costing will not result in the same MTR being set in each country. It will, however, lead to differences that are explainable and justifiable in economic terms. Vodafone is in a unique position to undertake a comparative analysis of mobile network costs between EU countries. Network equipment costs, for an efficient operator, should be similar in all countries, but there other sources of significant difference.[23]

Vodafone's own analyses of termination costs in its 14 EU operating companies shows an efficient cost variation (i.e. explainable directly by different national operating environments) of a factor of about two, i.e. the operating company in the lowest cost environment has an efficient cost per minute of half that of the company in the highest cost operating environment. It is interesting that the overall distribution of the cost variation is not dissimilar to the current distribution of MTRs reported in Figure 9 of the ERG paper (although the position of individual countries within this distribution is different).

Annex B gives a detailed commentary on Vodafone's views on cost modelling issues, relevant to any future ERG harmonisation proposal. Despite detailed areas of disagreement (discussed in Annex B), mobile network cost modelling has now been used to set regulated MTRs for almost 10 years. A large number of NRAs (inside and outside Europe) and consultancies now have experience of constructing such models and this experience is available to any NRA.

4.2 Externality

Socially optimal regulated prices should deviate from costs when account is taken of the network externality effect that is inherent in any two-sided market. In the UK, Ofcom has developed a robust methodology for including a network externality adjustment to MTRs, which can be implemented from market survey data. This method is based on objective market research that can be easily

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[22] Ex post intervention is the right approach here, as regulators in the UK, Spain and France have done. In the case of the UK and Spain, no anti-competitive conduct was found. See Spanish Competition Court ruling with respect to casefile nº 572/03 (22nd December 2004); and Ofcom investigation of "Suspected margin squeeze by Vodafone, 02, Orange & T-Mobile", see http://www.ofcom.org.uk/bulletins/comp_bull_index/comp_bull_ccases/closed_all/cw_615/ - case closed: 21 May 2004.

[23] In summary, the following are the most relevant factors in comparing efficient costs levels between countries:

- base station coverage and utilisation. Costs will be higher where the land mass and topography of a country requires more bases stations, and where the geographic distribution of traffic means that many coverage base stations in rural areas will be under utilised, whilst additional capacity is required in urban areas;

- locally incurred costs - principally civil engineering required for base station construction and maintenance, and central administrative staff.

replicated at low cost in any EU country – and so Vodafone would propose this approach for consideration by the ERG. There is no reason to exclude externalities *a priori* in any market and good reasons to suppose that they may be more important in some European markets than others.

Market research in a number of countries already demonstrates that a high proportion of subscribers would not be prepared to stay on the network if they were required to pay the full cost of a handset. Ofcom estimates, based on its market research, that 34% of the existing mobile subscriber base in the UK can be considered "marginal", in the sense that they would not renew their mobile handset and service if it were lost and they received no subsidy.[24] More recent market research by Vodafone in Australia suggests that this result is not unique to the UK, and Vodafone has obtained very similar results in other of its European operating companies.[25] The estimate of marginal subscribers from the UK 2006 research is the same percentage estimated four years previously, challenging claims that mobile phone ownership has become ever more 'indispensable' over time. It appears that marginal customers are a feature of mobile markets even when they are very mature.

4.3 Inter-temporal flexibility

Some NRAs require that MTRs should equal the regulated rate at all times of the day and week, whilst others allow operators the flexibility of de-averaging rates in order to achieve the most efficient utilisation of the network. The ERG's survey found that 4 NRAs specified the peak/off-peak/call set-up structure of tariffs, whilst 19 NRAs specified only average rates. It is unclear how many of the NRA's in the latter group allow MNOs to de-average the MTR by time of day or week.

Vodafone believes that the ERG could usefully make clear to all NRAs that there are significant network efficiency benefits in allowing operators the flexibility to de-average MTRs by time of day and/or week.

4.4 Sufficiency of price control as a remedy

Vodafone believes that an average price control is a necessary but also a sufficient remedy for any market failure in call termination. A number of NRAs have considered accounting separation as an additional remedy. This is usually applied to the incumbent fixed operator where it also has a mobile network operation, having significant market power across a number of retail and wholesale markets. It is, however, difficult to see how accounting separation can provide any additional regulatory or consumer benefit when applied to a stand-alone mobile operator. In the case of stand-alone mobile network operators, where market power is restricted to just one market, there can be no case for accounting separation, against which it would incur very significant implementation costs. Accounting separation is a disproportionate remedy if applied to a stand-alone mobile operator.

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[24] See "Mobile call termination", Ofcom, 27 March 2007, See Table A16.3. Ofcom assume a handset cost averaging £70 per subscriber. The precise definition of a marginal subscriber, therefore, is one that would not be prepared to pay this amount to subscribe or re-new a subscription to the mobile network.

[25] For example, see "Quantifying the Number of Marginal Subscribers in the Australian Mobile Market", a report submitted to the ACCC, available at:
www.accc.gov.au/content/item.phtml?itemId=794815&nodeId=762ce931df658dd7e0de9dda2f2030b9&fn=Vodafone%20Submission%20-%20Annex%20C%20Marginal%20Subscribers.pdf
Vodafone would be happy to provide to the ERG more details of similar surveys done in other of its European operating companies.

5. Conclusion

The principles that the ERG needs to establish in a common position on setting regulated MTRs can be summarised as follows are:

- Remedies must apply equally to all operators in a national market;
- The same regulated MTR targets (based on an efficient operator) should be applied to all MNOs in a national market, with existing asymmetries being eliminated by December 2010;
- NRAs should recognise the fundamental differences in cost structures between fixed and mobile networks and there should be no attempt to 'force' convergence;
- NRAs must make it clear that they are not seeking a particular market structure from their interventions;
- Concerns about convergence or on-net pricing must be associated with demonstrable cases of anti-competitive behaviour, not simply the fact that some operators are subject to new competitive pressures that they dislike. The ERG should make it clear that such issues are market-specific and should be subject to *ex poste* competition law enquiry, not *ex ante* rules in termination rate setting;
- The MTR should be based on a forward looking model, accurately calibrated against the actual national operating environment, with inclusion of network externality effects measured from market survey for each national market.
- Price caps are an adequate remedy – accounting separation obligations are not needed as well.
- All NRAs should aim to set a multi-year glidepath for MTRs starting with the period 1 January 2010 to 1 January 2015, providing certainty to the industry, and allowing step changes to be phased over a period of time.

Annex A: Call termination costs on fixed and mobile networks

Section A1 reviews the reasons for use of the incremental costing standard in telecommunications regulation. Sections A2 and A3 discuss the application of incremental costing to fixed and mobile networks respectively. Section A4 compares the costs of fixed and mobile networks.

A1 Incremental costing standard

Best practise interconnection cost modelling is built on the principle of "total service long run service incremental costs" (TS-LRIC), whereby all costs of the network are analysed to determine which costs are incrementally incurred (in the long run[26]) only as a result of providing each service individually.

The principal reason for this is to encourage productive and economically efficient investment in the economy as a whole. Regulated rates set below incremental costs will provide insufficient incentives for network operators to make investments in providing services that would have a net positive gain to the economy.[27] Investment that is made will be over-utilised (due to the low prices) which, in the context of telecommunications networks, means increasing levels on network congestion, but little incentive for operators to invest in additional capacity.

Conversely, regulated rates set significantly above incremental costs may encourage inefficient investment to take place (i.e. where the value to consumers and other businesses is less than the resource cost of the investment). Furthermore, the higher prices will mean that this invest is under-utilised.

Departing from long run incremental cost pricing for interconnection also has an impact on the competitive landscape between network operators. If the charge for an interconnection service is set above the TS-LRIC, interconnecting networks may find it unprofitable to provide their own services, even though they have lower underlying costs. Similarly, if the charge is set below the TS-LRIC, interconnecting networks may find it profitable to provide their services, even though they have higher underlying costs than their competitors. Interconnection charges set exactly as TS-LRIC, on the other hand, will allow competition between networks to evolve in a neutral and economically efficient manner.

However, not all costs of a network are incrementally incurred as a result of providing specific services. These remaining costs are "fixed common costs" (FCC). A network operator will need to recover its FCC as well as TS-LRIC in order to achieve a profit. It is, therefore, usual practise for regulators to set interconnection charges at a level of TS-LRIC plus a mark-up to recover an appropriate proportion of FCC, effectively spreading the FCC across all services provided by the network. A form of FCC mark-up often used by regulators is the Equi-Proportional Mark-up (EPMU), in which the mark-up is calculated so as to be an equal percentage applied to all services. Elsewhere in this submission we discuss whether departure from the EPMU rule may be appropriate for voice and data services. However, in the interests of the clarity of this annex we assume that the EPMU rule will be used,

We next describe how this costing principle applies to each of fixed and mobile networks in turn.

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[26] In this context "long run" refers to a period of time over which network capacity can be augmented or depleted (through non-renewal) in response to changes in service demand. Thus, TS-LRIC captures all capital costs, in addition to operational costs.

[27] Net gain to the economy by a providing greater value to users of the service (both consumers and other businesses) than the resource costs used in the investment.

A2 Application of TS-LRIC + EPMU mark-up to fixed networks

Fixed telecommunications networks provide two principal services:

1. Provision of subscriber lines;

2. Conveyance of traffic.[28]

Costing studies, therefore, need to determine which costs are incremental to subscriber lines and which are incremental to traffic. As an approximation, the analysis is generally framed in terms of which costs are "line sensitive", which costs are "traffic sensitive", and which costs are common to providing both services.

- Line sensitive costs: these include the cost of all network infrastructure from the NTP (Network Termination Point) on the subscriber's premises, through the local network, up to and including the subscriber line card at the local exchange, or remote concentrator unit. All these costs are directly driven by the number of subscriber lines provided, and are independent of traffic volumes. Beyond this point in the network, however, costs are independent of the number of subscribers (although certain non-network retail costs such as billing and customer services may be line sensitive). More precisely, line sensitive costs consist of:

  - Network termination point at the subscriber premises:

  - Local line network:

    - Drop wire from the last distribution point (DP) to the customer premises;

    - All wires, cables, ducts, trenches, pair gain line systems and network concentration points (including housing cabinets) in the local distribution and feeder networks (where even after concentration at a cross connect point, capacity is still dedicated to each individual local loop);

  - Local switch costs:

    - Main distribution frame (MDF) at the local exchange;

    - Cross-connects between the MDF and the subscriber line ports at the local switch;

    - Subscriber line cards of the local switch;

    - Incremental accommodation and utility costs (e.g. power supply, air conditioning) of the local switch (e.g. additional accommodation power and air conditioning required by the subscriber functions of the local switch).

- Traffic sensitive costs: in a fixed network traffic sensitive costs are restricted to the processing function and trunk ports of the switches, and all other core network transmission and signalling needed to convey the call from the originating local switch to the terminating local switch, or an interconnection gateway with another network. More precisely, traffic sensitive costs consist of:

  - Switching

[28] For the purposes of this note, we ignore distinctions between incoming and outgoing traffic.

- All local switch costs not covered by line sensitive costs. This will be the central processor, trunk ports and signalling functions;

- Incremental accommodation and utility costs (e.g. power supply, air conditioning) of the local switch (e.g. additional accommodation power and air conditioning required by the traffic functions of the local switch);

- All transit switch costs, including processor, ports, signalling and accommodation including power and air conditioning;

o Core network transmission:

- Cables (metallic and fibre);

- Microwave sites, antennae and systems;

- Line systems, multiplexing (PDH and SDH), cross-connects, and associated accommodation.

- Fixed common costs: these are generally restricted to miscellaneous network overheads and administrative functions. More precisely, fixed common costs consist of:

o Any residual switch accommodation (including power supply and air conditioning);

o Network management;

o Synchronisation network;

o Administrative overheads (e.g. finance and HR functions).

A3 Application of TS-LRIC + EPMU mark-up to mobile networks

Mobile telecommunications networks are usually considered to provide two principal services:

1. Provision of network subscriptions;

2. Conveyance of traffic.

Costing studies, therefore, need to determine which costs are incremental to subscriptions and which are incremental to traffic:

- Subscription costs: this is analogous to the line sensitive costs in a fixed network. In a mobile network these consist of:

o databases uniquely essential for a mobile network (but with no fixed network equivalent), e.g. AuC/EIR (Authentication Centre and Equipment Identity Register).

o account activation and management;

o billing and customer services.

Note that, in contrast to fixed networks, no network costs are sensitive to the number of subscribers.

- Traffic sensitive costs: virtually all other costs in a mobile network are dependent on traffic volumes. This includes the air interface, since more base stations and transceivers are required

as traffic volumes increase, as well as all switching costs (both processing and switch ports), and transmission and signalling links. Also to be included are the mobility functions including the VLR and HLR databases (that have no equivalent in a fixed network). More precisely, fixed common costs consist of:

- Cell site costs (including civil works, antennae, base equipment and power supply) where cells are required to provide network capacity;
- Additional transceivers to increase cell capacity;
- Backhaul costs, including microwave and leased line costs;
- Base station controllers (BSCs):
  - Base units;
  - Ports;
  - Signalling;
  - Accommodation, including power supply and air conditioning;
- Mobile switching centres (MSCs):
  - Central processors;
  - Ports;
  - Accommodation, including power supply and air conditioning;
- Core network Transmission:
  - Cables (metallic and fibre);
  - Microwave sites, antennae and systems;
  - Line systems, multiplexing (PDH and SDH), cross-connects, and associated accommodation.
- Visitor Location Registers (VLRs), and other mobility management functions (only applicable to terminating traffic).

Note that Home Location Registers (HLRs) are an unusual case of a subscriber sensitive cost, but one required exclusively for the incoming call service. It is, therefore, generally treated as an incoming traffic cost.

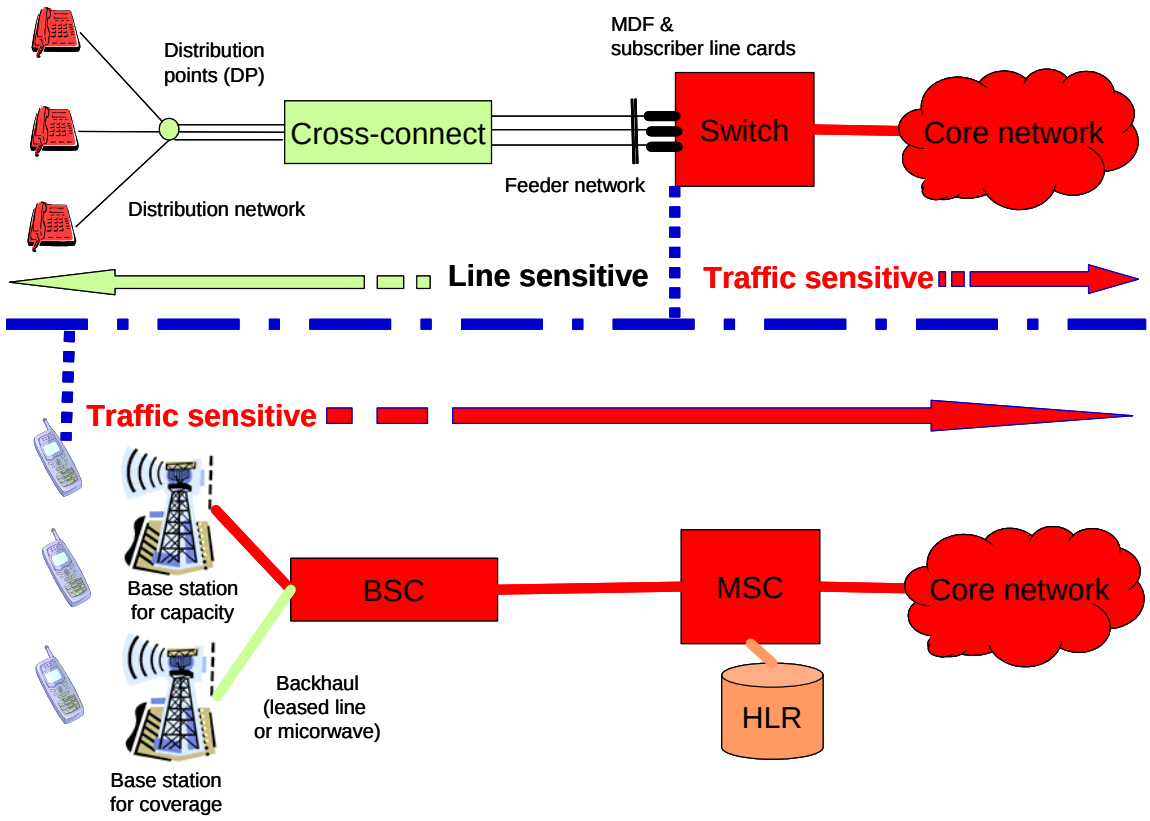
- Fixed common costs: again these are generally restricted to miscellaneous network overheads and administrative functions. The only exception is where parts of a network are built purely for coverage reasons, and are expected to operate at substantially below their traffic carrying capacity in the foreseeable future. Where this is the case, the cost of relevant base stations is sometimes treated as a fixed common cost. However, where traffic volumes are high, most cells are likely to be dimensioned for capacity rather than coverage. More precisely, this includes:
  - Network management;

- Synchronisation network;
- Administrative overheads (e.g. finance and HR functions);
- Cell sites required only for geographical coverage purposes.

A4 Comparison of fixed and mobile Costs

Fixed and mobile networks have cost elements that are similar, but also others that are very different. Figure A1 provides a comparative illustrative of the two network types.

Figure A1: Comparative network architectures (fixed & mobile)



First, consider the similarities. Both networks have a similar core, consisting of switching and transmission capacity, which in both cases is essentially a fixed infrastructure of digital switching platforms and line systems, linked by optical fibre cable possibly enhanced by DWDM (dense wave division multiplexing), and micro-wave links. Given the reducing procurement prices of this type of equipment, and the economies of traffic density inherent in optical technologies (e.g. DWDM), these elements form only a small part of the overall cost base.

The principal differences relate to the interface to the subscriber in a mobile network, and the subscriber's premises in a fixed network. In a fixed network this interface is a line sensitive cost (with capacity dedicated to each subscriber), whereas in a mobile network this is a traffic-sensitive cost of a shared radio link (and, indeed, needs to be in order to provide the mobile functionality that does not exist in a fixed network). Although one radio channel can carry only one voice circuit, this channel is not dedicated to any individual subscriber, and so the number of channels is dimensioned by traffic

rather than subscriber numbers. The only exceptions to this rule are any base stations that are built purely for coverage purposes, although in a highly utilised network this number will be very limited.

There are also other differences in the backhaul from the cell site to the BSC in a mobile network, and in the equivalent feeder network between cross connect points of concentration and the local switch in a fixed network. In the former (mobile network) these are traffic sensitive costs, and need to be incremented in E1 (2Mbit/s) blocks of leased line or microwave capacity according to traffic demand (irrespective of the number of subscribers). Otherwise the network will suffer from increasing levels of congestion. In the fixed network, by contrast, once the feeder network has been dimensioned to the number of lines required, additional traffic has no impact on the cost, and can be carried with no impact on congestion levels.

Finally, mobile networks need to perform certain functions (for mobility purposes) that have no correspondence in a fixed network. These are principally location update functions of the MSC (e.g. regular signalling to each subscriber's terminal to determine location) and maintenance of the HLR, AuC and EIR databases. These are functions over and above those necessary in a fixed network.

Annex B: Mobile Network Cost Modelling

B1 Top-down vs. bottom-up cost modelling

Costs remain relevant to setting regulated MTRs (if not the only factor). Of the 28 NRAs responding to the ERG's survey, 20 used cost modelling as a primary tool, with a further 3 using it as a complementary tool, with a further 4 having a cost model under development (implying that only two NRAs relied on benchmarking).

It is, therefore, reasonable for the ERG to look at harmonising costing methodologies.
European NRAs have used combinations of two approaches to regulatory cost modelling:

> Top-down (or accounting models): usually based on actual operator financial accounts and operational statistics;
>
> Bottom-up (or economic-engineering models): usually based on a forward looking generic model and calibrated against the situation of an actual operator (e.g. date of market entry, spectrum allocation, coverage obligation).

Of the 26 NRAs that had or were developing cost models, responses to the ERG's survey show that 13 rely on top-down models, 4 on pure bottom-up models, and 11 on hybrid/calibrated bottom-up models.

Vodafone believes that a properly constructed and calibrated bottom-up engineering model is the most appropriate approach. This is for a number of reasons:

- a bottom-up model enables forward looking price setting over a forthcoming price control period (e.g. the next 4 years). The expectation of what costs will be over the forthcoming period is the correct benchmark against which to incentivise network operators. If they achieve greater cost savings, they receive the benefit for the relevant period, but if they fail to make cost savings they suffer the reduction in profits. Top-down models, on the other hand are retroactive, relevant only to the costs of last year. An MNO regulated in this way will have less of an incentive to make cost savings;

- A bottom-up cost model, by definition, represents an efficient MNO. Top-down models, by contrast, will present regulators with a problem when models of different operators yield different cost levels. Differences may arise out (a) inefficiencies due to operation or scale; or (b) cost allocation or accounting assumptions. Both of these can be quite opaque. The NRA will then need to conduct a very detailed analysis of the cost models to determine the cause of cost differences, and decide on an appropriate cost level for the purposes of economic regulation;

- A bottom-up model provides complete transparency to the NRA and all other stakeholders on the methodology (down to the level of individual algorithms) and assumptions used in the model. Top-down models, on the other hand, by relying on existing accounting systems, will inevitably have areas of opaqueness;

- A bottom-up model allows a conceptually accurate form of economic depreciation to be calculated based on forward looking demand projections. This is important because the whole purpose of regulatory costing is to calculate (as accurately as possible) the true forward looking economic cost of the regulated service. Admittedly forward looking demand projections are uncertain (and should be constructed with a view to conservatism in order to

capture the asymmetric risk inherent with non-voice services), but the alternative of an accounting depreciation takes no account whatsoever of the forward looking cost profile;

- A bottom-up model risks under-estimating costs by erroneously omitting certain elements (e.g. the costs of installing an item of equipment), but this risk can be minimised by careful data collection (discussed below);

- The main draw-back of a bottom-up model is that it will never perfectly capture the complexity and reality of an actual countries situation. This is particularly important in respect of the radio access network, where the number of base stations will depend on topological and demographic factors that can never be fully captured in a model by a few simple parameters and variable (such as cell radii and percentage of traffic in the busy hour). In practise these variable will show a significant amount of geographical variation which, in aggregate, will affect the total cost. This draw-back can, however be minimised through proper calibration of the model against top-down operational and financial data to fit the specific circumstances of the country being modelled. The calibration process is sometimes referred to as a "hybrid-modelling process".[29]

At present, there is inconsistency amongst NRAs in a number of critical areas. We review each of these below.

B2 Network technology

The Europe Economics report for the EC, previously cited, provides a good description of GSM network technology, and the implications for network costs.[30]

At present, there is inconsistency amongst NRAs in their approach to migration of mobile technologies from GSM to 3G. Some NRAs disregard 3G networks altogether, whilst only two (according to the ERG survey) have begun to fully model hybrid 2/3G networks in bottom-up models (including Ofcom).[31]

Regulated prices should be based on costs that capture the most efficient forward-looking[32] technology practically available to the operators (who provide a mix of voice and non-voice services), taking account of historical network evolution patterns. This will be a GSM network, migrating to WCDMA. It is not sufficient to base regulated costs on GSM alone since operators will not be able to

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[29] The calibration process will, for example, adjust the average cell radii so that it fits the actual number of cells required for coverage, effectively taking account of the topological characteristics of the country. Similarly, scaling the radio network capacity (e.g. numbers of transceivers and backhaul capacity) to actual requirements will ensure that the model captures the actual busy hour traffic load taking account of the working and resident population distribution of the country, rather than relying on assumed ratios of traffic per subscriber per resident population.

[30] "Final Report for the European Commission by Europe Economics, Contract No. 48544, Cost Structures in Mobile Networks and their Relationship to Prices", 28 November 2001. See Chapter 3. . However, in re-reading this report it should be bourn in mind that significant traffic growth has occurred in the mobile sector since 2001. This will have implications for cost structures – for example, network investment is now principally driven by capacity requirements (e.g. cell splitting) rather than coverage.

[31] Vodafone notes that OPTA partially allows for the effect of 3G by modelling the de-commissioning of the GSM network.

[32] By forward looking, we mean technology available now, and that will be used in future. We do not mean future technology that is unavailable now.

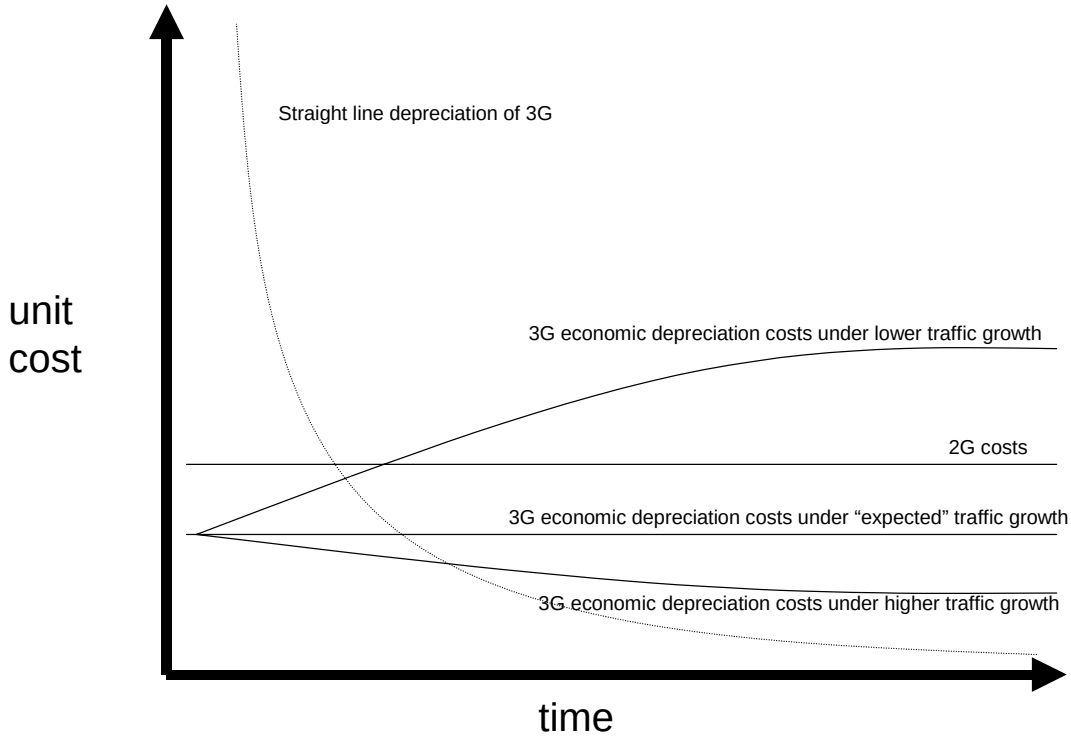
cater for the total demands on their network with GSM technology alone (either in terms of capacity or service capability).

There is a danger that a GSM-only network may be modelled to have a lower cost for voice. This is a misperception. Although GSM may be the lowest cost technology for voice alone, a GSM network (which has a lower spectral efficiency) would be incapable of providing sufficient capacity for all services going forward. In particular, the site density required of a GSM-only network in urban areas would place huge additional costs on the overall network, and in some urban areas may be actually infeasible. In terms of economics, this means that there are strong diseconomies of scale as the capacity limit of the GSM network is reached through multiple services. If all services are treated on a stand-alone basis, overall costs will never be recovered.

In addition, if costs were based on a GSM network alone, the significant costs of migrating to 3G (including the necessary costs of under-utilisation on both networks during the period of transition) would never be captured.

Finally, ignoring 3G investment would expose MNOs to an unreasonable level of regulatory risk. If regulation were to be based on a low cost GSM network for voice alone, but 3G was subsequently shown to have a lower cost for voice, it would not be possible for the NRA to change to a 3G assumption. To do so would result in asymmetric risk for the MNOs: if 3G is found to have higher costs MNOs will never recover the investment, whereas if 3G is found to have lower voice costs and MTRs are eventually regulated down to this level, there will be no corresponding benefit to MNOs. This would undermine the incentive for 3G investment, since any investment risk must be counter-balanced by an equivalent possibility of reward. Prof. Newbery explains:

> *The second problem is more fundamental, and is related to difficulties if actual demand falls short or exceeds the expectation on which the economic depreciation profile is calculated. This could result in actual unit costs being significantly higher or lower than expected in the later years of the asset life. This is illustrated in the graph below.*



> *This would introduce a significant asymmetric risk to the company. To see this consider the two cases of where actual demand: (1) exceeded expectations; (2) fell short of expectations. If*

the first case occurred, unit costs would be lower, and the NRA would wish to capture these benefits for consumers in any price cap revision. In the second case the regulator might wish to enforce the 2G price cap (as evidently the most efficient technology). However, since the agreed 3G depreciation profile required the bulk of the costs to be recovered in the later period, a large proportion of the 3G investment costs would then go unrecovered.

It is clear, therefore, that the risks perceived by the company are asymmetric. If demand exceeds expectations, the benefits will be handed back to consumers. If demand falls short of expectations the company will need to bear the shortfall. This would result in a significant disincentive to invest in a technology that could be expected to yield benefits to consumers.

Effectively, the regulator is requiring the company to grant a real option to consumers such that they benefit from lower future prices made possible by the 3G network, should demand be sufficient. In principle the value of the option (or cost to the company) can be computed from an assumption about the variability in the future demand forecast. It becomes clear, therefore, that there is an additional cost to the company over and above the cost of the existing 2G network, and so the 2G price cap will cease to be correct under this regulatory regime.[33]

B3 Costs relevant for MTRs

Vodafone believes that there is little to dispute here. Mobile call termination is a wholesale network service. Therefore, the only relevant costs are:

- Network costs, and network related functions (e.g. NSM and NOC);
- Costs specific to providing a wholesale service (e.g. inter-operator accounting and billing systems);
- Corporate overheads (e.g. central finance, HR and the CEO office).

Crucially, however, where a cost is relevant, all associated costs must be included. For example, when a network element is included, the following associated costs must also be included:

- software associated with the network element;
- other hardware associated with the network element (e.g. air-conditioning);
- planning;
- procurement;
- installation;
- commissioning.

This process of capturing all associated costs is particularly important in "bottom-up" modelling approaches (as already mentioned above).

Software is increasingly an important element, typically exceeding hardware costs in magnitude. Many equipment vendors are moving towards a model of recovering a higher proportion of the overall equipment costs through on-going releases of software. It is important to realise that new software releases (that occur every 18-24 months) are not solely required for new features, but are also essential for the ongoing operation of the basic equipment. Some vendors recognise this, and

[33] David Newbery "Regulating technically dynamic industries: the case of 3G call termination**",** Department of Applied Economics, Cambridge University, October 2004.

so submit lower prices for basic hardware, in the knowledge that full costs for the equipment will be recovered in on-going software charges.

Retail costs (including subscriber acquisition and retention) are excluded. Note, however, that the magnitude of these costs required to acquire and retain marginal subscribers will be relevant to the magnitude of the network externality surcharge (discussed above). In the UK for example, the magnitude of the externality surcharge determined by Ofcom (0.3ppm) is equivalent to an allocation of less than 3% on customer acquisition and retention costs.

B4 Cost allocation

This area is also largely uncontroversial. A detailed cost analysis will reveal the underlying cost drivers of each component of the network. The analysis must be conducted in sufficient detail to allow separate routing factors to be used for originating and terminating calls.

The differences between originating and terminating call routing stems from the facts that:

- Terminating call set-up requires interrogation of both the HLR at the GMSC and a VLR at the MSC, to determine the location on the network of the mobile device. This interrogation uses significant processing and signalling resources at the MSCs;

- Originating off-net calls are directed to the nearest GMSC, whilst terminating calls may need to be transited through the network to the correct terminating MSC.

In detail, the differences are shown in Table B1 below.[34]

Table B1:
Differences between originating and terminating calls

Originating (off-net)	Terminating (off-net)
1 x Radio access network	1 x Radio access network
1 x GMSC	1 x VLR look-up
	1 x MSC
	1 x possible transmission link
	1 x possible transit MSC
	1 x possible transmission link
	1 x HLR look-up
	1 x GMSC

Source: Vodafone

B5 Cost annualisation in forward-looking models

The majority of NRAs deploying bottom-up or hybrid/calibrated bottom-up models in the ERGs survey used economic depreciation in their models.[35]

[34] An alternative description of the differences in cost between call origination and call termination is found in "Final Report for the European Commission by Europe Economics, Contract No. 48544, Cost Structures in Mobile Networks and their Relationship to Prices", 28 November 2001. See Box 5.2. This estimates that the differences in costs as a result of call set-up and call routing are up to 1c/minute.

[35] Economic depreciation is only feasible in the context of a bottom-up model.

There is, however, a lack of consensus over which economic depreciation model should be used, and this can have a very significant impact on the profile of cost recovery.

Economic depreciation is defined as the change in the value of the asset between two dates. There are, essentially, two approaches to estimating this amount:

- Life time model: this recovers the total net present value (NPV) of the capital expenditure on each asset over the whole lifetime (or, in practise, the next 50 years) of the network (but not necessarily over the lifetime of each individual asset). Therefore, all assets of a particular class that will need to be purchased over the lifetime of the network are treated as one single investment, whose value will depreciate each year according to:

    - the change in the purchase price for a new equivalent asset;

    - the proportion of the expected lifetime output from that is expected to be utilised in that year.

    The second of these factors means that in times when network utilisation is low, relatively little depreciation is charged (in contrast to the "contestability model" discussed next).

    Both OPTA and Ofcom models use versions of the "lifetime model" economic depreciation method – but with differences in the precise algorithms used. The OPTA method focuses on ensuring the depreciation charges for different years are strictly profiled according to the combined output and purchase price quantum. The Ofcom method places an additional constraint on the end value of the depreciation charge, to ensure that it is consistent with the value of the asset at that particular moment in time, but as a consequence produces a different time profile of depreciation. In general the profiles are similar for most assets.

- Contestability model: this assumes a hypothetical new entrant could enter the market each year, and place a constraint on any residual value that can be recovered on the asset going forward (note that no such constraint is assumed in the lifetime model). The effect of this constraint is felt in cases where assets are under-utilised in the early years of their life. Under the lifetime model there would be a lower level of depreciation in the earlier years (as depreciation is profiled according to output), but under the contestability model the asset would be depreciated largely independent of early years output because this would not effect a hypothetical new entrant in later years.

    Therefore, the impact of the contestability model is that depreciation is more directly related to asset utilisation, in that when utilisation is low (as would be the case in the early years of a 3G network), economic depreciation would be much higher than under a lifetime model.

Vodafone can see some merit in both models – both allow full cost recovery (in terms of discounted cash flow), but with different profiles. The life-time model has been preferred by both Ofcom and OPTA, and can be easily re-produced in other NRA models.

The most important point is that a consistent approach is adopted by NRAs over a period of time. It is not possible for a NRA to switch between models, unless of course, it performs a complex calculation of the difference in cost recovery between the two models at the point at which the switch-over is made, in order to allow for any windfall gain or loss.

Under both approaches is important that NRAs set reasonably conservative future demand forecast, where these are based on new technologies with a material degree of market risk. This is consistent for the objective of not discouraging innovation. If MNOs believe that by adopting new innovative network technologies (such as HSDPA, or in the future LTE), they will be penalised in the current

regulated termination rates through optimistic demand forecasts, the incentives to invest will be dampened. Ofcom provides a good example of how this has been taken into account in an MTR determination:

> *Ofcom has noted previously that there is potentially an asymmetry in the risks and impact of setting charges that turn out to be too low. Charge controls which, in practise, fail to enable recovery of efficient costs may have an adverse impact on investment, which would be detrimental to consumers generally. Ofcom has noted that charge controls should not be so tight as to impact adversely prospects for investment, particularly in the light of uncertainty about future traffic levels on 2G and 3G networks.*
>
> *Ofcom accepts that there is potentially an asymmetry in the risks and impact of setting charges on the basis of forecast costs that are ultimately below the actual costs incurred by MNOs. Charge controls which, in practice, fail to enable recovery of efficient costs may have an adverse impact on investment in mobile services, which would ultimately be detrimental to consumer generally.*
>
> *…Ofcom has concluded, therefore, that unit estimates adopted when identifying the appropriate level of MCT charges should be based on reasonably conservative assumptions which, in the presence of any uncertainty, are not likely to result in an under-recovery of costs.*[36]

B6 Cost annualisation in accounting models

In general Vodafone advocates the use of generic forward looking bottom-up models as the primary tool that should be used for regulatory costing. However, analysis of top-down accounting data will remain relevant to calibrate and reconcile these models against actual costs incurred by operators.

Accounting models need to take a different approach to cost annualisation, since they are not able to extrapolate into the future – something that is essential for the calculation of economic depreciation. There is general acceptance that current cost accounting (CCA) provides the closest match to economic depreciation, since this will reflect the change in value of the asset over time. It will not directly capture the impact of changing output or utilisation levels of the asset, since accounting models do not forecast future output (which is an essential input if depreciation is to be profiled against output). Implicitly, straight line accounting depreciation assumes a constant stream of output from the asset over its lifetime. This means that, if a new asset actually has a low level of output in early years (i.e. it is under-utilised), it will have a high unit cost when calculated using straight line accounting depreciation. In this case, straight line accounting depreciation under CCA will give similar results to the contestability model implementation of economic depreciation.

Within the CCA framework, there are two separate approaches to asset valuation:

- OCM – Operational Capital Maintenance;
- FCM – Financial Capital Maintenance.

OCM calculates annual depreciation charges to maintain the operational capability of the company. When technological change results in replacement assets of greater efficiency (e.g. higher transmission capacity per optical fibre), the company is deemed to have made a holding gain from the lower replacement cost, and this is accounted as additional profit. Therefore, under OCM regulation, the regulated revenues companies are able to recover may be lower than the historical investment (even if efficiently incurred).

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36 Ofcom, "Mobile call termination, Statement", March 2007. See paragraphs 9.168, 9.194 and 9.195.

FCM rectifies this shortcoming by allowing any holding gain (or loss) to be included in the cost base of the company, in order that the financial value of the company can be maintained.

There is consensus amongst regulators that, where accounting data is to be relied upon for economic regulation, FCM is the correct approach. OCM, would fail to provide an expectation of recovery of efficiently incurred costs in an environment of technological progress (and would also similarly provide financial windfall gains in an environment of increasing real asset prices).[37] In other words, if technological progress is expected, an OCM cost base is consistently lower, because its objective is that the company should have sufficient revenue to continue future operations at the same level of output (requiring less forward looking expenditure), rather than to enable investors to recover efficiently incurred investment.

[37] Arguably, OCM is the correct accounting approach for a nationalised company, where the provision of incentives for efficient investment are not an issue, since the government itself provides all necessary investment to meet the required operational capability of the firm. In the past, OCM has been used as the preferred CCA for some nationalised industries in the UK.

Annex C: Cross references to questions asked in ERG Draft

This annex provides cross references between questions asked by the ERG Draft, and sections in Vodafone's response.

Question G1: Do you think that the principles outlined in the general economic introduction cover adequately the underlying economic situation of both mobile and fixed telecommunication markets?

Vodafone firmly supports "a unique and uniform TR, determined with reference to costs incurred by a hypothetic efficient operator, i.e. a termination rates which does not depend on costs effectively incurred by the operators or on their market shares." See Sections 2.1.

Vodafone believes that deviating from this principle, even in the short term, or for new operators, has significant costs with no mitigating consumer benefit. See Section 2.2.

Question G2: Any further comments regarding consistent regulation of both MTR and FTR with regard to symmetry is welcome.

Vodafone believes that there will be enduring differences between the economically optimal termination rates on fixed and mobile networks, resulting from fundamental differences between fixed and mobile services, and the resulting efficient network cost structures. See Section 3.1 and Annex A.

Question G3: Finally we would like to ask you to elaborate on the question of converging MTR and FTRs and the timeframe you envisage for this.

See answer to Question G2.

Question M1: Do you agree with the general principle promoting symmetry: *"Termination rates should normally be symmetric"*?

Yes. See Section 2.2 and 2.3.

Question M2: Do you agree with the exception to take into account exogenous cost differences: *"asymmetry is only acceptable to take into account exogenous factors, outside the control of operators"*? The only example, which is not related to a late entrant, identified by ERG is cost differences due to the spectrum licensing holdings. Can you identify other exogenous factors?

Vodafone can't identify any other factors, and draws to the ERG's attention to the declining importance of spectral frequency in termination costs. See Section 2.2 and 2.3.

Question M3: Do you agree with the following principle: *"Assuming that cost differences due to different spectrum allocations are properly evaluated, they may justify an asymmetry?"*

See answer to Question M2.

Question M4: Do you agree with the following principle: *"If the level of competition in the mobile retail market asks for measures which create incentives for new network level entry or measures that strengthen the position of small new entrants, substantial differences in the date of market entry can justify an asymmetry for a transitory period"?*

No. See Section 2.2 and 2.3.

Question M5: Do you agree with the principle of keeping the level of asymmetry "reasonable"?

Vodafone believes that all asymmetries in the mobile sector should be eliminated. See Section 2.2 and 2.3.

Question M6: Do you agree with the fact that an initial level should be accompanied by a glidepath towards symmetry.

Vodafone generally supports the use of glidepaths for material step changes in the regulated termination rate. See Section 2.1. However, the benefits of this should be weighted against the costs of prolonging asymmetry between operators.

Question M7: Do you agree with the fact that national factors should be taken into account to evaluate the length of the transition period?

Although general sector price caps (for a symmetric rate) should be set with reference to a relatively long period (4-5 years, see Section 2.1), any asymmetric rate should be phased out as quickly as possible (see Section 2.2 and 2.3).

Question M8: Do you agree that in specific market circumstances (MTRs tariffs are significantly above MTR costs, there are high traffic imbalances between mobile operators and benefits of a transitory asymmetry outweigh any short term disadvantages of doing so), a temporary asymmetry may limit competitive distortions?

No. Vodafone believes that competitive distortions will always be minimised by setting symmetrical termination rates. See Section 2.2 and 2.3.

Question M9: Do you agree that NRAs should first try to set MTRs at cost?

Efficient cost is an important component of any termination rate determination – but economic theory clearly shows that they are not the only input. Externality and demand side factors are increasingly important as well. See Section 4.2.