

Wholesale mobile voice call termination: Preliminary consultation on future regulation

Vodafone welcomes Ofcom's review of the future regulation of mobile voice call termination. It is right that regulators should critically review past practice and current assumptions from time to time to determine whether existing arrangements are working well and/or can be improved. It is also right that any changes, which would be likely to have a significant impact on the performance of the UK mobile sector, should as a result require in order to be justified very careful consideration and extensive prior consultation of the kind which Ofcom is now undertaking.

Summary and conclusions

Vodafone finds no sound reason for a policy change in the evidence presented by Ofcom to date.

The comparative evidence, when considered properly, does not show that existing mobile termination arrangements mean that UK consumers are poorly served relative to their US counterparts. On the contrary, most UK consumers pay less for the mobile services they use than their US counterparts, and would pay about the same even if they chose to consume at US levels.

The evidence also shows that more UK consumers are able to use mobile services than their US counterparts, and that the existing UK regime is particularly good at serving the needs of disadvantaged users, many of whom rely upon mobile as their primary means of communication as a result. Ofcom does not offer any proposals that would safeguard the interests of this group in the event of a radical or disruptive change.

Today the UK is performing well in terms of the investment in mobile infrastructure and the coverage and resilience this produces. These levels of investment will need to continue if the UK is to remain a world leader. Ofcom has previously been concerned that radical changes in termination rates would adversely affect investment, so it would be perverse for Ofcom to argue that it will now do the opposite.

The theoretical literature does not support a fundamental change to existing mobile termination arrangements, in which both a proportion of common costs and all marginal costs are recovered through interconnection charges. There is, in particular, no evidence that UK mobile users value receiving calls so much that it is economically efficient for them to bear the full cost, as would happen if the UK moved to 'bill and keep'.

None of the alternative arrangements considered by Ofcom would allow it to better fulfil its policy objectives or its duties. On the contrary, Ofcom itself has already recognised that most of them would jeopardise important objectives like ensuring widespread access to mobile services and sustaining the high levels of investment necessary for the UK to remain one of the best performing mobile markets in the world.

This does not mean there is nothing further for Ofcom to do. Although we think a proportion of common costs and all marginal costs should be recovered from mobile termination charges, we do see some potential advantages in doing this through capacity based charges rather than existing linear charges. This approach has theoretical merits but implementation challenges. We think it is worthy of further study. And even if we maintain the existing linear approach, we think Ofcom needs to consider adjusting the way in which common costs are recovered as we move from a voice-centric to increasingly data-centric environment.

Outline of our response

Our response is structured as follows:

Chapter 1 – we consider the empirical evidence about how the UK has performed under existing termination rate arrangements, and how this relates to Ofcom's objectives.

Chapter 2 – we consider what economic theory says about how termination rates should be set under different conditions.

Chapter 3 – we examine the options in general and CBC in more detail.

Chapter 4 – answers Ofcom's specific questions.

Annexes

Annex A – Morgan Stanley Research report: Telecommunications Changes – Guide to investing through MTR changes, March 2008.

Annex B – Frontier report: Assessing the impact of lowering mobile termination rates, July 2008.

Annex C – Prof Ordober, Recovering fixed and common costs for mobile networks in Europe, August 2008.

Annex D – Frontier: A literature review of papers on mobile termination rates with relevance to bill and keep, February 2009.

Annex E – Sandbach J., and van Hooft L. (2009), Using on-net / off-net price differential to measure the size of call externalities and its implications for setting efficient MTRs.

Chapter 1: The performance of the current UK mobile termination rate regime

Ofcom asks:

“should our policy approach towards regulating termination rates change?...should we adopt a policy of reducing termination rates as far and as fast as we reasonably can, within the boundaries of sound economic policy and the legal framework, whilst recognising underlying cost differences between fixed and mobile networks?¹”

We think a good place from which to start in addressing this question is to consider the evidence of how Ofcom’s existing policy approach towards regulating termination rates, which it has applied consistently for many years, has performed overall. (There are, of course, also important theoretical and legal considerations which we address in the following chapter).

When assessing the performance of regulation, Ofcom is rightly concerned with the outputs of the UK mobile market and, in particular, with the level and structure of the retail prices for which mobile termination charges are an input. It is often feared that the existing approach to mobile termination rates might inhibit innovation in retail tariffs or otherwise keep them undesirably high. Since this is a serious claim, and one which appears to lie at the heart of Ofcom’s concerns, we devote significant attention to it.

However, retail prices cannot be the only concern which Ofcom has to weigh. Ofcom is to be accorded new duties to have even greater regard to investment than in the past, whilst already being concerned to ensure that mobile network coverage continues to improve in the UK. Ofcom has also shown itself to be concerned about access to mobile services for disadvantaged groups in society, something which is also likely to be directly affected by the retail prices that mobile operators are able to offer. We consider each of these in turn in the following sections.

How do UK retail prices compare?

Ofcom relies heavily upon the comparison between the US and UK to assess the performance of the existing UK regime. The US is chosen because it is a market which has supported much lower (sometimes zero) mobile termination rates for many years. Although there are many other differences between the US and UK markets, it is generally assumed that at least some of the differences in terms of market outputs are attributable to the different way in which mobile termination rates have been set.

At various points (notably Paras 2.23, 6.29, 6.37 and 6.42), Ofcom asserts some form of causal relationship between existing UK termination rates and:

- Retail tariff plan inflexibility
- An absence of large bundles
- Low mobile usage resulting from the lack of large bundles
- Large on-net/off-net price differentials

¹ Ofcom consultation, paragraph 1.18

- Charging mostly on a per unit usage basis with low monthly access charges
- An overall high cost per unit – i.e. a switch to low termination rates will cause a decrease in the cost per minute of calling

Comparison between US and UK tariffs

Ofcom notes that:

“A good understanding of the retail price structures in the UK and US may help to predict, at least in part, what the UK retail price structure may look like if UK mobile termination rates were reduced further and possibly be set close to zero²”

But this assumes a causal link between termination rates and retail prices in both the UK and US. This is in itself a controversial assumption given the history of US retail tariffs, which have changed dramatically in recent years despite the absence of any significant change in the termination rate arrangements. The ‘big bundles’ for which the US is often heralded are largely a feature of the market since 2000³. Data from the FCC (Federal Communications Commission, Thirteenth Report to Congress, January 2009, table 12, page 93) shows a step change in direction around 2000, as chart 1.1 shows:

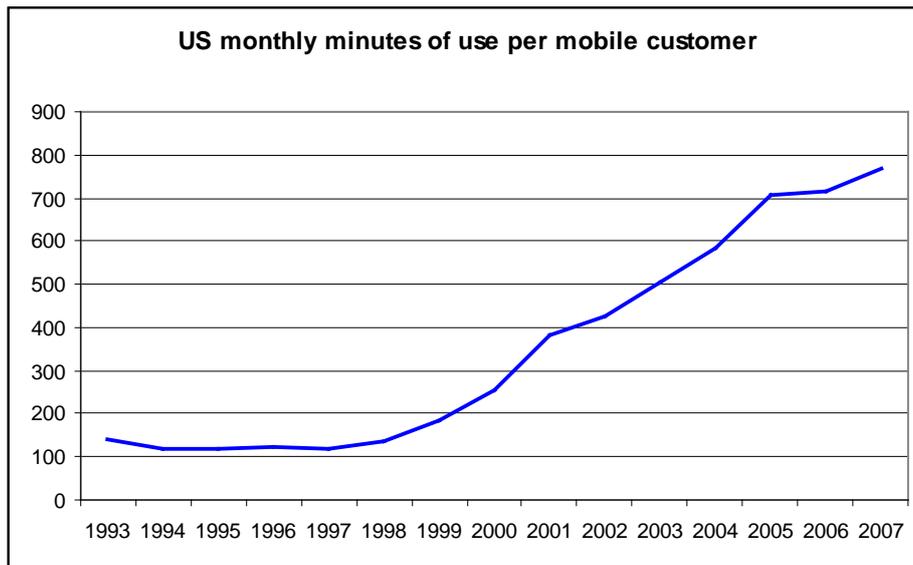


Chart 1.1: US monthly minutes of use

The Ofcom study in annex 9 is a tabular comparison of the different price plans available in the UK and the US in 2008. However there is little attempt to compare the two on a consistent basis, and some key differences are not addressed.

For example, it is wrong to conclude that US minute bundles are bigger in any meaningful sense without an understanding of what is in the bundle, and whether UK bundles are sufficiently large to accommodate UK demand. The prepay tariff comparison also omits a key feature: credit expiry. The absence of limits on credit

² Consultation annex 9, paragraph A1.3

³ See FCC Wireless Competition Report referred to above at paragraph 112

expiry is a significant difference, allowing UK customers to retain service whilst making very low monthly expenditures. Such terms are not generally available in the US.

The exercise undertaken for Ofcom in annex 9 is clearly flawed, but can be corrected. We do so below.

UK contract tariffs compare well with US

For brevity and simplicity we confine this analysis to a comparison between Vodafone's own UK tariffs with those of its US affiliate, Verizon Wireless. Verizon has several families of tariffs for post-pay customers. The first one is Basic, which has the following bundles:

- \$39.99 – 450 inclusive minutes – calls outside bundle 45c (free for on-net and off-peak)
- \$59.99 – 900 inclusive minutes – calls outside bundle 40c (free for on-net and off-peak)
- \$79.99 – 1,350 inclusive minutes – calls outside bundle 35c (free for on-net and off-peak)
- \$99.99 – unlimited⁴

In the UK there are the following bundles:

- £20 – 100 inclusive minutes (and 500 texts)
- £25 – 300 inclusive minutes (and unlimited texts on this and all larger price plans)
- £30 – 600 inclusive minutes
- £35 – 900 inclusive minutes
- £40 – 1,200 inclusive minutes
- £70 – 3,000 inclusive minutes⁵

Calls outside the bundle are 20p to a geographic number or a Vodafone UK number (although the former are free on larger bundles), and 35p to other mobile networks.

The UK therefore has smaller bundles, and the US features an unlimited bundle that is not offered in the UK⁶. Equally however, aside from the unlimited bundle, the UK's bundle sizes overlap those of the US. Differentiation on the basis that one is more "flexible" than the other is not immediately apparent.

Any reasonable comparison needs then to consider what is actually offered inside the respective US and UK bundles. An attempt to restate the US bundles so that the

⁴ Source for Verizon tariffs – online inquiry 25th June 2009

⁵ Source for Vodafone UK tariffs – Vodafone June 2009 brochure and website

⁶ At least for consumers. The Vodafone Business Clarity plan does in fact offer unlimited voice and text calls to each customer. Available for businesses with 2 employees and up, for 2 phones it averages at £51.50 per employee, and for 20 £39.95 per employee (the SIM only version is £10 less). The US tariff incorporating unlimited voice, texts and MMS is \$120, or £72.72 at \$1.65 to £1.

bundle size and cost are shown in UK equivalents improves the quality of the comparison.

For example, looking at the \$79.99 for 1,350 inclusive minutes plan for example, this bundle also includes unrestricted weekend and evening calls (after 9pm) and unrestricted on-net calls, and unrestricted calls to 5 nominated numbers, none of which decrement the bundle. The UK 1,200 minute bundle for £40 includes unrestricted off-net to fixed calls, but not unrestricted weekend and evening calls or unrestricted calls to nominated numbers.

In the UK weekend and evening traffic is approximately 30% of the total, so the US 1,350 minutes would gross up to 1,925 minutes on an equivalent basis i.e. assuming weekend and evening traffic were to be inside the bundle⁷. Unrestricted calls to 5 nominated numbers could account for on average 25% of otherwise in-bundle calling activity, so the equivalent bundle rises to 2,600 minutes⁸. However from this must also be deducted incoming minutes. If we assume conservatively that only one third of all calls are inbound⁹, then the bundle size is around 1,725 outbound minutes¹⁰ – at a higher inbound proportion, the effective size of the outbound bundle shrinks further.

The remaining difference is that the US bundle includes unlimited on-net minutes and the UK bundle unlimited off-net to fixed geographic minutes. The volume of the two call types is broadly equivalent so these differential features can be considered to cancel out.

Thus overall, for \$79.99 in the US one can acquire approximately 1,725 outbound minutes, when measured in a manner roughly equivalent to a Vodafone UK voice bundle¹¹.

Conducting a similar exercise for the \$59.99 900 minutes bundle gives an outbound bundle of 1,150 minutes or fewer. The \$39.99 450 minute bundle price plan does not include the 5 nominated numbers allowance, so it is equivalent to around 425 UK outbound minutes. Clearly there is significant scope for variation on these results depending on actual individual calling patterns, which may or not be influenced by the specific US price differentiation by destination (i.e. on-net vs. off-net.¹²)

The UK bundle also includes unlimited texts,¹³ whereas the Verizon Wireless Basic tariff family is voice only and charges 20c for each outbound SMS (and also for each inbound SMS). It is the next tariff family up, the Select tariff family which includes unlimited texts (but also unlimited MMS) for an additional \$20 above the Basic

⁷ $1350/0.7 = 1929$

⁸ $1929/0.75 = 2571$

⁹ Given that on-net calls are also counted as incoming from a US point of view, much closer to an even split between inbound and outbound might more reasonably be expected.

¹⁰ $2571 * 2/3 = 1714$

¹¹ This, however, ignores the issue of unitisation, where it appears that the US will round up all calls to the next whole minute, whereas the UK \times does not. The US bundle size should be further reduced to compensate for this difference. Using a negative exponential call distribution and published average US mobile call lengths of 2.27 minutes, this unitisation factor will decrement the size of the US bundle by as much as 19%. The 1,725 outbound minutes will then equate to 1,400 UK equivalent minutes. Given the approximations of the calculations in this section, this potential further adjustment is not formally reflected in the subsequent tables.

¹² Unlike in the UK, the US tariffs appear to make no differentiation between mobile and fixed (wireless and wireline) in terms of off-net destinations. This is presumed to be largely a result of the historic intermingling of fixed and mobile numbers, local and national, unlike the differentiation offered by the second digit of a UK number.

¹³ At least at the £25 and up level.

equivalent. The text element of this \$20 can be valued at say \$15 (on the basis that text message volumes are very much higher than MMS volumes) so the Verizon Wireless equivalent rates become \$55, \$75, and \$95 respectively.

The next factor to adjust for is the handset. Since phones are not always directly equivalent due to technology differences, only a general comparison can be made. A high cost phone that would be free in the UK might cost \$70 or more in the US, and there is a \$35 activation charge, so this over a 24 month contract is equivalent to \$5 per month. Hence the US equivalent cost rises to \$60 for the 425 min outbound, \$80 for the 1,150 min outbound, or \$100 for the 1,725 min outbound.

Finally the prices need to be adjusted to be consistently presented. There are two elements here – local taxes, and currency. The UK prices shown are all inclusive of VAT, whereas to quote Verizon’s terms and conditions:

“Tolls, taxes, surcharges and other fees, such as E911 and gross receipt charges, vary by market and as of April 1, 2009, add between 5% and 36% to your monthly bill and are in addition to your monthly access fees and airtime charges.”

For consistent comparison, local taxes should be removed, so the UK costs need to be discounted by 15% VAT.¹⁴ The US \$ has been translated at 1.65 to the £, so that the \$60, \$80, and \$100 become £36.36, £48.48, and £60.61 respectively.

The results of the foregoing adjustments are shown in table 1.1 below:

UK			US		
Cost	Outbound bundled minutes	Implied ppm at full utilisation	Cost	Outbound bundled minutes (approx)	Implied ppm at full utilisation
£17.39	100	17.4			
£21.74	300	7.2			
			£36.36	425	8.6
£26.08	600	4.3			
£30.43	900	3.4			
			£48.48	1,150	4.2
£34.78	1,200	2.9			
			£60.61	1,725	3.5
£60.87	3,000	2.0			
			£72.73	Unlimited	n/a

Table 1.1: Comparative bundle sizes and costs, UK and US

The result of this simple comparison, which we believe to be more robust than that undertaken by Ofcom, suggests that the assertion that US bundles are cheaper than

¹⁴ In fact some of the supplemental charges applied in the US are not taxes, but Verizon Wireless fees, e.g. regulatory and administrative charges, so arguably the US rates should be uplifted before translation, but this complication is ignored at this stage.

the UK equivalents is simply wrong. The lower volume user however is better served in the UK than the US, where the minimum cost of entry for a Verizon Wireless contract is significantly greater than for a Vodafone UK contract. The evidence above suggests that the UK provides bundles that are at least equivalent in size and cost to the US bundles (except for the unlimited bundle) despite having a very different termination rate.

UK contract customers appear to be happy with smaller bundles and lower total costs

The UK and the US may differ in the rates of take-up or adoption of different bundles. US information is not available, but Vodafone has analysed its own UK contract consumer base by bundle size. The data is presented in two ways – with respect to both the current UK bundle sizes (table 1.2), and the implied US outbound minutes volumes (table 1.3) as per table 1.1 above:

✂

Table 1.2: Proportion of UK contract consumer base at each UK bundle threshold

The UK customer base is strongly represented in bundles with fewer than ✂ minutes. Redrawing the same results in line with the apparent US bundle sizes shows the following:

✂

Table 1.3: Proportion of UK contract consumer base at each US bundle threshold

A similar position is reflected in Ofcom's Communications Market review for 2008. Figure 5.55 of that review shows that for Q1 2008, 15% of new mobile contract connections were for a monthly commitment of less than £20 (or £17.40 net of VAT), 20% between £17.40 and £26.08, 49% between £26.09 and £34.77, and thus only 16% were for a sum greater than £34.78. The minimum Verizon Wireless contract subscription on a comparative basis above is calculated as £36.36.

In summary, the US price plan structure would not be appropriate for UK levels of demand – only ✂ proportion of customers in the UK elect for the larger bundles equivalent to those available in the US, and ✂ proportion have elected for smaller bundles that are not available in the US¹⁵. *The UK demand exists despite the fact that UK consumers could select large or very large bundles that are at least the equivalent in price of what is available in the US today.* This is underlined by the fact that – as table 1.4 shows - ✂

✂

Table 1.4: ✂¹⁶

¹⁵ In the UK only approximately 36% of customers are on contracts, whereas in the US, some 83% are contract, so the UK contract segment, other things being equal represents a greater proportion of higher users (by UK standards) than the US contract base.

¹⁶ ✂.

It is difficult not to conclude simply that UK tariffs appear optimised to meet the demands of UK consumers, whilst US tariffs appear optimised to meet the demands of US consumers. UK consumers could buy larger bundles at comparable US prices – but choose not to. US consumers do buy larger bundles – but have fewer alternative choices.

The above table also confirms that UK contract customers generate most of their revenues from the monthly “access charge” rather than usage charges outside of the bundle. There is no evidence that US and UK contract tariffs differ in this regard, nor is there any evidence – as Ofcom sometimes suggests – that mobile termination rates predetermine the structure of retail prices or otherwise constrain them in the UK. Vodafone can find no evidence of greater tariff innovation or choice in the US which might suggest otherwise.

UK prepay tariffs are better value than US

Prepay tariffs are much more significant in terms of customer adoption in the UK than in the US.¹⁷ Ofcom’s annex 9, whilst listing the prepay tariffs available in the UK and the US, attempts no meaningful comparison between the two.

Most comparisons would tend to suggest that the US tariffs are higher, not lower than the UK equivalent. Whilst the Ofcom analysis notes in A1.15 that in the UK prepay calling credit does not generally expire, it fails to register the fact that in the US, calling credit does expire.

Verizon Wireless in fact quotes the following terms on its website:

- \$15 to \$29.99 top-ups expire in 30 days
- \$30 to \$74.99 top-up expire in 90 days
- \$75 to \$99.99 top-ups expire in 180 days
- \$100 or more expires in one year

A minimum spend of \$15 is required on a monthly basis, or \$10 per month if payment is made for 3 months up front. In the UK top-ups do not expire, so provided there is some activity every quarter, a £5 top-up¹⁸ could last for an extended period, making the minimum monthly spend close to zero.

In terms of relative costing of usage at and above the minimum level, Verizon Wireless offers 4 prepay tariffs. These are generally two-part, with a minimum payment on every day of use, supplemented with volume related charges.¹⁹ These are tabulated below in table 1.5:

¹⁷ 64% of active customers are prepay in the UK, vs. 17% in the US.

¹⁸ Or £4.35 net of VAT.

¹⁹ The one exception to this, the Basic tariff, is new – it was not mentioned in the tables of Ofcom’s annex 9, which used late 2008 data.

Rates in \$	Basic	Core	Plus	Unlimited
Daily access	0.00	0.99	1.99	3.99
Onnet voice	0.25	0.00	0.00	0.00
Night & weekend voice	0.25	0.10	0.05	0.00
Other voice	0.25	0.10	0.05	0.00
Text	0.20	0.10	0.05	0.01

Table 1.5: Verizon Wireless prepay tariffs

In order to convert these into UK equivalents we assume that 30% of the traffic is on-net, and of the remaining 70%, 30% is night and weekend. Therefore the traffic proportions will be 30% on-net, 21% night and weekend, and 49% other voice. In the UK, prepaid customers exhibit a more or less equal balance between calls made and calls received, (when on-net calls are not being counted as inbound) so effectively the usage rates above need to be at least doubled for effective comparison of outbound traffic volumes.

Given that the US floor would appear to be defined by the minimum top-up and the credit expiry period, i.e. \$15 per month, on the Basic tariff this is equivalent to 30 outbound minutes per month. (On the two-part tariffs comparison is not so easy – for the Core tariff for example \$15 could be 8 active days with 50 total outbound minutes across the month.) \$15 is equivalent to £9.09. On Vodafone’s Simply prepay tariff, 30 outbound minutes would be £6.00, or £5.22 excluding VAT, and 50 minutes £8.70 net of VAT, so clearly at this traffic volume the UK is cheaper.

Assuming a level of activity above this threshold, of say 50 outbound minutes and 100 outbound texts, we could estimate the expected number of days usage per month for the US price plans assuming calls occur randomly in 30 day month. The formula is:

$$\text{number of days usage} = 30 * (1 - (29/30)^{\text{number of in and out calls per month}})$$

Since the US average call length is 2.25 minutes, 50 inbound minutes plus 50 outbound minutes represents 44 total calls, and so from this we would expect about 23 days of usage in a 30 day month. At this volume level, the US and UK tariffs compare as table 1.6 shows below:

Costs in £ excl taxes	US				UK
	Basic	Core	Plus	Unlimited	UK Simply
Voice outbound 50 min	15.15	4.24	1.48	0.00	8.70
Text outbound 100 texts	24.24	12.12	6.06	1.21	8.70
23 days access	0.00	13.80	27.74	55.62	0.00
Total	39.39	30.16	35.28	56.83	17.40
Cost uplift US over UK	127%	73%	103%	227%	0%

Table 1.6: US to UK prepay comparison – medium utilisation

At higher usage levels, Vodafone offers Freedom Packs, which do expire in 30 days, but offer for £10 100 voice minutes plus 300 texts,²⁰ or for £15 200 minutes and 600 texts, and for £20 300 minutes and unlimited texts. Table 1.7 below shows the result from taking the £10 pack (£8.70 net of VAT) and comparing it to US tariffs in a similar manner, assuming say 26 access days in a month:

Costs in £ excl taxes	US				UK
	Basic	Core	Plus	Unlimited	UK Freedom
Voice outbound 100 min	30.30	8.48	2.97	0.00	n/a
Text outbound 300 texts	72.73	36.36	18.18	3.64	n/a
26 days access	0.00	15.60	31.36	62.87	n/a
Total	103.03	60.45	52.51	66.51	8.70
Cost uplift US over UK	1084%	595%	504%	664%	0%

Table 1.7: US to UK prepay comparison – high utilisation

It is clear that in the UK the cost of prepay usage is significantly lower than in the US, and because of the US calling credit expiry, has a much lower minimum monthly cost. The implications of this for Ofcom's other policy objectives, notably access and investment, are considered in the following sections.

Overall, UK offers lower cost of ownership and similar plans

It is widely believed that the US' low termination rate regime has stimulated usage and encouraged tariff innovation. This is a misconception. A detailed review of the differences between US and UK tariff structures shows that whilst the US may offer larger bundles in general, the UK offers high usage price plans which are broadly equivalent in cost to their US counterparts. For the majority of UK consumers who wish to spend and use less - and for almost all prepay customers - the UK in fact offers a lower cost of ownership, and a wider and more flexible range of tariff plans.

This is confirmed by an analysis of the Teligen pricing data, which shows that for all the typical usage baskets (based mainly on typical European usage patterns), UK customers pay around half as much as US customers would do if they had the same usage patterns. Even a UK user with average US usage patterns would pay half as much in the UK:

	Low usage	Medium usage	High usage	US usage
UK: O2	151.29	155.33	227.08	244.51
UK: T-Mobile	183.20	237.22	247.76	277.17
US: Verizon	270.26	519.42	619.68	636.89
US: AT&T	274.30	523.46	565.69	565.69

Table 1.8: Comparison of typical annual bills (US\$)

²⁰ Or other combinations of voice and text

Source: Teligen, May 2009, with Vodafone calculation of typical US usage²¹

Tariff flexibility

Ofcom states in 6.99 that one of the limitations of the existing termination rate regime may be “*the reduction of pricing flexibility imposed by LRIC+ on mobile network operators*”. However, Ofcom does not establish whether and why a lower termination rate would generate further ‘retail tariff flexibility’, and what flexibility might mean.

Ofcom often appears to have the availability of bigger bundles in mind when referring to tariff flexibility, but we have already shown above that the UK does not perform poorly on this metric, apart from the absence of a completely unlimited bundle (see²²). This aside, the UK retail market is widely recognised as being one of the most competitive in the world, with 5 mobile operators, and a number of MVNOs, offering a wide variety of innovative and varied tariff structures. Over the past years, as Ofcom’s own Mobile Sector Assessment has shown, the cost of mobile ownership has fallen significantly, with such innovations as Vodafone Family, SIM only tariffs, Vodafone Freedom Packs all offering a range of cost options for a range of usage profiles. Vodafone’s MVNOs offer a further range of simple tariffs, e.g. Lebara Mobile’s international tariff focus. There is simply no evidence of tariff inflexibility in the UK.

Ofcom’s wider international comparisons confirm the positive relationship between MTRs and mobile take-up

There is broad agreement that mobile phone uptake is higher in countries with higher mobile termination rate levels. For example, CEG states that “*We find that the take-up of SIM cards will tend to be higher, (i) the higher the level of MTRs and (ii) if a country has adopted a CPNP regime rather than a B&K regime.*”²³

Table 1.9 below shows that, quite apart from numbers of SIMs, take-up of mobile telephony is higher in the UK than in the US. In the UK 92% of households contain at least one mobile phone,²⁴ compared to only 80% in the US.²⁵

	UK	US
% prepay	61%	17%
Subs/pop	127%	93%
% households with mobile	92%	80%

Table 1.9: Households with a least one mobile

²¹ CTIA report 2.2 trillion minutes of use in the US in 2008. After adjusting for consistency with UK reporting (e.g. treatment of on-net calls, and rounding to nearest minute versus per second billing) this equates to 1,186 billion minutes, and an average of 262,864,740 subscribers over the year. This equates to 4,513 minutes/subscriber/year.

²² See.

²³ Annex 7, page 4.

²⁴ Ofcom “The Communications Market 2008”, Figure 5.4, 2008Q1, <http://www.ofcom.org.uk/research/cm/cmr08/telecoms/telecoms.pdf>

²⁵ CDC, Wireless Substitution, July-December, 2008, Table 1, http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200905_tables.htm

Ofcom's wider international comparisons are otherwise inconclusive

As well as the simple US to UK comparison in annex 9 reviewed above, Ofcom considers (in annexes 5 to 7) wider international comparisons and econometric analysis on how termination rates may influence usage, pricing and uptake.

Ofcom concludes that:

- the average minutes of usage (MoU) per capita is higher in bill and keep and/or low termination countries;²⁶
- it is difficult to reach any reliable conclusions in price levels using either the Merrill Lynch revenue per minute figures or the Teligen price indices data;²⁷ and
- there is some evidence that multiple subscriptions are more widespread in CPNP countries than in bill and keep countries.²⁸

None of these comparisons yield results which would justify a change of policy.

First, there is no compelling evidence of a causal link between bill and keep and higher minutes of usage. For example, Ofcom's analysis at Figure 10 of Annex 5 shows that the gap between the US and the UK in terms of average MoU per capita has widened from 2002 to 2007, yet during this period UK mobile termination rates have fallen from around 10 pence per minute to around 5 pence per minute.²⁹ If termination rates were the only or main driver of average MoU per capita, we would expect the US and UK data to have converged rather than diverged.

CEG takes the same view: *'We believe that the results in Table 6 should be taken with caution as they cannot provide robust evidence that the choice of regime (or the level of MTRs), as apposed to other unmeasured factors, explains differences in usage across countries.'*³⁰ *'We did not find robust statistical evidence on the relationship between usage and level of MTRs.'*³¹

Second, CEG similarly conclude that using a "de-biased" measure of average revenue per minute they do not find a *"robust relationship between the level of MTRs and retail prices"* or *"statistically significant effects from CPNP dummy on RPM"*.³²

On-net/off-net pricing is not an issue in the UK

Ofcom also considers the argument, often made, that on-net/off-net pricing differentiation is a product of the existing mobile termination rate regime, and that this acts to the detriment of smaller operators who inevitably have a high proportion of their outbound traffic off-net, since only a small proportion of mobile customers are on their own network.

²⁶ Annex 5, paragraph 31.

²⁷ Annex 5, paragraph 32.

²⁸ Annex 5, paragraph 33.

²⁹ Consultation, Figure 7.

³⁰ Annex 7, last paragraph of Section 4.2.2.

³¹ Annex 7, Executive Summary of CEG report "Wholesale Termination Regime, Termination Charge Levels and Mobile Industry Performance"

³² Annex 7, section 4.3, first and second paragraph

This argument has many flaws:

- On-net/off-net pricing differentials are not a significant feature in the UK mobile industry. Only a small proportion of Vodafone's outbound calls are made where price differentiation between on-net and off-net exists. The remainder are made where the price of an on-net call is the same as an off-net call, because either the call is charged at a rate that does not distinguish between the two destinations, or the call is made inside a bundle that allows both on-net and off-net calls³³. Other UK operators have similar tariff structures.
- The current structure of the UK market means that for all operators, the large majority of mobile customers and hence call destinations are off-net and it is not clear to what extent, even where there are some on-net/off-net price differentials, this will impact a customer's network selection or calling pattern.
- On-net/off-net pricing differentials can equally be seen in the US, where lower termination rates apply. One major feature of Verizon Wireless' retail rates is that all contract price plans, and all prepay price plans except for the Basic include unlimited free on-net calls, whereas off-net calls carry some form of cost, either outside the bundle (typically 45-35c in contract plans), or in decrementing the bundle.
- Even if the UK market structure were radically different, and even if on-net/off-net pricing differentials were very significant (a set of hypotheses on which it would be difficult to base a change in policy approach), Vodafone has shown elsewhere that any material detriment to competition only arises in certain extreme circumstances. Most of the academic models assume two players only with very asymmetric market shares respectively³⁴.

No evidence that fixed callers would pay less

Although we have shown that mobile prices in the UK compare well, and that concerns about off-net prices and other aspects of tariff structures seem misplaced, it is normally assumed that fixed to mobile call charges would inevitably be lower if the UK were to change its approach and significantly reduce mobile termination charges. This, however, depends critically on the fixed operators' willingness to pass on any reductions in termination charges to UK consumers.

In its response to the recent fixed narrowband retail markets consultation, T-Mobile drew Ofcom's attention to the implications of Ofcom's figure 4.9 of that consultation which showed that BT's revenue per minute from fixed to mobile calls was *increasing* in the face of a *reduction* in mobile wholesale termination costs. The chart, overlaid

³³ The only area where significant pricing differentials exist is where there is a perceived advantage from attracting and retaining customers in limited closed user groups, such as Vodafone Family, a tariff that allows no more than 4 or 6 members for differential intra-family on-net pricing and is hence not related to overall operator size and general on-net opportunity. Given the fact that the closed user group involved is so small, such a tariff option is replicable by any operator, irrespective of their overall customer base size.

³⁴ Vodafone Public Policy Series, #8, April 2008; and Hoernig S "On-net and off-net pricing on asymmetric telecommunications networks", Information Economics and Policy, 19 (2007) pp171-188. All these papers show that on-net pricing serves to intensify competition for subscribers and is not an exclusionary tool.

with Vodafone's termination rate over the same period is reproduced below as chart 1.2.

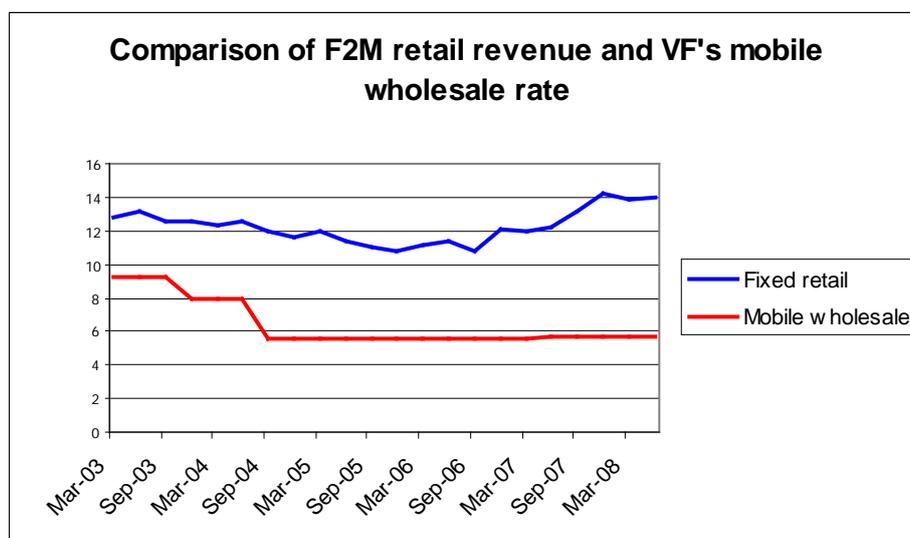


Chart 1.2: F2M revenue per minute vs. VF wholesale termination rate

Ofcom confirmed in 4.76 of the narrowband retail consultation: “*there is no evidence that fixed operators have responded to mobile competition by lowering prices where mobile calls are likely to exert the strongest pricing constraint (on fixed calls to mobile). Indeed the price of a fixed call to mobile increased significantly relative to a fixed geographic call between 2007 and 2008.*”

The historical evidence makes it difficult for Ofcom to conclude that fixed to mobile callers would be better off as a result of a change in policy approach. Even if this were the case, data published by Ofcom³⁵ shows that the number of mobile only households (11% of homes) is greater than the number of fixed only households (7% of homes). This means that the number of unambiguous gainers from lower termination costs³⁶ (those with only a fixed phone) will be lower than the number of unambiguous losers (those with only a mobile phone).

Access to mobile services in the UK

UK termination rate regime has delivered high levels of access to mobile

We have shown in the previous section that UK retail prices compare well with the US and that, in fact, low users with tight budgets clearly have a significantly wider choice of better value options in the UK than they would find in the US today.

We have been careful to note that causal relationships between mobile termination rates and retail prices are difficult to deduce. However, the evidence Vodafone has presented elsewhere from other major European markets with similar termination rate regimes confirms that we can claim with some confidence that the existing mobile termination approach has proven particularly successful at extending mobile phone access in the UK. CEG confirm this view in their work for Ofcom. US adult mobile

³⁵ The UK Communications Market 2008, page 296, figure 5.4.

³⁶ Assuming of course that any reductions are passed on to callers from fixed phones.

ownership remain unambiguously lower than the EU average (despite GDP per capita being 55% higher), and appears to be 5% lower across the adult population.³⁷

Ofcom has consistently expressed concern about the 'un-mobiled' because citizens without mobile devices may find themselves marginalised in an increasingly 'mobile-focused society'.³⁸ Ofcom is – rightly in our view - concerned that some public services may only be accessible from a mobile phone and that participation in democratic, health and social opportunities may suffer without access to a mobile phone.

We know that some citizens do not own a mobile phone for reasons of affordability (see MSA 1) and that that low income users continue to prefer the cost control offered by prepay. Ofcom's research in 2007 found that a vast majority of consumers earning less than £15k were on prepay services. Prepay was viewed by respondents as an ideal payment method and take-up was widespread as a result. Consumers in this group tended to avoid mobile contracts due to difficulties experienced in the past (such as call costs and missed payments) and some had tried contracts but had reverted back to a prepay method. Above all, prepay subscriptions were valued for the ability they gave consumers to have flexibility and exercise control over their spending. Ofcom's Consumer Panel has also reported that *"low income households have a higher reliance on mobile phones rather than fixed lines and are spending proportionately more than higher income households for their phone bills through prepayment deals."*³⁹ Indeed *"... low income households are four times more likely to have only a mobile phone than higher income households"*.

However, the evidence suggests that it is precisely these classes of customers who will suffer if Ofcom were to change its policy approach and seek to reduce termination rates 'as far and as fast as possible'. These prepay customers on average have much lower ARPU (versus contract) and generate a far greater proportion of that ARPU from inbound calls.⁴⁰ As a consequence it is these customers who will face an increase in the cost of ownership as operators rebalance their tariffs to more closely match customers' lifetime value.

An increase in the cost of owning a prepay phone may mean that some customers choose not to renew their subscription once their handset becomes obsolete (or is lost)⁴¹ and that those citizens who do not own a phone for reasons of affordability would be even less likely to subscribe, all else being equal.

Ofcom recognises that there will be winners and losers from much lower termination rates and *"for some customers, particularly low users, who do not make many calls, this effect could make them decide not to continue to have a mobile phone(s)."*⁴²

³⁷ See also the discussion in Vodafone's comments on the Draft Commission Recommendation on the regulatory treatment of fixed and mobile termination rates in Europe (1 September 2008).

³⁸ MSA 1 paragraph 5.14

³⁹ <http://www.ofcomconsumerpanel.org.uk/nr/050510.htm>

⁴⁰ Unsurprisingly the prepay model proves to be more attractive to customers with tight budget constraints and a limited need to make outbound calls.

⁴¹ Ofcom has previously produced market research evidence to show that around a third of respondents were marginal customers i.e. they would not re-subscribe if the price were to increase significantly.

⁴² Paragraph 6.49 of the consultation

Changing the regime risks disenfranchising millions of phone users

Vodafone has undertaken a data analysis to show how revenue is currently earned across its UK subscriber base, and the impact of a significant reduction in termination rates on different customer groups. Setting call prices (including mobile termination rates) at (say) marginal cost coupled with a recurring fixed fee payable by the retail user can only be desirable if (amongst other assumptions, such as an absence of network externalities) Ofcom makes strong assumptions that subscribers are sufficiently homogeneous to the extent that all would be able to retain their subscriptions to the network irrespective of the level of the fixed fee.

This homogeneity is not evident in Vodafone’s customer base today. ⁴³

This analysis demonstrates the heterogeneity of consumers, and the potentially damaging impact of imposing a fixed access fee on all subscribers.

To quantify the possible impact of the increases to customers’ bills we utilise the results of the latest market research carried out on behalf of Ofcom by Jigsaw Research, included in Annex 10.2 of the Consultation Document. Since Jigsaw did not research the impact of a flat rate increase in monthly bills we ⁴⁴.

Figure 20 - PrePay scenarios: likelihood to stop having a mobile

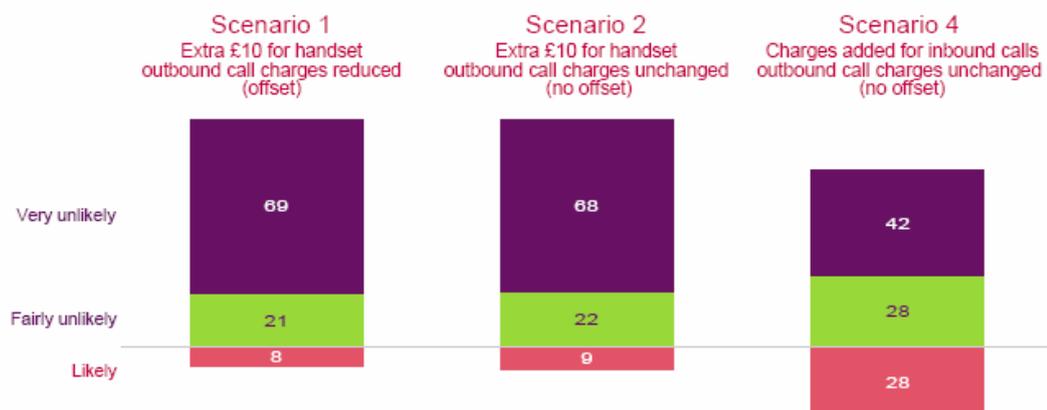


Chart 1.6 (Reproduced from Ofcom Consultation Document)

⁴³. Irrespective of the exact figures, it is clear from Ofcom’s own data that a significant change in the policy approach to mobile termination rates would have major implications for the access to mobile services currently enjoyed by some of the most disadvantaged members of UK society, many of whom have been very well served by existing arrangements and who, as a result, rely heavily upon their mobile service for participation in the economic and social life of the UK today.

No evidence that ‘social tariffs’ could do better

Ofcom suggests that the potential answer to the problem of higher bills for low users is another intervention: “some form of mandatory social tariff to ensure that mobiles are affordable for low usage users.”⁴⁴ Unfortunately, Ofcom does not explain how such a tariff would be funded or would otherwise work. Vodafone cannot see any

⁴³ ⁴⁴.

⁴⁴ Paragraph 6.50

basis for believing that such an arrangement would be capable of providing a more efficient solution to the challenge of making mobile access affordable for these groups than is provided by existing mobile termination arrangements in the UK. We know that existing mobile termination rate arrangements ensure that low users who would otherwise be unattractive to serve are sustained on the UK network because they receive a large proportion of incoming calls. It is hard to find a better proxy for the most disadvantaged and budget constrained users in the UK than their relative propensity to receive as opposed to make mobile calls. In these circumstances, it cannot be sufficient for Ofcom simply to speculate that 'some form of mandatory tariff' can safeguard the interests of millions of users who might otherwise be adversely affected by a change in the termination rate regime.

Investment in mobile services in the UK

Ofcom has long recognised the link between the level of termination rates and the levels of investment in new infrastructure and services which UK mobile operators are required to sustain on an ongoing basis if the UK is remain at the forefront in mobile communications:

"Ofcom has taken into account the potential impacts on investment and innovation if MNOs are prevented from recovering their efficiently incurred costs..."[Paragraph 9.33 Mobile call termination statement March 2007]

*"... option 1 reflects a conservative assumption about the level of MNOs' costs in a competitive market and would therefore ensure that Orange and T-Mobile recover their efficiently incurred costs (which to the extent that **this impacts on investment decisions, is likely to serve the longer term interests of consumers.**"* [Paragraph 9.138]

*"Ofcom has noted **that charge controls should not be so tight as to impact adversely prospects for investment.**"* [Paragraph 9.167]

*"Ofcom recognises that a balance must be achieved between serving the short term welfare of consumers (through lower prices and hence immediate reductions of prices to a level consistent with the underlying costs), and conversely **the need for efficient investment incentives for existing and prospective network operators** and service providers allowing a sufficient period of time for operators and customers to adjust to new levels and structures of mobile charges (which benefit consumers in the longer term)." [Paragraph 9.175]*

*"Ofcom is concerned that a sharp and immediate reduction to cost (Option 3) may not be in the longer term interests of consumers (if such a reduction presents a **material risk to further investment in mobile services.**"* [Paragraph 9.185].

*"The possible adverse consequences of setting an inappropriately low termination charge, in terms of weakened demand and **the potential effects on investment and innovation are likely to be higher in the context of 3G,** given the relatively immature and still-developing nature of many 3G services". [Paragraph 7.98 of Mobile Call Termination Market Review 2006]*

Those allocating capital to the mobile sector have also clearly recognised the link between termination rates and the returns which might be available to those investing. The consequences were made clear⁴⁵ on 31 March 2008 when Morgan Stanley released a research note (attached in Annex A) speculating that the EC would issue a Recommendation in June “cutting MTRs aggressively”, resulting in a cut of “11% to leading European mobile operator EBITDA over three to four years”.

These considerations are important because Ofcom will shortly acquire a new primary duty both to encourage investment and to report on deficiencies in mobile coverage, capability and resilience in the UK⁴⁶. An adjustment to its primary duties might be the catalyst for a change in policy approach to the setting of mobile termination rates. But it is very hard – and Ofcom advances no evidence – to conclude that any of the changes in approach considered in their current consultation would clearly serve to enhance the prospects for investment in mobile coverage, capability or resilience in the UK.

Such a conclusion would in fact represent a complete reversal of Ofcom’s previous views on the matter, and would contradict the available evidence. Last year Vodafone asked Frontier Economics to look at the impact of lowering mobile termination rates (report attached in Annex B). Frontier compared population and geographic mobile coverage across the EU compared with US where termination rates are much lower. Frontier observes that population coverage figures in the US are comparable with those of the EU-27 but geographic coverage is much worse and that “*This is the case when, contrary to European operators, US wireless operators received in 2007 98% or \$1.18 billion, of the \$1.2 billion that the program paid out each year to CETCs (competitive eligible telecommunications carriers – non – incumbent carriers that have been certified for participation in the high-cost program).*”⁴⁷

⁴⁵ Vodafone’s share price fell by 6p or 4% on March 31; there was no significant other news.

⁴⁶ The Digital Britain report states: “*The centrality of our communications infrastructure to our economy and society has grown since the Communications Act 2003 was drawn up. We have also moved from a relatively stable era of copper networks and early deployment of 3G to an accelerating picture of investment in multiple types of next generation networks. To that end Government believes that Ofcom’s duties should be modernised in two ways. Firstly, **Ofcom should have an explicit general duty to encourage investment as a means of furthering the interests of consumers**, alongside its duty to promote competition where appropriate. We also propose to give Ofcom a duty, which is the communications equivalent of the letter from the Governor of the Bank of England, to alert the Government to any significant deficiencies in the coverage, capability and resilience of the UK’s communications infrastructure and to report every two years on the state of that infrastructure.*” (Our emphasis.)

⁴⁷ Section 4.3.3

Chapter 2: Theoretical approaches to setting termination rates

For many years termination rates in the UK (and many other countries) have been set with reference to the long run incremental cost of conveying traffic on the network, with an “equi-proportional mark-up” for the fixed common costs of the network and other non-network functions required to convey traffic. This ensures that a proportionate share of costs is allocated over all network usage services.

We have shown in the previous chapter that the UK mobile sector (in common with most European countries) has performed well under this regime, particularly in comparison to the US.

In this chapter we revisit a theoretical debate which is now well advanced and on which Vodafone has previously contributed extensively. We can therefore be brief and reference other papers where necessary.

Framework for optimal mobile termination rates

Economic theorists are agreed that, under a host of simplifying assumptions, optimal prices (in this case the mobile termination rate) should equate to marginal costs.⁴⁸ Marginal or incremental⁴⁹ costs are clearly an important point of departure in any debate about mobile termination rates.

Mobile networks have several key features, each of which might justify departures from the marginal cost benchmark. These are:

- common costs, principally coverage costs;
- customer heterogeneity and externalities, giving mobile services the features of a two-sided market, specifically:
 - network externalities
 - un-internalised call externalities.

Common costs

In practice firms must and do price above marginal costs. In industries where there are economies of scale (in particular where there are large fixed common costs) pricing above marginal cost is essential if firms are to avoid making sustained losses over time. Mobile network operators are no exception.

In fact mobile networks involve significant fixed common costs - network costs which are not incrementally or marginally incurred to provide any one particular service, but are essential to provide every service (including call termination). Most significant is “network coverage” - the minimum number of base station sites required for a signal to be received by and transmitted to a mobile device anywhere within the coverage area of the network. Without network coverage, call termination would not be possible. Neither would call origination or network access.

⁴⁸ Principally, no fixed or common costs between services, no externalities, independent demand between different services, and homogeneous consumers.

⁴⁹ Where the increment usually refers to the whole service demand in the multi-service firm (e.g. total service incremental cost).

Ordoover⁵⁰ shows the fallacy of excluding common costs altogether from pricing of mobile termination:

“The simple economic precept that price ought to equal marginal cost only holds in the benchmark setting when there are not scale or scope economies or when any budgetary deficits for market participants resulting from marginal cost pricing can be covered with non-distortionary (lump-sum) taxes. Given that cost functions for telecommunications services are generally characterized by scale and scope economies and given that lump-sum taxes are not available to recover the shortfalls that would result from deviations from such pricing, marginal cost pricing is simply not feasible in the mobile telecommunications industry. This general point is well-recognized in economic literature and serves as a foundation for the theory of second-best (Ramsey-Boiteux) pricing.”⁵¹

Ordoover confirms that where firms face fixed common costs the first best “welfare maximising” option would be for firms to operate at marginal cost pricing. They would then recover the additional common costs necessary to sustain their operations via an external lump sum payment from Government funds, allowing common costs to be distributed across the economy as a whole via an optimal taxation policy.

This is clearly not a realistic option for mobile communications, or for any other sector. As a result, some form of ‘second best’ recovery of common costs within the mobile sector itself is required: mobile operators will need to recover common costs from their customers, retail or wholesale, rather than from taxpayers.

Theoretical models of network industries then seek to resolve the problems of mark-ups by assuming that all fixed and common costs can be recovered from a fixed retail fee for each customer (in a two-part charging scheme). Unlike the Government funding option, such two-part charging schemes do occur in some industries. However, Ordoover explains:

“It may appear that a first-best solution to the recovery of fixed and common costs could be implemented by means of a multi-part pricing imposed on users, with a fixed fee component and marginal-cost-based volume pricing. This is so only when consumers are homogenous, however. When consumers are not homogenous, the fixed fee component will create distortions by discouraging some consumers from subscribing to the network, which necessitates the careful assessment of the pertinent elasticities.”

Setting call prices (including mobile termination rates) at marginal cost, with a subscriber fixed fee to recover the common costs, is only optimal if we assume that subscribers are sufficiently homogeneous that all of them would retain their subscriptions to the network irrespective of the imposition of a fixed fee to recover common costs. In other words, a zero mark up on mobile termination rates is welfare maximising if we can assume full market participation, or zero access price elasticity for subscription. Under these assumptions, recovering common costs via subscription charges would have no effect on levels of mobile penetration and hence usage.

⁵⁰ In a paper included as Annex C to this consultation

⁵¹ See, e.g., W. J. Baumol and J. G. Sidak, *Toward Competition in Local Telephony*, MIT Press (1994) for a non-technical discussion. See also, W. J. Baumol, J. C. Panzar, and R. D. Willig, *Contestable Markets and the Theory of Industry Structure*, Harcourt Brace Jovanovich, rev. ed. (1988) and J.-J. Laffont and J. Tirole, *Competition in Telecommunications*, MIT Press (2000) for more technical expositions.

However, this assumption is patently unsustainable in the case of mobile communications markets. Here we find a large group of mobile customers that have only a limited willingness to pay for mobile service. This is sometimes referred to as 'customer heterogeneity', in other words different customers have a different willingness to pay for a subscription to mobile services. Subscription is therefore elastic. In these circumstances, attempts to recover common costs from subscription charges clearly can affect levels of mobile penetration and usage and hence overall welfare. Setting termination rates at marginal cost will not be optimal under these conditions.

Vodafone has already presented robust empirical evidence for customer heterogeneity in the UK in Chapter 1. This confirms that there is a huge variation in the monthly amounts that customers do pay (and are prepared to pay) in order to have access to a mobile network. This is also clearly reflected in the tariff structures that have been developed by mobile operators themselves over many years – prepay services have developed precisely to allow customers with a low willingness to pay for subscription to avoid such subscription charges, allowing mobile operators to recover common costs via usage charges instead. The high levels of mobile penetration in the UK (and other markets) suggest that these pricing approaches have greatly enhanced welfare and are likely to be highly efficient.

Externalities

Mobile networks (in common with other telecommunications networks) display two types of externalities, providing them with the feature of being two-sided markets. These also affect the optimal approach to the setting of mobile termination rates.

Network externalities mean that existing subscribers value the opportunity to call marginal subscribers who might otherwise not be connected to the network, and are therefore willing to pay to subsidise their subscriptions. Call externalities mean that subscribers value being called, and are therefore willing to pay towards the cost of receiving calls. In practice, it is intuitively obvious that everyone will to some extent both value the opportunity to make calls to people and value the opportunity to receive calls – all calls which work are inherently two-way interactions in which both parties must derive some value.

The question in setting mobile termination rates is therefore not whether such features exist, but their relative magnitude. The existing approach to mobile termination rate setting suggests that the calling party derives, in general, relatively greater value from the call than the called party. This is intuitively plausible and would explain why the calling party rather than the called party initiated the call. As we note below, the case for a change to another approach, such as bill and keep, would rely upon fundamentally different evidence of externalities.

Network externalities

The network externality of telecommunications networks has been recognised in the academic literature since at least the 1970s⁵², and recognised by Ofcom and the Competition Commission. Its magnitude, however, has been a matter of dispute. Ofcom have previously taken account of network externalities in setting optimal mobile termination rates, but, following the latest Competition Commission investigation, this is now excluded.

⁵²The seminal paper is Rohlfs, J., "Economically-efficient Bell-system Pricing", Bell Laboratories Economic Discussion Paper #138, January 1979.

The magnitude of network externalities is captured in the so-called “Rohlf’s-Griffen factor” – the ratio of the marginal social benefit to marginal private benefit of an additional (marginal) subscriber joining the network. Traditional expositions of the network externality suggested that *a priori* the Rohlf’s-Griffen factor should lie between the values of 1.0 and 2.0, and Ofcom in the past has assumed a narrower range of 1.3 to 1.7. However, there is good empirical evidence to assume that an appropriate value for network externalities will be in excess of this range, based on relative incoming and outgoing call activity of very low user customers. \gg . This is strong evidence for the existence of a network externality since it shows that although the benefit to these customers themselves of joining the network may be low (reflected in the low number of calls they make) the benefit to others who call them is \gg . It follows that the actual value of the Rohlf’s-Griffen factor must, at a minimum, exceed 2.0. Vodafone believe that a value of 2.0 should be a conservative working assumption in any analysis.

A recent academic paper by Julien, Rey and Sand-Zantman⁵³ analyses the implication of heterogeneous customers in a model with network externalities and finds:

“Therefore, the presence of light users, who furthermore have an elastic participation, leads to favoring a positive termination mark-up. Note that the above analysis puts the same weight on both categories of users. If a regulator wanted to promote the participation of light users, thus placing a higher weight on those users, the optimal termination mark-up would be even higher. Note moreover that raising the termination charge above cost may benefit here all categories of agents. In particular, if the participation of light users is quite elastic, heavy users are better by raising the termination mark-up to increase their calling opportunities⁵⁴.”

“Our results thus imply that while some cap on termination rates is desirable, the regulated cap should be above termination costs. This optimal rate depends on factors such as the proportion of light users and their demand elasticity. Thus local market conditions matter, suggesting that, at least in Europe, there should be some discretion left to national regulators in defining these rates⁵⁵.”

Julien, Rey and Sand-Zantman show that setting mobile termination rates above marginal cost (in fact, setting call charges in general, both retail and wholesale, above marginal cost) is welfare enhancing in the face of customer heterogeneity and network externalities.

Failing to take account of the network externality in a scenario where mobile termination rates may be falling to very low levels will mean that the revenue earned from these low user marginal customers does not capture the much higher benefit that others receive from keeping these customers on the network.

Call externalities

Call externalities mean that utility from a call being made accrues both to the calling and receiving parties, suggesting in simple terms that the cost of a call should be split

⁵³ Julien B, Rey P, and Sand-Zantman W, “Mobile call termination revisited”, IDEI, April 2009.

⁵⁴ Op cit page 14

⁵⁵ Ibid page 22

between both parties. The proportions will depend on the relative size of the benefits accruing to both parties.

Call externalities will frequently be internalised, either by people within the same household, or the same business organisation. In these cases call externalities are irrelevant because the whole cost of the call and the whole benefit of the call occurs within the same family or organisation.

Internalisation can also occur between two people that call each other frequently enough for the understanding to develop that the costs are usually shared. For example, callers may “share” the cost of calling by explicitly or implicitly agreeing to take turns to call each other over an extended period of time (“sometimes you call me and sometimes I call you”).⁵⁶ Call externalities which are internalised will not affect the setting of termination rates: only externalities which are not internalised are relevant for these purposes.

Most call externalities are internalised

Determining the degree of internalisation of call externalities is difficult – but essential if Ofcom is to find a theoretical basis for a fundamental change in approach. This is an area on which Ofcom might consider further research – and on which Ofcom must do further work if it were to proceed with proposals to fundamentally change its approach to mobile termination rate setting.

In the meantime, Vodafone has conducted customer research. ✕.

These results at least suggest that a very high proportion of call externalities may be internalised because they are made to or received from people with whom the callers frequently speak and/or share exactly the same economic interest.

Size of un-internalised externalities

It is of course possible that un-internalised call externalities could remain for a small proportion of calls. Even if this were the case, the implications of this for mobile termination rate setting are not self-evident. A considerable volume of recent

⁵⁶ One of the ways in which we see this is the phenomenon of call propagation - an empirically observed tendency for call sequences to be “propagated”, in the sense that a call from A to B may generate a return call from B to A. Note that this is different from saying that traffic from A to B will on average equal traffic from B to A. This may be true, but does not imply propagation. Propagation depends on a call from A to B *causing* a subsequent call from B to A, which may be the case irrespective of whether traffic is in balance. For an academic discussion of call propagation, see Cambini, C, and Valletti, T (2008) “Information Exchange and Competition in Communications Networks”, *Journal of Industrial Economics*, Vol.LVI, pp707-728. Accurate empirical evaluation of call propagation requires “point-to-point” models of demand. These models allow the identification of the impact of a change in the level of traffic from B to A on traffic from A to B, after allowing for all other major effects. Taylor (Taylor, L “Telecommunications Demand in Theory and Practice”, Kluwer Academic Publishers, Dordrecht (1994)), in his standard text on telecommunications demand theory, highlights “...two recent studies that are at the forefront of point-to-point modelling” (p.132). These two studies are by Larson *et al* (Larson, A, Lehman, D, and Weisman, D “A general theory of point-to-point long distance demand” in Fontenay, A, Shugard, MH and Sibley, DS (eds) “Telecommunications Demand Modelling”, North-Holland, Amsterdam (1990)) and Applebe *et al* (Applebe, T, Snihur, N, Dineen, C, Farnes, D, and Giordano, R “Point-to-point modelling: an application to Canada and Canada-U.S. long distance calling”, *Information Economics and Policy*, 1988 3(4), pp311-331). Both studies found statistically significant call propagation.

academic literature has analysed externality effects from a theoretical perspective. Due to the analytical complexity, all of these papers consider only partial models of particular cases (e.g. network externality, call externality, two-part pricing, on-net/off-net price differentiation - none of these papers consider all of these issues). Conclusions drawn from individual papers can be very misleading. Vodafone has commissioned Frontier Economics to undertake an analysis of all the relevant literature. We provide this in Annex D. Frontier Economics clearly show that although externality effects are important when setting optimal mobile termination rates, they do not automatically justify a move to bill and keep or other regimes:

“... B&K is efficient only under very specific conditions. It requires the absence of network externalities, the presence of call externalities and, that the cost of origination equals the cost of termination and that the value of calls is shared evenly among senders and receivers. Therefore, the existence of call externalities is a necessary but not a sufficient condition for B&K to be optimal.”

We see no basis on which Ofcom can draw inferences on whether the size of the call externality is sufficient to justify discounting mobile termination rates to any material degree below marginal cost, or to challenge the intuitive assumption which we outlined earlier, namely that those who initiate calls are likely to value them more than those who wait to receive them. Indeed, even at the extreme case where the value of the un-internalised call externality is 1.0 (i.e. the benefit to the recipient is the same as the benefit to the caller, a position contrary to all intuition), internalisation of up to 80-90% of calls (as suggested by the market research presented above) would reduce the overall value of the call externality to 1-0.2.⁵⁷

Call externalities would mean no SMP

There is a further paradox to the call externality debate – namely that if customers really did value receiving calls and were therefore sensitive to the costs imposed on others for calling them, we could expect mobile termination rates to be an important element in determining the network selection made by customers. In other words, large call externalities would imply that mobile operators would be subject to competitive constraints upon their own mobile termination charges. In such circumstances, it is not clear to us that Ofcom would be able to sustain the current approach to market definition for mobile termination services and that as a result, Ofcom would be unable to find SMP.

⁵⁷ The extent of on-net pricing behaviour by mobile operators is inconsistent with a large un-internalised call externality. See Sandbach J., and van Hooft L. (2009), “Using on-net / off-net price differential to measure the size of call externalities and its implications for setting efficient MTRs”. This paper is included in our response as Annex E.

Chapter 3: Review of the options proposed by Ofcom

We have explained in previous chapters that the existing approach to mobile termination rates has served UK consumers well in practice and that it is well supported by economic theory. We have also said that any departure from the existing approach would have to rely upon untested assumptions (about call un-internalised externalities or the ability to implement a social tariff to protect disadvantaged groups) for which Ofcom has provided little or no evidence to date.

In this chapter we consider each of the alternative approaches listed by Ofcom in more detail.

All other approaches rely on arbitrary assumptions

Ofcom considers several other options that would all result in a network termination rate below the current LRIC plus EPMU approach:

- Long run marginal cost (LRMC): in which common costs between services are excluded from call termination – most significantly in practice the coverage costs of the network;
- Reciprocal charging for both fixed and mobile termination, irrespective of any cost difference in providing mobile termination on a wide area network;
- Bill and keep (B&K): in which no costs are recovered from call termination, and so termination rates are effectively set to zero.

We have explained above that each of these positions is an essentially arbitrary one to take. We have accepted that the optimal pricing of interconnection between two telecommunications networks is complicated by network and call externalities and customer heterogeneity, and the issue of how common costs should be recovered in a multiservice network. However the three proposals of LRMC, reciprocal charging and B&K each rely on simplistic and arbitrary assumptions in order to attempt to cut through these complexities. Ofcom would need good empirical evidence to justify why these assumptions were correct particularly when, as discussed above, Vodafone believes that the balance of available evidence points in the opposite direction.

There are several other important considerations to bear in mind when assessing these options.

Costs would need to be recovered

In all of these cases, operators would then have to seek to recover common costs or, in the case of reciprocal charging and bill and keep, marginal costs from mobile users. It cannot be the case that Ofcom expects costs to simply ‘disappear’ (as the European Commission has occasionally appeared to hope). The evidence from the market research conducted by Jigsaw Research on behalf of Ofcom, and fully corroborated by Vodafone’s own research, is that there would be strong adverse customer reaction to imposing incoming call prices, and as a consequence network operators would be likely to adopt other methods of recovering the cost of incoming calls, such as increasing fixed monthly charges. We have already considered the consequences of this for access to mobile services in Chapter 2.

None of the alternative approaches is ‘simple’

It is sometimes suggested that bill and keep or reciprocal charging is less arbitrary and less costly to implement than existing approaches. Vodafone believes that this is neither true nor that, even if it were, it would be sufficient grounds to depart from the current well established approach.

All approaches considered by Ofcom involve an unavoidable appraisal of complex empirical data if they are to be anything other than irresponsible and arbitrary⁵⁸. Only reciprocal charging is absolutely simple – and absolutely arbitrary as a result. There is no theoretical or empirical justification for this approach in the face of clear evidence that the underlying costs of providing mobile and fixed termination services are fundamentally different in nature.

Bill and keep also presents formidable implementation challenges. First, it requires complex rules to determine the conditions under which operators would exchange traffic at no charge, including the configuration of hand over points to prevent ‘hot potato’ routing and other inefficient activities. Second, assuming that some operators met the conditions for bill and keep, either in relation to all of their traffic or in relation to some portion of it, bill and keep would require the mobile operators to invest in complex systems to distinguish incoming calls according to their originating network in order to identify operators or traffic operating outside of the bill and keep regime, including traffic such as that deriving from inbound international calls. Even if such equipment is installed to identify the originating network of the individual incoming calls an arbitrage problem remains. Networks could readily find ways of effectively disguising their calls as originating from mobile networks within the bill and keep ‘arrangements – for example, by using mobile gateways. Such a reaction could lead to significant network congestion and volatility. All of these issues are likely to require governance by Ofcom.

The blurring of fixed and mobile services

Ofcom observes in paragraph 6.108.7 that:

“LRIC+ also assumes that there is a clear distinction between what is defined as a mobile service and a fixed service. Service congruence and technological developments are blurring these lines, and these developments are likely to happen more quickly than regulatory price setting.”

However, this is an accusation that could be levelled against any charging methodology that attempts to recover mobile termination costs that differ from the cost of fixed termination.

Ofcom also states in paragraph 6.114.3:

“A reduction in mobile termination rates would reduce the absolute difference between fixed and mobile termination rates. This would be more consistent with the anticipated general direction of travel over the longer term, and provide industry greater flexibility to adapt to ongoing market developments (e.g. fixed/mobile convergence).”

It is difficult to respond to a sentence that is so devoid of meaning. What is meant by convergence? What is the “*general direction of travel*” and where is the evidence that that the current termination rate regime is somehow inhibiting that journey?

⁵⁸ The existing LRIC+ methodology suffers, as Ofcom points out in paragraphs 6.116 and 6.129, from fewer issues in this respect than LRMC and CBC.

Issues for Ofcom to explore further

Although we have shown that the case for a fundamental change in approach to mobile call termination regulation – as implied by bill and keep, LRM or reciprocal charging - has not been made and is fraught with risks to a UK mobile market which currently performs well by any standards, we do not suggest that the existing approach is incapable of refinement. We see two avenues in particular where we think Ofcom should now focus its attention.

Alternatives to EPMU

We are increasingly concerned that the current EPMU approach to the allocation of common costs, whilst pragmatic and workable in a voice-centric environment, may prove increasingly inappropriate when data begins to dominate the traffic carried over mobile networks.

Economic theory is clear that in a multiproduct/service company allocation of fixed common costs should be best done on the basis of respective price elasticities, or equivalently consumer willingness to pay for different services. This ensures the most efficient pattern of consumption between services. Until now, however, telecommunications regulators have adopted an EPMU (equi-proportional mark-up) scheme, effectively assuming that all services have the same price elasticity. This is justified on the basis that evidence of differential price elasticities between different voice and text services is very difficult to establish.

Vodafone believes, however, that this issue needs to be revisited. Whereas price elasticity differences within voice services are indeed very difficult to accurately identify, price elasticity differences between totally different services such as voice and broadband data (which are currently sold separately) can be identified with significantly more confidence.

To date there has been no consistent data on the relative price elasticities of mobile voice and mobile broadband data. Vodafone has now made an initial attempt to rectify this. The results of the omnibus survey show. This is indicative of a difference in usage price elasticity between the two services.

This is substantiated by the fact that mobile broadband data pricing has fallen substantially in the UK in the last 18 months. In December 2007 a mobile broadband contract was on offer by Vodafone for £30 for 3GB, together with a free 3.6mbps dongle or a 7.2mbps dongle for £58. Currently 3GB can be obtained for £15 with a free 7.2mbps dongle (or 5GB for £25). Over this period mobile broadband connections on the Vodafone network increased.

Additional validation of this conclusion comes from drawing analogies with the elasticities of broadband services on fixed networks that are typically found to be very elastic.⁵⁹

⁵⁹ See recent published elasticity estimates from fixed network services for broadband and narrowband services. See also Robertson, A, Soopramanien, D, Fildes, R. "A segment-based analysis of Internet service adoption among UK households", *Technology in Society*, 29 (2007), pp.339-350; and Cardona, M, Schwarz, A, Yurtoglu, B, and Zulehner "Demand estimation and market definition for broadband Internet services", *Journal of Regulatory Economics*, (2009) 35.

Mobile broadband can be expected to be a significantly more price elastic service relative to mobile voice. The implication is that an optimal allocation of common costs should be heavily weighted towards voice services and that continuing with EPMU could significantly distort the efficient recovery of costs. Vodafone estimates that allowing MTRs to increase their allocation of fixed and common costs (along with other voice services) would allow mobile broadband prices to fall by a further 3% (in the direction of marginal costs). On the basis of our best estimates of price elasticity, this would increase the user base by some 3%. This is an area which, given its importance, should merit more research from Ofcom.

Capacity based charging

The principle of a capacity based charge (CBC) has been discussed within the UK telecoms industry for around 15 years, but to date without any consensus about how it should be implemented.

The EC's Recommendation and associated working documents are silent on use of CBC for call termination, although the documents acknowledge that termination costs are primarily caused by the need for "capacity" rather than the call minutes themselves. For example:

*"Investments in mature mobile markets are largely driven by capacity increases. Capacity represents the additional network costs which are necessary to carry increasing levels of traffic (above the network coverage necessary to offer a retail service to subscribers)."*⁶⁰

The acknowledgement by the EC that marginal costs are fundamentally capacity driven is correct. Although the EC goes on to also correctly identify the link between capacity and traffic, this link is neither precise nor linear.

Vodafone believes that interconnection payments based on capacity (rather than traffic) might allow retail tariffs to better reflect underlying cost structures of the terminating networks. In particular, it could encourage fixed and mobile network operators to stimulate additional traffic outside of the terminating network, since the marginal cost of termination of this traffic away from the peak will be low under CBC (reflecting the "true" underlying cost). To the extent that consumers gain utility from the new traffic there will be a clear gain in consumer welfare. The counter-side to this is the possibility that originating networks will face a higher marginal cost for traffic in the busy hour that contributes to peak capacity. This would however generate truer price signals for the cost of this traffic, and to the extent that operators are able to flatten or shift this peak will lead to greater network utilisation and consequently more efficient network investment – something that is also welfare enhancing. Vodafone therefore agrees with Ofcom that a CBC method represents a potentially viable alternative method of recovering the costs associated with termination.

Overview of approaches to CBC

There are several possible charging methods that come under the overall umbrella of CBC. NGNuk in their recent study of potential charging mechanisms in the fixed

⁶⁰ Commission Staff Working Document accompanying the EC recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU, paragraph 5.2.2.

domain⁶¹ listed several variants (in the context of charging all traffic being passed across a point of interconnect, rather than just mobile terminated voice). A non-exhaustive list of possible alternative measures and permutations includes:

- Basing the charge on the peak quantity of active circuits, or connected circuits, or pre-booked circuits;
- Charging on the basis of peak erlangs, either actual or pre-booked;
- Using ports as an alternative measure of capacity;
- Measuring the peak with reference to the usage at the point of interconnection or the recipient operator's peak period;
- Setting the capacity prices prospectively or retrospectively;
- Having a single part charge for capacity, or a two part charge for capacity and usage;
- Overlaying the capacity charge with a call set-up charge;
- Applying discounts for early capacity booking and penalty rates where usage is greater than booked or forecast use;

It is not obvious that there is any consensus on what a capacity based charge might actually mean, in practical terms. We set out below our understanding of what an efficient capacity based charge might look like.

The underlying cost structure of a mobile network is well known to consist of two main elements:

- Costs incurred by providing wide area coverage to make and receive calls and other services;
- Marginal costs incurred from providing additional capacity over and above what can be provided by the coverage network.

Vodafone believes that it may be possible to construct a two-part tariff such that the fixed charge per interconnection unit (e.g. E1 or STM-1) recovers the costs of the former and a variable charge element recovers the costs of the latter.

Another network wishing to access the mobile network for call termination might, therefore, expect to pay a two-part charge:

- A fixed charge to contribute towards the fixed coverage costs of the mobile network, to which the interconnecting network is purchasing access;
- A variable charge linked to the amount of marginal capacity required to terminate the traffic on the mobile network.

This interconnection pricing structure would enable the network seeking access to the mobile network to experience the same cost structure (including marginal cost) as the mobile network itself for its on-net traffic. Although conceptually simple, capacity based planning raises a number of important design considerations. We consider each element in turn.

⁶¹ NGNuk. A summary of NGNuk member views on potential charging mechanisms for PSTN emulation over NGNs, July 2008.

Fixed charge

The starting point for the fixed charge may be just that: a fixed flat rate charge paid by each network requiring access for call termination to the mobile network. After all, each network requiring access receives the same benefit of coverage, and the coverage costs themselves are a fixed cost incurred by the mobile network. A fixed flat rate charge would, therefore, reproduce the mobile network's cost structure.

In practice, however, this may be viewed as being (i) unfair on small networks; (ii) open to arbitrage abuse if a large network transited traffic through a small network; and (iii) not easily adaptable to the situation of incoming international calls.

There are a number of options for linking the fixed charge contribution to the size of each network seeking access, whilst keeping it fixed with respect to actual usage. The most obvious is to make it based on the number of customers (or retail access lines) of the access seeker. We see this, however, as being challenging because of the difficulties associated with the auditing of customer numbers and ambiguities on how to deal with transit and international traffic.

The most promising basis for charging would seem to be the actual volume (or more specifically capacity) of interconnection links sought for outgoing traffic by the network seeking access to the mobile network (e.g. charge per E1 or STM-1 of outgoing interconnection link). Whilst not directly linking interconnection costs to traffic levels, this would capture the overall size of the network seeking access including all transit and international traffic, mirroring the benefit that the network would be receiving from the ability to interconnect for call termination on the fixed cost coverage network of the mobile operator.

Variable charge

The variable charge would then be based on the intensity with which those links are used in the busy hour of the terminating network (contributing to the overall investment in core and radio access network capacity), or more specifically the number of busy hour erlangs of traffic passed over those links, based on the long run marginal cost of terminating an erlang of traffic on the mobile network (on average across the whole coverage area). This would include all capacity related long run marginal costs in the core and radio access network of the mobile operator required for terminating traffic.

In practice it is not possible to charge on a per erlang basis, and so a per minute charge would be used (as a close proxy for erlangs, assuming a diurnal call distribution). This variable charge would be paid and collected in exactly the same way as present but with the difference that its level would be below LRIC+ EPMU; this would be expected to stimulate usage. The extent to which the variable charge is close to LRMC will depend on the way the fixed charge is calculated.

Networks seeking interconnection to a mobile network for call termination would, therefore, face almost exactly the same cost structure as the mobile network itself.

Detailed implementation issues

There are a number of issues to be considered during subsequent rounds of the current consultation process: these, while being difficult, are certainly capable of successful resolution. Vodafone would welcome considering these issues with Ofcom and in mobile industry in general in more detail over the coming months.

Inbound/outbound mismatch

The first issue to consider is whether CBC could be introduced only for mobile inbound interconnection without introducing issues and obligations elsewhere in the UK telecoms network.

If CBC were introduced for mobile termination only there would be a mismatched regime with mandated capacity pricing on a per link and per erlang basis on mobile networks, whereas under the network charge controls BT would be mandated to charge on a usage basis for traffic inbound to BT. Therefore on a two-way point of interconnect between a fixed and mobile operator the F2M traffic would be charged on a capacity basis, and the M2F traffic on a usage basis, sending conflicting economic signals to each party. This may not necessarily be a problem, and could simply be regarded as an interim stage before CBC could be considered for traffic terminating on the BT network as well.

Alternatively the inconsistency could be eliminated by charging both F2M and M2F links on a capacity basis. The inbound to mobile route would be priced at a higher rate than the inbound to fixed route, given the difference between the underlying cost structures.

Transit

It is regular custom and practice for mobile operators to use a fixed operator to transit some of their M2M traffic. How would this traffic be charged for? Would it require (possibly inefficiently) dedicated transit links that carried only M2M traffic on a "sealed train" across the transit operator, preserving the capacity charging methodology and preventing contamination with usage based M2F traffic (which might otherwise either pass uncharged or utilise charged M2M capacity)?

Alternatively it is conceivable that the transit operator would accept M2M traffic on a per minute charge basis (varied by time of day) and accept the risk/reward of terminating this under a capacity based charge on the terminating mobile network. This may have some advantages in that the transit operator is able to aggregate traffic from different networks, potentially with non-co-incident peaks, and so make efficient use of CBC for terminating the traffic, reflecting this in offering lower per minute charges to each of the originating networks. Presumably whichever way it is done, some element of distance related charge must be built into the cost of transit, to avoid sending inappropriate pricing signals on route minimisation.

CBC is likely to force up the threshold cost of direct interconnection, limiting the number of fixed operators for whom it is economic to directly interconnect with mobile operators. Those fixed operators for whom direct interconnection is not viable will presumably use a transit operator to route their fixed to mobile traffic, and so the charging regime employed by the transit operator will be important. Given that traffic sent to a transit operator will be a mixture of call types (e.g. voice, text, video telephony between a range of national and international, fixed and mobile operators), rather than just solely mobile terminating voice traffic, it is most likely that the transit operator will choose to price on a per minute basis rather than on a capacity basis. This will reduce the degree of transparency in transit pricing (for example how will international carriers be able to relate the price they are paying their UK transit operator on a per unit rate for calls to UK mobile customers to the mandated capacity charge), and increase the role of transit operators to one of taking on risk (and reward) of aggregating traffic being an interface between the two regimes.

Determining the level of charges

Pricing under a capacity basis is not something that has previously been attempted in the UK and could lead to a number of practical but addressable challenges within the regulatory cost models. For example the regulated charge would presumably be derived from the annual sum to be recovered from a given busy hour throughput, divided by the number of links or erlangs (or other unit of capacity) assessed as being required. The latter would be a very critical variable, given the “lumpy” nature of CBC.

Impact on physical arrangements for interconnection and routing strategies

Operator interconnection strategies and the number of interconnection links provided are currently related to the present position of the actual interconnect link cost being a relatively small cost component of call conveyance for an operator. Interconnect capacity is relatively cheap to install, and hence the incentives on both originating and terminating operators are such as to ensure that there is always sufficient capacity installed to permit all demanded traffic to be accommodated (despite the unpredictable volumes that a transit operator in particular may be required to carry). In the presence of CBC, the cost of each interconnect link would no longer relate to the link itself, but to the downstream capacity of the terminating mobile network, and would become of considerable cost significance, providing incentives on the originating operator to minimise capacity (and potentially QoS) and maximise certainty that capacity will be used as fully as possible. This could lead to operator routing strategies changing, and the number of links being reduced, plus the use of transit operators being increased, all without actually impacting in any way the termination traffic load (and hence the real required cost recovery) of each mobile operator. The significance of this effect would vary depending on whether the charging basis adopted was capacity installed, capacity actually used, or pre-booked forecast capacity.

Pre-booked capacity vs. used capacity

The issue of how to proceed if demand exceeds installed or pre-booked forecast capacity would also have to be resolved. For the originating operator, seeking cost minimisation, the very stepped nature of the CBC methodology suggests that each interconnecting link be used up to maximum capacity, leaving little room for resilience or headroom for surges in traffic. Given the stepped nature of costs (that might increase over time as larger interconnect pipes are brought into use), it would be economically efficient for the originating operator when at the limit of capacity to allow calls to fail rather than install extra capacity, or incur penalty charges (if levied) for exceeding demanded capacity. It is obvious that this would not be to the benefit of the consumer or the mobile operator. Transit operators, in particular, would have a more difficult task since they would need to forecast actual peak loads, given the potential variability of traffic shipped to them by other operators. This may lead to more restrictive minimum and maximum capacity agreements between transit operators and their clients.

Non-coincident peaks between different networks

One complication relates to different time distributions of traffic on different networks. The logic of CBC is in part to match recovery with the underlying cost of dimensioning traffic volumes at the peak period of the terminating operator. However it is possible to conceive of the situation where an interconnecting operator has a capacity peak that is at a different time of day from the terminating operator's peak. In these circumstances a discount could be provided against the

interconnecting operator's peak capacity requirement since it will make a lower level of contribution to the peak capacity required on the terminating network.

Non-coincident peaks within networks

The majority of the capacity cost of a mobile network is at the level of individual base stations (BTS), and here the busy hour will vary from BTS to BTS. In practice, however, this is not a problem if it can be assumed that terminating traffic will be a representative mix of traffic over the whole network. In this case a "network average" busy hour can be used.

The alternative of distinguishing traffic according to the BTS to which it is destined and applying accordingly different capacities with different busy hours would not seem practical.

Shifting peaks

A more fundamental problem is of "shifting peaks". If CBC is economically successful traffic will respond to the pricing signals, with less traffic in the busy hours and more in non-busy hours, perhaps to the extent that the busy hour changes. It follows that prices should not be set for the busy hour alone, but capacity used in non-busy hours could still be relevant. There is significant experience from other industries on this issue, and it will need to be carefully studied.

Definition of "peak"

There may be definitional issues with what the peak represents – is it the instantaneous peak demand recorded at a single point of time in the month, the average across the busiest hour of the month, the average of the busy hours in the month, and so forth? These definitions will need to be very strictly specified if charging is to be done on an appropriate basis.

Implementation costs

It is clear that irrespective of which variant of CBC were to be adopted, some billing changes would be required, the extent of which will vary with the specific solution. Potentially more complex might be any changes to measurement systems, to ensure that both originator and recipient have a clear and unambiguous way of recording the same values for the appropriate capacity metric or metrics. The existing per minute metric has the merit that it is straightforward to measure and established systems are in place to robustly measure it – disputes on traffic volume measurement between interconnecting operators are rare in the UK.

Chapter 4: Vodafone response to Ofcom's specific consultation questions

Consultation questions

Question 3.1: Do you agree with our preliminary view on market definition? Has anything changed, or is anything likely to change within the period of the next review, which would materially impact on the definition of the market(s)?

We agree with the market definition and do not envisage anything that will materially impact it. For example, we do not believe that call externalities will suddenly prove to increase significantly.

Question 4.1: Do you agree with our view? Or are there other developments, not considered elsewhere in this consultation document, for potentially removing the underlying causes of SMP?

Yes. However given that the period of the next review will not begin until 2011 and may only end in 2015 Ofcom should keep a close eye on the possibility that technological developments, notably VOIP, will undermine the underlying causes of SMP.

Question 5.1: What are likely to be the main sources of detriment to consumers of excessive termination rates in the period 2011 to 2015?

Vodafone does not take issue with Ofcom's list of the potential detriments of 'excessive' termination rates, although 'excessive rates' would require a departure from the existing rate setting methodology. However, we believe that there are significant (and arguably greater) detriments to investment in services and customers from setting termination rates that are too low.

Question 6.1: Should our policy approach to regulating MCT change? For example, given the possible benefits, should we adopt a policy of reducing termination rates as far and fast as we reasonably can, within the boundaries of sound economic policy, and whilst recognising underlying cost differences? If our policy approach did change, what do you think are the relevant factors for us to consider in deciding on the best future policy to regulating MCT?

Vodafone finds no sound reason for a policy change in the evidence presented by Ofcom to date.

The comparative evidence, considered properly, does not show that existing mobile termination arrangements mean that UK consumers are poorly served relative to their US counterparts. On the contrary, most UK consumers pay less for the mobile services they use than their US counterparts, and would pay about the same even if they chose to consume at US levels.

The evidence also shows that more UK consumers are able to use mobile services than their US counterparts, and that the existing UK regime is particularly good at serving the needs of disadvantaged users, many of whom rely upon mobile as their primary means of communication as a result. Ofcom does not offer any proposals that would safeguard the interests of this group in the event of a radical or disruptive change.

Today the UK is performing well in terms of the investment in mobile infrastructure and the coverage and resilience this produces. These levels of investment will need to continue if the UK is to remain a world leader. Ofcom has previously been concerned that radical changes in termination rates would adversely affect investment, so it would be perverse for Ofcom to argue that it will now do the opposite.

Question 6.2: Are there additional options (other than the six set out in this consultation) that we should consider? If so what are they and what advantages/disadvantages do they offer?

We are not aware of any alternative approaches to those considered.

Question 6.3: Do you agree with our preliminary views set out for each of the options? If not, what are the additional factors that we should take into consideration, and why are the relevant to our analysis?

Please see below.

Question 6.4: Do you agree with our preliminary view of the De-regulatory option? If not, what are the additional factors that we should take into consideration, and why are the relevant to our analysis?

We agree with Ofcom.

Question 6.5: Do you agree with our preliminary view of the LRIC+ option? If not, what are the additional factors that we should take into consideration, and why are they relevant to our analysis?

No. We show in this submission that the current LRIC+ method has served customers well in terms of investment in services, access and coverage. The disadvantages that Ofcom attributes to LRIC+ do not withstand close scrutiny.

Question 6.6: Do you agree with our preliminary view of the LRMC option? If not, what are the additional factors that we should take into consideration, and why are they relevant to our analysis? In addition what do you expect the costs of a move to this option to be?

No. We believe that a significant reduction in termination rates will have a significant adverse effect on investment in services and customers which could not be mitigated by requiring operators to offer some form of social tariff. Ofcom has previously been concerned that radical changes in termination rates would adversely affect investment, so it would be perverse for it to argue that it will now do the opposite.

Question 6.7: Do you agree with our preliminary view of the CBC option? If not, what are the additional factors that we should take into consideration, and why are they relevant to our analysis? In addition what do you expect the costs of a move to this option to be?

Although we think a proportion of common costs and all marginal costs should be recovered from mobile termination charges, we do see some potential advantages in doing this through capacity based charges rather than existing linear charges. This approach has theoretical merits but some implementation challenges. We think it is worthy of further study.

Question 6.8: Do you agree with our preliminary view on mandated Reciprocity? If not, what are the additional factors that we should take into consideration, and why are they relevant to our analysis? In addition what do you expect the costs of a move to this option to be?

Please see below for our view on bill and keep. The same considerations apply to reciprocity.

Question 6.9: Do you agree with our preliminary view of the B&K option? If not, what are the additional factors that we should take into consideration, and why are they relevant to our analysis? In addition what do you expect the costs of a move to this option to be?

The theoretical literature does not support a fundamental change to existing mobile termination arrangements, in which both a proportion of common costs and all marginal costs are recovered through interconnection charges. There is, in particular, no evidence that UK mobile users value receiving calls so much that it is economically efficient for them to bear the full cost, as would happen if the UK moved to bill and keep.