Routing calls to ported telephone numbers – Vodafone response to Ofcom's August 2009 consultation

Summary

Vodafone welcomes the opportunity to respond to this consultation, and notes that many of the points made by us in the previous MNP consultations have been incorporated into this document, for example the decoupling of the routing of ported traffic from the porting process.

Vodafone's view on the routing of traffic has always been a consistent one: we hold no doctrinaire position, other than a desire to minimise our costs without compromising quality of service, to provide the best possible network for our customers at the lowest possible cost. For the routing of porting traffic we agree with Ofcom that the least cost method (without compromising quality) offers all networks the opportunity to minimise their overall costs, for the benefit of consumers. We also agree that this routing decision (like all others) is fundamentally an evidence based financial one, and support Ofcom's view that extraneous matters such as alleged detriments to hypothetical new services and concerns on potentially failing networks should carry no weight in the decision.

Vodafone argued in our previous consultation responses that the available evidence showed that Ofcom's proposal for universal (fixed and mobile) direct routing supported by a central database (CDB) would not result in industry cost savings, but rather would increase industry costs, leading to consumer disadvantage, not consumer benefit. We welcome the fact that Ofcom in the current consultation supports this view.

Ofcom's latest work on porting traffic, based on its overall estimation of industry costs and benefits under alternative "flavours" of direct routing, rejects universal direct routing, and considers that the only permutation that appears to produce a favourable financial result is that for mobile to mobile (M2M) direct routing, (and further only for the major mobile operators). The interim conclusion from this consultation reflects this, that M2M direct routing under a CDB should happen, if necessary in a mandated manner.

Vodafone does not agree with this conclusion. We have two principal objections: manifest errors in the cost benefit assessment, and a failure to consider alternative solutions.

In the cost benefit analysis:

- the potential savings have been very significantly overstated by over estimating the volume of traffic that could be re-routed, and overstating the unit costs of the existing onward routing method, over the period for which benefits are calculated, i.e. 2012 – 2021; the real savings may lie in the range £✂m to £✂m rather than the £✂m[1] that Ofcom has estimated.

- the costs of implementing any direct routing method with a CDB are likely to have been understated, but are at least the £✂m that Ofcom calculates.

[1] Values are shown as 2009 NPVs

- the ten year period of benefits over which the cost benefit analysis is taken is too long: over a more reasonable shorter assessment period the net loss to industry of direct routing implementation becomes even greater.

Vodafone shows in this document that a case cannot realistically be made on the data currently available that CDB based M2M direct routing will show a positive result and thus offer the prospect of ultimate benefit for consumers. As a consequence implementation of the CDB direct routing solution will almost certainly result in an overall increase in costs for the mobile industry and thus a loss of benefit for consumers, and its implementation should therefore be resisted.

More importantly, Ofcom appears to have made a major error in logic in its approach. Having reached the conclusion that a universal direct routing solution will not be appropriate, it has persisted with the CDB design methodology developed for universality and suggested that this should be instituted for the major mobile operators alone. This does not make sense. If Ofcom's objective is to seek the maximum consumer benefit, having dismissed the universal direct routing solution the next question should have been what is the least cost direct routing solution that could be developed for the five (or possibly four after consolidation) mobile operators? Whatever direct routing solution were to be implemented would accrue the same level of gross savings (whatever that sum happens to be) in terms of avoided onward routed traffic – therefore the direct routing option that produces the best possible result must be the one that has the lowest solution cost – this cannot be a CDB solution.

Vodafone believes that in a world with five/four participating mobile operators the CDB solution is an over-engineered, excessively centralised and over expensive solution. There are other, cheaper, ways of achieving M2M direct routing for ported traffic. Given that the costs of implementing and running an alternative method would appear to be significantly less than the cost of a CDB solution, it must always be able to offer a superior result in a cost benefit analysis to a CDB solution. Whether such a solution is adopted should, in turn, depend on the results of a properly executed cost benefit analysis.

One factor that Ofcom could not have anticipated in the consultation is the proposed T-Mobile – Orange joint venture. This, in the event that it was to take place, would have a considerable impact on the assessment of the benefits of a direct routing solution. Vodafone is not suggesting that network consolidation would reduce the annual volume of ports, but that consolidation would reduce the number of customers who are currently porting (i.e. are using a number that is outside the number range of their current network operator) and that for reasons explored in section 2 below the future growth of onward routed ported traffic (the traffic in scope for re-routing) would be retarded. Also the reduction in the number of operators required to participate in direct routing may have an impact on solution design. Ofcom's cost benefit assessment needs to take account of the possibility of network consolidation, and the impact that it would have – for this reason alone, the interim conclusion should be revisited.

Vodafone suggests that the next stage is for the operators to work together (with Ofcom) to determine the outline of a possible alternative direct routing method, and for Ofcom to assess properly the quantum of potential savings, so that we can take a view on whether there is <u>any</u> direct routing solution between the mobile operators that will reduce operator costs and provide potential customer benefit. If this is possible then the least cost solution could be seriously investigated so that we can decide whether

the benefits are sufficiently material for it to be appropriate for operators to apply resources to work on re-routing of ported traffic in the context of all the other demands on them.

Structure of this response

The rest of this document is arranged in three parts:

- Section 1 contains the principal elements of Vodafone's response;
- Section 2 comprises a detailed examination of the cost benefit analysis that is the heart of Ofcom's consultation;
- Section 3 contains responses to Ofcom's specific questions, although they are responded to more generally and in more detail inside sections 1 and 2.

Section 1 – Vodafone's key arguments

Introduction

Section 1 considers Ofcom's position on the relative merits of onward and direct routing and agrees neither is inefficient per se; any evaluation between the two should merely be on the grounds of which is more cost effective. The best way to conduct this is to compare the existing costs of onward routing that could be avoided by implementing a solution that would switch routing of the traffic to direct routing, with the costs of implementing such a solution.

We summarise the arguments made in detail in section 2 on the cost benefit analysis where we demonstrate that Ofcom's case that a positive benefit can be obtained from a CDB solution is not correct. We show that despite the general uncertainty of the levels of savings in terms of the future costs of the existing method of direct routing it is clear that Ofcom's view of savings is very much a high outlier, and it is likely that by changing either of the two major levers of savings, i.e. traffic volumes or unit rates, or more realistically both, a negative rather than a positive result ensues from the cost benefit analysis.

We conclude that it is not in the consumers' best interests for a CDB direct routing solution to be implemented, and suggest that as next steps attempts are made to better quantify the likely minimum savings that could be estimated to accrue from re-routing and to see if a lower cost direct routing solution could be built inside this threshold, before determining whether such implementation is justifiable.

Onward and direct routing

Ofcom, in the first of its specific questions in this consultation, 3.1, asks*: "Do you agree that there is a problem in the way mobile originated calls to ported mobile numbers are routed? If not, why not?"*

We do not entirely agree with Ofcom's analysis that there is necessarily a "problem" per se. We agree that there is a trade off between onward routing and direct routing in terms of efficiency, in that under onward routing the call passes through more networks, but under direct routing each and every participating network requires more information on actual call destinations and has to look up and re-map the destination of all calls in the light of this. It follows that onward routing is not a 'problem' in itself, as Ofcom has expressly recognised in relation to calls to ported fixed numbers. The key question is at what point does a move from onward routing to direct routing become cost effective (as Ofcom acknowledges at 3.6). This is an empirical question that depends on the reliability of the underlying cost benefit analysis. A clear analogy can be drawn with the use of a transit operator to pass calls across to another operator versus the establishment of a direct interconnection with that operator – the use of a transit operator is not inefficient in itself, but depending on the volumes of traffic, the cost of transit, and the cost of establishing a direct interconnection, may or may not be the most cost effective routing solution. It is cost effectiveness that determines routing efficiency.

Ofcom assumes and asserts that a tipping point has already been passed such that onward routing can be regarded as 'inefficient', but has failed to demonstrate that that is actually the case. In fact, Ofcom's portrayal of 'net inefficiency' at 3.9 and Figure 3 is

completely inconsistent with the cost benefit analysis it presents at Annex 5 which, although imperfect, does at least recognise that the cost of onward routing needs to be set against the cost of alternative solutions before any sensible assessment can be made of relative efficiency or cost effectiveness.

If the claimed inefficiencies charted in Figure 3 really were 'net' of the costs involved in eliminating onward routing, the present value of a move to direct routing of mobile originated calls from 2012 onwards would be far in excess of the £26m over ten years Ofcom derives from its own cost-benefit analysis. However, it appears that in reality the values charted in Figure 3 are not in fact net 'inefficiencies' but rather the forecast costs of maintaining onward routing which are assumed to be saved by a move to direct routing *before taking any account of the costs of implementing and maintaining a direct routing solution,* i.e. they represent the gross savings calculated by Ofcom[2], not the net benefit. Characterising such costs in isolation as a measure of 'inefficiency' is simply not correct.

The confusion in Ofcom's thinking is clear when one considers the cases of fixed to mobile traffic to ported numbers and Ofcom's proposed approach to new mobile entrants. Insofar as these call flows continue to rely on onward routing, they will contribute to the costs associated with onward routing which Ofcom seems to regard as inefficient *per se* when it comes to mobile originated calls from established mobile networks. Yet Ofcom does not propose that F2M and new entrant originated (or terminated) call flows should be directly routed precisely because it recognises that any benefit associated with reduced onward routing costs is likely to be overwhelmed by the costs of implementing an alternative direct routing solution.

Confusion is also evident in Ofcom's suggestion that onward routing is currently 'inefficient' based on its forward looking cost-benefit analysis, since the marginally positive present value of £26m over ten years from 2012 that Ofcom estimates might result from a *future* move to direct routing tells us nothing about the relative cost effectiveness of onward routing to date. In fact Ofcom's model estimates that in 2009 the volume of re-routable traffic is one-third less than in 2012, the first year for which Ofcom's cost benefit analysis is claiming benefits. In any case, such speculation is wholly irrelevant to the matter in hand which is whether a future move to (partial) direct routing would be cost justified. Ofcom clearly believes it would be, based on its analysis to date. However, Vodafone's critique of Ofcom's revised modelling casts substantial doubt on the reliability of Ofcom's conclusion and points to the need for a more realistic assessment of costs and benefits before reaching firm conclusions on relative efficiency and cost effectiveness.

Having apparently convinced itself that onward routing is 'inefficient' and that consequently a move to direct routing would yield net benefits, Ofcom then proceeds to speculate as to why what Ofcom supposes is a more efficient solution has not spontaneously come into being to date.

The first point to make is that Ofcom's discussion of co-ordination failure presupposes that a future move to direct routing is cost justified. This is by no means clear, however. If Ofcom is wrong, then far from increasing economic efficiency, requiring a wholesale move to direct routing would in fact impose an *inefficient* solution, the costs

[2] For example the value given in figure 3 for 2012 of just over £16m can be readily recognised as £16.4m in the spreadsheet that accompanies the consultation, being calculated as the product of the forecast volume of onward routed M2M that could be re-routed and the forecast cost of onward routing in that year.

of which would ultimately be borne by consumers. That is why the cost benefit analysis matters. Ofcom's confidence that it knows the answer is not warranted by the analysis it has presented to date.

Moreover, as noted, even if Ofcom's conclusion about a future move to direct routing were robust, this in itself tells us nothing about when any tipping point may have been reached – if indeed it has. Even if there might be a future cost-justification for moving to direct routing, it does not follow that the continued existence of onward routing must be due to some sort of coordination failure, as Ofcom seems to believe. If one accepts that the trade off between onward routing and direct routing is an empirical question, not an article of faith, it should be obvious that there is no good reason for industry to migrate spontaneously to a direct routing solution prematurely i.e. before it becomes cost-effective to do so.

This straightforward explanation of why onward routing persists is curiously and conspicuously absent from Ofcom's discussion of 'absence of incentives to change' (3.10 onwards). Instead, Ofcom posits two reasons – both based on the commercial arrangements originally put in place by its predecessor, Oftel, and still applicable today. In principle, Vodafone agrees that commercial arrangements are likely to have a bearing on incentives – whether or not they are determinative in any particular case. However, while we think Ofcom has identified some potentially relevant factors, its account of how they operate is slightly wide of the mark.

In relation to termination rates, Ofcom states:

> *"Where the terminating operator has a higher termination rate than the range holder, the call originator is not incentivised to route that call directly to the terminating operator."*

There are several problems with this assertion. Firstly, and most fundamentally, Ofcom is effectively presupposing that the originating operator is in a position to choose how to route the call and accordingly which termination rate to pay. In reality, no such choice exists. Unless and until a direct routing solution is available, an originating operator generally has no means of knowing the identity of the current recipient operator if a number is ported, and no choice but to send the call to the range-holder network for onward routing, and paying the range-holder's termination rate. Secondly, even if this practical problem were assumed away so that incentives became relevant, by Ofcom's logic, where the terminating operator had a *lower* termination rate than the range holder, the call originator *would be* incentivised to route the call directly. The critical factor is not, in fact, the termination rate, but that lack of any technical means for the originator to discover the identity of the current terminating operator.

Ofcom repeats the same mistake in relation to its discussion of who bears the cost of conveyance where it states:

> *". . . at present, the porting (or donor) conveyance costs of onward routing are borne equally by the mobile terminating network, who makes a payment of 50% of the donor conveyance costs, and the mobile range holder, who absorbs the remaining 50%, <u>while the choice of whether to use onward routing or direct routing rests with the mobile originating network."</u> (emphasis added)*

As noted, however, in reality the originating network has no such choice and has to route the call to the range-holder network regardless of how the conveyance costs of onward routing are borne. Ofcom speculates about lack of incentives on originating

operators to invest in direct routing as though it were possible for an originating operator to achieve a direct routing capability unilaterally. This is simply not the case, however. Without a reliable source of routing information other than the identity of the original range-holder, there is no investment that an originating operator can undertake to achieve direct routing. While it is certainly the case that direct routing requires originating operators to develop a look-up capability, it also requires an accessible source of current routing information in order for a look-up to take place. This inevitably requires co-ordination and co-operation between network operators, and simply cannot be achieved by individual network operators acting alone.

Given this inherent need for co-ordination in order to realise a migration from onward routing to direct routing, Vodafone accepts that there is a *possibility* of coordination failure. Crucially, however, the fact that mobile operators continue to employ onward routing does not in itself demonstrate any sort of market failure warranting regulatory intervention. It is only if the collective benefits of a move to direct routing clearly outweighed the associated costs that the persistence of onward routing might conceivably be ascribed to a co-ordination failure. Ofcom's cost benefit analysis does not demonstrate that this has been the case to date as it only considers the case for direct routing from 2012 onwards. Even if taken at face value, the positive present value of £26m over ten years Ofcom estimates might accrue from a future transition to direct routing is only marginally positive and clearly not robust in the face of realistic variations in modelling assumptions and input values. However, as Vodafone shows in section 2 below, Ofcom's claimed positive result relies heavily on highly dubious assumptions e.g. that traffic volumes will rise sharply over a short period before levelling off, that its calculation of the unit cost of onward routing in the period 2012 - 2021 are correct; that its preliminary cost estimates represent a ceiling that can only be undershot, and so forth.

While it is possible to speculate about all manner of potential reasons for co-ordination failure, it remains an open question whether any of these would actually prove sufficiently serious to stifle a future migration to direct routing if all mobile operators genuinely believed that future conveyance cost savings would clearly outweigh the up front and ongoing costs of an alternative direct routing solution. Admittedly, if the overall net benefit were so unevenly distributed between MNOs that the private costs overwhelmed the private benefits for some operators, a spontaneous consensus might be unlikely. It is not immediately clear, however, why net costs and benefits should be systematically skewed to such a degree that the private net benefit position for an individual MNO should be of the opposite sign to the aggregate industry result – i.e. net negative rather than net positive. If, on the other hand, each MNO individually faced a net benefit from migrating to direct routing, there might be a reasonable prospect of achieving sufficient consensus to proceed.

Other apparent issues with onward routing

In paragraphs 3.19 onwards, Ofcom states that "*in addition to the issue of productive inefficiency and potentially higher prices for subscribers which may result, there are further factors that may make onward routing less desirable than direct routing.*"

Ofcom discusses in turn the possibility of commercial or technical failure, quality of service, and service interoperability/interworking. We agree with the bulk of this discussion and the conclusion that these issues are secondary to the primary issue of economic efficiency. We are mystified, however, by the fact that Ofcom seeks to suggest that these issues "may, nevertheless, be potentially significant" in spite of a

complete lack of evidence to this effect. Direct routing for M2M traffic will only insulate against technical or commercial failure by a participating mobile operator. Ofcom cannot seriously place any weight on direct routing as a means of addressing possible technical or commercial failure in circumstances where it proposes to continue onward routing indefinitely not only for F2F, F2M and M2F traffic, but also for M2M as regards new mobile entrants.

Similarly, Ofcom explicitly acknowledges that it has found no evidence to suggest quality of service has been an issue of any significance [3.27] yet feels compelled to speculate on a possible future benefit that it cannot specify or quantify. Any reduction in transmission links and switching is already taken into account quantitatively in the cost-benefit analysis. Finally, Ofcom correctly diagnoses that service interoperability is not an issue particular to onward routed calls but then goes on, without explanation, to suggest that the adoption of direct routing "might nevertheless lessen the effect of this issue".

While we recognise that Ofcom has previously sought to attach weight to these issues, and that this may in part explain its apparent reluctance to discount them entirely, the attempt to elevate them into potentially significant issues in the face of all evidence to the contrary is weak and unconvincing. Ofcom implicitly recognises this by not seeking to place weight upon them. To do otherwise would strain credulity.

We therefore welcome the fact that such dubious putative secondary benefits form no part of Ofcom's discussion of its policy objective in paragraphs 3.33 to 3.35. We largely agree with the way Ofcom has formulated this objective, despite our reservations about the soundness of Ofcom's provisional conclusions.

Ofcom's cost benefit analysis

The mis-labelling of the difference between onward routing and direct routing is also visible in the title of section 4 "*assessing the level of the inefficiency*" when it is clear that the subject matter of the section is as described in 4.2: *"in this section we quantify our assessment of the overall value of moving from onward routing to direct routing".* To describe onward routing as inefficient begs the question, particularly where Ofcom's work concludes that only in the M2M case can an argument be made that a change should be made. Putting this quibble aside, Ofcom proceeds in section 4 to describe in a reasonable manner the principles underlying the cost benefit analysis, i.e. assessing the relative merits of:

- Continuing the existing method of onward routing and identifying the costs of this in terms of the volume of traffic that could be re-routed in the future and the costs that would become avoidable if traffic were re-routed; and

- The costs that would be incurred by direct routing, in the form of both initial capital investment and ongoing operating cost.

Ofcom examines this for multiple traffic permutations of the direct routing solution:

- All onward routed traffic. Avoiding this would require all telecoms operators to look-up the actual destination of all outbound calls;

- Fixed to fixed onward routed traffic, requiring the participation of fixed operators to look up the actual operator for all their outbound fixed geographic calls;

- Mobile to mobile onward routed traffic, requiring all mobile operators to look up the actual operator for all their outbound to mobile calls;

- Fixed to mobile and mobile to mobile where all operators both fixed and mobile would look up the actual destination operator for all mobile destined calls;

- Fixed to fixed and mobile to fixed, where all operators both fixed and mobile would look up the actual destination operator for all fixed destined calls.

In Ofcom table 1 the results of this exercise are presented and these are reproduced below in table 1.1.

	NPV £m	
	7 years	**10 years**
All calls	-118	-108
Fixed to fixed	-130	-137
Mobile to mobile	**16**	**26**
Fixed to mobile and mobile to mobile	-81	-86
Fixed to fixed and mobile to fixed	-205	-215

Table 1.1: Ofcom's overall cost benefit analysis

It is clear that only in the M2M case is a positive result produced – the other alternative scenarios are very strongly negative.

Ofcom entertains a very limited sensitivity analysis around the M2M outcome, as explained in 4.21 and following:

> "*We have subjected our analysis to sensitivity testing including the construction of a low case and high case NPV based around variations of +20% and -20% on key inputs. Under the low case scenario the NPV is negative at -£15m over ten years and -£16m over seven years while in the high case the NPV values are £66m and £90m for seven and ten years respectively. Therefore we could not rule out the possibility of a negative NPV if there was substantial downside variation to several key inputs simultaneously, However we consider that scenarios which result in negative NPVs are unlikely, as they rely on all the key inputs simultaneously taking values which reduce the benefits and increase the costs relative to the base case.*
>
> *Based on the above analysis, we consider that the introduction of direct routing for mobile to mobile calls is likely to yield a positive net benefit."*

Vodafone strongly disagrees with this conclusion. But first, even if one were to accept that £26m is the best possible estimate of the potential benefit from M2M direct routing, is this sum sufficiently material to justify intervention?

Ofcom's mobile to mobile outcome

The underlying premise to Ofcom's interim conclusion is that a direct routing solution that will benefit the industry by lowering its costs will benefit the consumer since these savings will ultimately be passed on to them. Vodafone has no argument with the principle, but wonders whether, even before considering the accuracy of Ofcom's input, that the quantum of benefit derived by Ofcom is sufficiently material to merit intervention. The cost benefit analysis in the present consultation arrives at a "ten year" net present value (in 2009 terms) of £26m. This is generated from a solution build in 2011 followed by ten years of implementation, over the period 2012 – 2021. Strictly speaking this is not a ten year but rather a thirteen year period from start to finish. It thus requires a considerable degree of certainty of the estimates that are made on the levels of traffic and costs projected some distance into the future – as Vodafone shows in section 2 below at table 2.2, merely projecting a straight line growth in traffic from Ofcom's assumed 2008 starting point to its estimated 2021 end point, instead of the steep initial growth that Ofcom is estimating, reduces the value of the net present benefit by a third, when assessing on a ten year basis, and by a half on a seven year assessment.

Even if one assumes perfect knowledge and that therefore £26m is genuinely the achievable benefit for the consumers, is this sufficiently material to justify intervention? Over the thirteen year assessment period, this is £2m per year, or assuming four operators (in the event of network consolidation), £0.5m per operator per year. Given industry annual turnover of £15.4bn[3], this £2m represents only 0.01% of turnover. Is that actually a suitable case for intervention? We note that in the recent consultation on next generation networks Ofcom observed that:

> "*The industry is having to cope with uncertainty created by the current economic climate: greater costs of financing investments, technology risks around the future of telephony, and considerable technology and commercial risk.*[4]"

This too is a suggestion for restraint, not intervention and the consequent enforcement of industry investment that Ofcom's provisional conclusion would involve.

Removing perfect knowledge from the equation, and assuming that Ofcom's £26m positive result is only an approximation of the single real outcome, which might hypothetically be smaller or greater than this sum, there is the risk that intervention might cause a negative result or only an immaterial positive result. Given the uncertainty, in order for a £26m benefit over such an extended period to justify intervention one has to be very certain that the results are right and will not be "under-achieved" – but as Vodafone establishes below there is every reason to conclude that the £26m is not a mid-point expectation, but a very high outlier.

Given the considerable uncertainty of outcome, it is difficult to establish what value of apparent positive benefit might justify intervention. On 10th July 2009, Ofcom gave an initial briefing to mobile operators of their conclusions prior to consultation publication. In this presentation, the benefits of M2M direct routing were cast as £45m – £70m. This total, spread across the years of benefit, might have been capable of being construed as a sufficiently material sum. But in the brief discussion that took place at that time

[3] Total mobile revenues, per the Ofcom 2009 Communications Market Report, 4.2.4
[4] Ofcom, Next Generation Networks, 31st July 2009, paragraph 1.36

between Ofcom and the operators, it was evident that one particular call case that was already being directly routed had been inadvertently included by Ofcom within the scope of traffic for which savings were being calculated. Ofcom immediately recognised this, and in the consultation published on 3rd August 2009, this error was corrected, resulting in a reduction of the benefits to £26m. It is not clear how the £45m - £70m range had been calculated by Ofcom, and where precisely the equivalent to the single value of £26m lay inside this range. A simple adjustment however inside the spreadsheet model supplied to the operators with the consultation, eliminating the particular traffic from the scope of the saving produces an NPV of £58.3m, a value which is very close to the mid-point of the £45m - £70m range. If this is the correct value that Ofcom has calculated in early July then it suggests that the benefit was reduced by 55% by the recognition of this error.

Vodafone is belabouring this issue not to embarrass Ofcom, but to make two general points. Firstly, that a £58m benefit makes a far superior case for intervention than a £26m benefit, when looking over a very extended period, given the uncertainties of estimating values as far forward as 2021 in the context of the volatility of the mobile industry. In Vodafone's view, "only" a £26m benefit even if it were absolutely certain to be the minimum value of benefits that could be captured, is likely to be insufficiently material to justify intervention. Secondly, Ofcom's difficulty with forecasting indicates the volatility and uncertainty of the result – adjusting one cell in the spreadsheet as a result of five minutes of discussion has stripped out 55% of the apparent benefit. How much further adjustment might be necessary as a result of any investigation of this model?

As Vodafone shows below, a detailed examination of the inputs, assumptions and estimates of the model gives rise to the considered view that the benefits have been substantially overestimated and the costs most likely underestimated, such that the most realistic outcome from an implementation of a CDB based direct routing solution is that operator costs would be increased, not decreased.

Vodafone's evaluation of the mobile to mobile outcome

Vodafone devotes the whole of Section 2 of this response to an evaluation of the M2M cost benefit analysis. Our approach and conclusions are summarised below.

Vodafone's view is that Ofcom's assessment of its £26m as some form of reasonable mid-point of the possible outcomes is totally wrong. There are good reasons to believe that all of the inputs are wrong – under more realistic input values a negative result is obtained, suggesting that the implementation of a CDB based direct routing solution would most likely *decrease not increase* consumer welfare. In essence:

- Ofcom are estimating volumes of traffic and unit costs over the period 2012 - 2021. Over this period all values must be treated as estimates rather than sound forecasts;
- The volume of onward routed traffic that Ofcom have developed is not soundly based and results in a significant overestimate;
- The unit rates of saving are flawed so that they are unrealistically high; and
- There is every likelihood that the costs of solution build are underestimated.

In particular the conclusions on the future costs of onward routing (the product of volumes and rates) that are used to value the future benefits of re-routing are unsafe. Varying *either* volume *or* cost individually down to more realistic levels will produce a negative result in the cost benefit analysis.

Taking a view of the future volumes of onward routed traffic obviously involves much estimation, particularly when going so far into the future, as Ofcom has chosen to do by evaluating the benefits over a ten year period to 2021. Ofcom has created a very high forecast without allowing themselves any room for doubt. Their whole method is a series of approximations: taking a starting point of the proportion of the industry base that is ported, allowing this to grow by use of a model that uses a survey based estimate of the annual number of ports, when real data is available, to give a proportion of the total base that is ported across the period 2012 to 2021, multiplying this by the forecast of total mobile outbound traffic to get the total volume of calls to ported customers, and then discounting this by a further calculation to arrive at the volume of such calls that are onward routed. To derive a single forecast rather than a spread of outcomes from this method involves a totally unwarranted confidence in the accuracy of all these guesstimates. Unfortunately Ofcom's output fails the "is this a reasonable result?" test almost immediately.

Figure 1.1 below shows Ofcom's forecast of the future growth of ported customers.

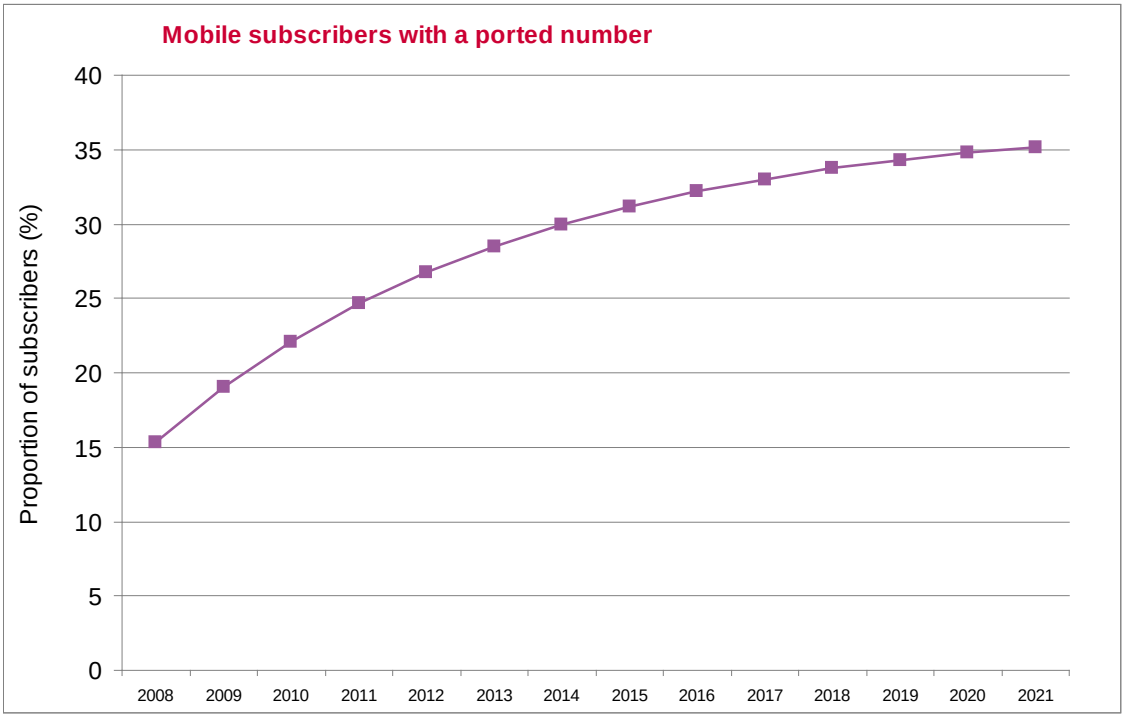

Figure 1.1: Ofcom's estimate of the growth of ported customers

The percentage of customers who are ported is estimated to grow from the base of 15.3% in 2008 to 26.8%, as table 2.16 shows, i.e. by 87%. But back-tracking into the past the method Ofcom uses to grow this proportion results in a zero proportion in the middle of 2006 – clearly therefore Ofcom's method cannot predict the past, so it cannot be expected to predict the future in a reliable manner. The biggest single problem is that the model is fuelled by a survey based view that every year 6.3% of all mobile customers port their number, when the real proportion taken from the actual porting

volumes (unaccountably not used by Ofcom) is closer to ✂%. Substituting this value into the model, and allowing for potential network consolidation (a factor Ofcom could not have predicted but which should not be ignored) gives a revised "recalibrated" growth rate as figure 1.2 below.

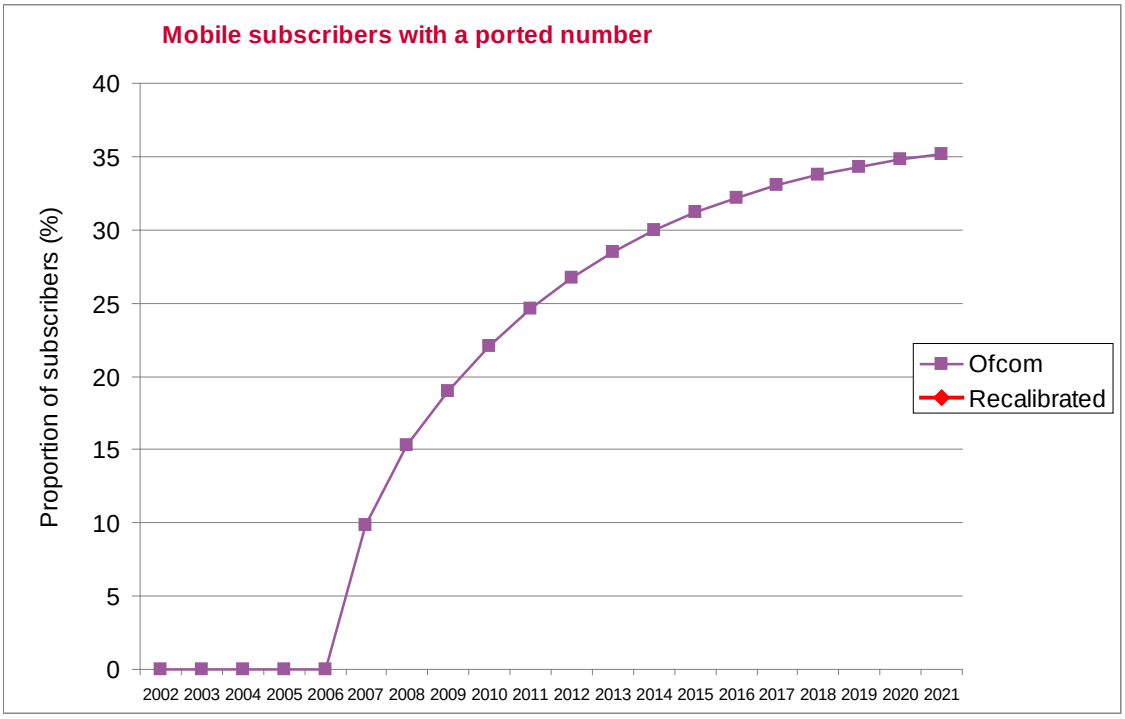

Figure 1.2: Alternative outcomes of ported customer growth (recalibrated redacted)

This revised path more accurately predicts the past and provides a more reasonable expectation of future trends, given the counteracting elements of stop-ports, un-ports and re-ports that Ofcom models. Purely to explore their impact, Vodafone assumes two intermediate alternatives, where the annual porting rate is ✂% or ✂% - we do not accept that the current rate of ✂% should be seen as a floor, but by this means are examining the sensitivity of the accuracy of Ofcom's estimates in the overall cost benefit analysis.

Ofcom also somewhat arbitrarily assumes that the proportion of total ported traffic that is directly routed is 50%, whereas a more reasoned view explained in section 2 suggests that it is more likely to be 45% to 37%, i.e. 10 - 25% lower. Putting these two sets of changes together gives a set of outputs, shown in table 1.2 below, that are, when applying Vodafone corrections to both, some ✂% to ✂% of the total volume of in-scope traffic that Ofcom is claiming benefits for over the period 2012 to 2021.

Volume of onward routed calls, as a % of the Ofcom base outcome i.e. 6.3% annual porting with 50% onward routed		**% of calls that are to ported customers**				
		A Ofcom 6.3%	**A1 Ofcom 6.3% with consolidation**	**C ✂%**	**D ✂%**	**B1 ✂% calibrated with consolidation**
% of traffic that is onward routed	Ofcom 50%	**100%**	✂	✂	✂	✂
	45%	✂	✂	✂	✂	✂
	37% post consolidation	✂	✂	✂	✂	✂

Table 1.2: Onward routed M2M ported traffic volumes under variant assumptions – as proportions of Ofcom's central case

When these reduced volumes are brought into the cost benefit analysis even at Ofcom's view of the cost per minute of onward routing, the impact is significant. As table 1.3 shows, even over a ten year appraisal period, very few solutions continue to have a positive NPV – one has to believe for example that Ofcom's 6.3% annual growth rate is very nearly right across every year from 2009 to 2021 to get to a positive result, despite it being ✂ the actual rate.

£m NPV of net benefit over ten years, multiplying volumes by Ofcom's view of unit rates		**NPV of gross savings**				
		A Ofcom 6.3%	**A1 Ofcom 6.3% with consolidation**	**C ✂%**	**D ✂%**	**B1 ✂% calibrated with consolidation**
% of traffic that is onward routed	Ofcom 50%	**26.0**	21.1	7.4	**-3.2**	**-14.8**
	45%	17.9	13.5	1.1	**-8.3**	**-18.8**
	37% post consolidation	4.9	1.3	**-8.8**	**-16.6**	**-24.9**

Table 1.3: Alternative £m NPVs of net benefit over ten years, varying traffic volumes only

But Ofcom's view of the *cost* per minute of onward routing is also by no means sound. It is in two parts: a switching cost, taken as in 2007 from the LRIC termination model, and a new element, transmission, which contributes one third of the costs. The latter is based on the assumption that operators acquire their interconnect links from BT at their wholesale rates, when there are in reality significantly cheaper means. The former is taken (not in the most logical manner) from the old termination model, built for the 2007 - 2011 charge control, and is not necessarily fit for purpose for the 2012 – 2021 period, not only since a new termination cost model is in preparation, but also since the termination model is currently an average cost calculation, where a more incremental

approach is arguably needed for the present issue. There is every expectation therefore that Ofcom has overstated both the transmission and switching unit costs. As explained in detail in section 2, Vodafone has derived a simple matrix of possible reasonable unit costs that when applied to the unchanged Ofcom traffic volumes significantly erode the Ofcom base NPV of £26m as follows:

£m PV over 10 years	**Transmission savings**		
Switching savings:	**Ofcom**	**50%**	**15%**
Ofcom	**26.0**	**15.0**	**1.8**
MTR model	**21.9**	**10.8**	**-2.3**
MTR high scenario	**13.2**	**2.1**	**-11.0**

Table 1.4: Potential net benefits over ten years from varying unit rates alone

Again, one has to believe that Ofcom are very nearly right on the unit rates to get a positive NPV, when there are ample grounds for believing that they are not.

Putting together the overstatement in both volumes and unit rates has a dire impact on the cost benefit analysis. Table 1.5 shows what happens when the two are overlaid – even over ten years, only one of the alternative volume/rate scenarios has a breakeven value, and that is one that as explained in section 2 only relaxes Ofcom's input assumptions very slightly. If one takes the view that Ofcom are rather more wrong than that, then the size of the operator loss from direct routing implementation rapidly moves into the tens of millions of pounds.

10 year NPV of net benefits		**Estimates of unit cost of onward routing**				
£m		**Ofcom**	**A**	**B**	**C**	**D**
	Ofcom	£26.0m				
Volume	**1**		£0.6m	**- £6.7m**	**- £10.4m**	**- £17.7m**
scenarios	**2**		**- £9.4m**	**- £15.4m**	**- £18.4m**	**- £24.4m**
	3		**- £17.1m**	**- £22.1m**	**- £24.6m**	**- £29.6m**
	4		**- £23.8m**	**- £27.9m**	**- £30.0m**	**- £34.3m**
	5		**- £30.8m**	**- £33.9m**	**- £35.5m**	**- £38.7m**

Table 1.5: Calculation of net benefits under varying volume and unit rate assumptions, after deducting Ofcom's view of costs

But this is over ten years. Vodafone argues in section 2 that a more reasonable evaluation period is no more than seven years (which in reality encompasses the period 2009 to 2018 so arguably is a ten year cost benefit analysis anyway). Table 2.37 shows that over seven years, even option A1 produces a negative result, of -£3.7m.

But even this result is obtained by assuming that Ofcom's costs estimates are correct – unfortunately because of their source, there is every reason to believe that are light. Assuming a 10% increase in the costs of the solution build would reduce ten year NPV by a further £✂m.

When the problems of all of these inputs are overlaid, but in particular those of the benefits, it is clear that Ofcom has to be very right in its estimation of all inputs for even a very small positive result to be obtained – but there is very strong evidence that Ofcom is substantially wrong. The impact of the underestimation of implementation costs is less sensitive – its main impact is to reduce the freedom of movement of a positive result. In effect it further increases the degree to which Ofcom's savings estimates must be held to be absolutely right in order to reach a positive result.

Vodafone's review of the cost benefit analysis, detailed in section 2, concludes that overall it is very hard to believe that a positive outcome can be obtained from a CDB solution – in effect in order to produce a positive result Ofcom have to be very right on all grounds, when there are sound reasons for believing they are wrong on most.

But even then there is a major flaw in Ofcom's methodology. Having concluded that a universal direct routing solution was never going to cost out, Ofcom should have considered the design of the alternative lesser solutions, M2M only, F2F only and so on to see if a lower cost alternative to the generic CDB solution (in particular for the M2M call case) could be developed. We observe Ofcom's expectation that the M2M participating operators should be limited to the existing five (or possibly four after network consolidation) major operators. This immediately suggests that a lower cost solution than the CDB must be possible.

Clearly if costs were lowered, a higher positive net benefit or smaller negative outcome would result, so if Ofcom were to be right that £26m is the correct level of benefit under a CDB solution, then a higher level of benefit could be achieved under a lower cost solution. Ofcom's failure to consider this is inexplicable. Given the overstatement and general uncertainty of the level of benefits, we do not know if such an alternative solution can be constructed such that a positive result is assured, but at least it offers a much higher prospect of success than a CDB solution, where failure is certain.

Ofcom assessment of policy options

In the light of its cost benefit analysis, Ofcom considers four policy options:

- Option 1: do nothing, i.e. allow industry to decide on routing on its own;
- Option 2: encourage an industry led initiative into direct routing;
- Option 3: change the routing incentives for ported traffic;
- Option 4: mandate direct routing.

Ofcom rejects 1 and 3, expressing a desire that 2 might come about over a fairly short time period, but with the backstop of 4, mandating direct routing. If one were to accept that substantial benefits could accrue to the operators by the commencement of direct routing, then option 2 followed by 4 might be judged an appropriate set of outcomes, but since this is not proven, Ofcom's conclusions cannot stand.

Option 1 – allow industry to decide routing on its own

Taking each of these in turn, in examination of option 1, Ofcom considers whether, given that direct routing is more cost efficient, industry is likely to spontaneously develop and implement its own solution, or whether there is more likely to be a co-ordination failure, meaning that the benefits that Ofcom sees are unlikely to come about. We do not necessarily see that such a co-ordination failure is axiomatic. Clearly in the present situation where a CDB central routing solution does not provide benefits to the industry and hence to the consumer, the absence of a MNO consensus to build such a solution is not a co-ordination failure but a rational act. Ofcom cannot thus infer a co-ordination failure from the lack of direct routing to date.

If one were to accept Vodafone's conclusion in section 2 that whilst a CDB solution will never produce a favourable result it is possible to see that an alternative non-CDB solution might be capable of being engineered at a cost below the floor of reasonably anticipatable benefits, then it is clear that one thing that has inhibited the prior emergence of such a solution is effectively the "planning blight" under which the routing of ported traffic has been placed since at least 2006 as a result of Ofcom's prior attempts at intervention.

Now that a universal CDB solution is, we must presume, a thing of the past, the way is open for a more objective viewing of possibilities for direct routing amongst the limited set of potentially participating mobile operators, once a proper assessment of the likely costs of onward routing over future years is made. Assuming that a solution with a positive result could be found, we agree that co-ordination would be required to achieve a change; this may benefit from regulatory facilitation if not formal intervention. Operators will have a need for clarity, confidence, regulatory certainty etc, the absence of which might otherwise inhibit action.

Ofcom makes the suggestion that termination rate asymmetry is likely to "*place a strong financial incentive on certain operators to reject any moves towards direct routing*[5]". Vodafone does not agree with this. Rate asymmetry may in the past have influenced outlooks, but has never been relevant at an industry level in the CBA. On a forward looking basis asymmetry is now largely extinct. We note that in 1.18 Ofcom states that as a result of the CAT decision "*the difference between average mobile termination rates of the MNOs will reduce to 0.3p by 2011 from 1p currently*". This is not quite accurate: in fact from 1st April 2010 *all* four major operators will have the *same* termination rate (this was actually an Ofcom decision made in March 2007) and are currently actually only around 0.1p apart. It is only H3G who will have a different annual termination rate, of 1p higher now and 0.3p higher from April 2010. The four major operators have stronger porting interactions between themselves than with H3G, so the proportion of total ported traffic where termination asymmetry is and might be relevant must be relatively small. There is every expectation that any asymmetry will rapidly disappear altogether thereafter in the prospective charge control beyond 2011.

Would there be co-ordination failure if incentives are clearly aligned for all operators? It is possible, but in Vodafone's view there is no basis as yet for Ofcom's stronger conclusion that such failure is likely. Ofcom's "the sooner the better" thesis is also questionable. The objective for the industry and the regulator is the same - to maximise benefits. This does not necessarily equate with any arbitrarily short lead-time forcing introduction of a solution if this would inflate industry lifetime costs – for

[5] Consultation 5.11

example by interfering with overall asset replacement and development strategies of operators. Clearly ported voice traffic is only a relatively small part of the traffic that each operator has to carry and should not dictate their overall switching and transmission strategy. Assuming that a positive cost effective result is possible, there is clearly a trade off which, if all MNOs have a stake in achieving net benefits, MNOs are likely to be better placed to judge than Ofcom.

Option 2 – industry led direct routing with Ofcom's assistance

Vodafone cannot see much of a difference between options 1 and 2, providing there is a consensus between Ofcom and the mobile industry on the financial appropriateness of direct routing. At the moment this does not exist, and Vodafone believes that Ofcom is wrong to suggest that industry benefits can be achieved from CDB direct routing. At present therefore option 2 would not be in the best interests of the mobile industry or its customers.

Vodafone has outlined above the necessary steps to discover whether it is possible that a substantially lower cost solution than the CDB option envisaged by Ofcom could yield net benefits. If this was to be found, and a consensus was to emerge on its acceptability, then in principle, Vodafone would support a solution that provided sufficient benefits to make it worthwhile. As noted, however, such a solution requires co-operation, so Vodafone cannot speculate far about the realistic prospects of this outcome prior to discussion.

In this light we do not think that Ofcom's proposed timetable of spring 2010 for 'commitment' plus 'plan' is a realistic one, given Vodafone's view of the current state of the cost benefit analysis. As discussed above, the first step would be to identify the likelihood of a sufficiently low cost solution to yield a worthwhile benefit based on a more realistic view of potential benefits. Only if a solution emerges that is sufficiently positive for a quorum of participating operators is any further work on implementation and a framework for mutual commitments likely to be justified.

Ofcom asks in connection with option 2 "w*hat steps do you consider should be taken to ensure that any industry solution that emerges does not foreclose the opportunity for other mobile operators to participate in the short term or longer term?*[6]"

We consider this to be a premature question at this stage. Only if or when a solution can be arrived at that generates a positive benefit for industry and the consumer can this question be addressed, in the context of the particular solution design. Clearly what is under consideration is merely a routing solution, not a porting solution, so there is no suggestion that non participating operators will not be able to port. The pragmatic routing design point that smaller operators tend to use transit operators rather than employ extensive direct interconnection until they reach sufficient levels of traffic with a particular operator would probably also apply in the case of the routing of ported traffic.

Discussion of the potential participation of additional operators can be undertaken once the future direction becomes clear. The need for consistency with competition law is taken as given. Clearly any solution design might need to be able to accommodate more players, but not in a way that founders should bear a disproportionate share of the costs of expansion. There is obviously no reason for founders to exclude others since in principle extension would bring the potential for greater industry benefit in

[6] Question 5.4

terms of additional in-scope traffic volumes (by avoiding some existing onward routing by the participating operators) – however if the implementation costs of solution extension were greater than the benefits arising, there would be an overall industry loss, not a benefit from extension.

Option 3 - changing the routing incentives for calls to ported mobile numbers

Ofcom explains the rationale behind option 3 as:

> *"In previous sections we identified the reasons why incumbent mobile operators have not to date moved to direct routing. In this sub-section we describe an option we have considered around changing the routing incentives in order to try and encourage individual operators to decide whether and when to move to direct routing. We also explain why we do not consider this option to be an effective means for resolving the issue of productive inefficiency caused by onward routing*"[7].

Vodafone does not see this investigation as fruitful. Having failed to establish that direct routing is currently more cost effective than onward routing, any attempt to alter routing incentives to artificially encourage operators to move away from the more cost effective method cannot be seen as sound policy.

Any discussions therefore on the likely success or otherwise of these suggested changes in incentives to encourage the move away from onward routing is premature. Only if it were to be clearly established that it will be more cost effective in the future for operators to route traffic directly, and that there are sufficient benefits to justify the effort, and that operators have failed to co-operate on implementing a solution would it be sensible to entertain a discussion of whether there are alternative ways to incentivise operators to implement the solution.

Whether it is appropriate to change the routing incentives independently of any putative impact on routing behaviour is a different issue that Ofcom does not address. Vodafone is happy for a discussion with Ofcom to take place on the relative merits of alternative ported number routing cost strategies, but does not see that this consultation is an appropriate vehicle for this. If in due course mobile operators are able to find and implement a cost effective direct routing solution for M2M ported traffic then a discussion may be appropriate at that point on the pricing methodology for the *remaining* volume of onward routed traffic.

If in the alternative it is determined that there is no current or foreseeable way in which direct routing of M2M ported traffic can be implemented in a manner that the industry and consumer will benefit, then onward routing must be seen at least as a semi-permanent feature of the mobile, as well as the fixed, industry. Any review of charging arrangements would then have to be looked at in this context.

Option 4 – mandated direct routing

Ofcom considers that the mandated option 4 would be a backstop to option 2, so if industry failed, with Ofcom's encouragement, to arrive at a direct routing M2M solution, then a regulated solution should be imposed. Since Vodafone believes that a CDB

[7] Consultation at paragraph 5.25

M2M direct routed solution would impose additional costs, not benefits on the mobile industry, Vodafone entirely rejects this option. The next stage, as discussed above is to determine whether any direct routing solution between the potentially participating operators can be developed that can be seen to be reducing rather than increasing industry costs. Once that has been determined, the advisability of options 1 to 4 can be revisited.

Next steps

Ofcom's view of the next steps depends on whether industry chooses option 2 and commits to an industry-led solution or whether in the absence of this Ofcom invokes option 4 and mandates direct routing.

- Under option 2 industry would be expected to submit an agreed project plan with public CEO commitment by spring 2010 for a solution to be in place by at latest during 2012.

- Under option 4:

    - An independent expert would be brought in to be "*helpful in enabling industry to develop, agree and document a provisional technical specification which would provide for mobile calls to ported mobile numbers to be directly routed*[8]".

    - This expert would be appointed once Ofcom has received and considered responses to the current consultation.

    - The expert would be given three months to finish this work, and operators a further three months to derive cost estimates from the specification and submit them to Ofcom.

    - Finally "*once industry has submitted its cost estimates to Ofcom and, assuming the benefits of direct routing continue to yield a positive NPV, Ofcom will decide if there is a case for mandating direct routing and will then proceed to implementing the necessary changes to GC18 as appropriate*.[9]"

In Vodafone's opinion all of this activity is premature. Given that Ofcom's assessment of the future costs and volumes of onward routing is unsafe, a direct routing CDB solution cannot be said to provide a favourable outcome, and therefore Ofcom cannot suggest that the imposition of one via either option 2 or option 4 would be in the best interest of consumers. Whether a lower cost solution can be developed that would provide a favourable result is an open question.

Before embarking on any commitment to operator investment (or expecting a voluntary one from the operators) therefore Vodafone suggests two key next steps for Ofcom:

- It informs the operators that they are freed from the straight-jacket of a CDB solution and invites them to sit down together to investigate what solutions

[8] Consultation at 6.13
[9] Consultation at 6.19

might be possible given the very limited number of suggested participant operators, and build up a picture of indicative costings and timings.

- It has another go at estimating the future costs of onward routing, in terms of unit costs and possible volumes. But given the uncertainty inherent in estimation of these values for some extended period, Ofcom should focus on establishing as far as is possible a likely lower reasonable bound of potential savings per year.

As a first stage we would suggest that the potential minimum savings be derived (and agreed with operators), since this would indicate a ceiling of cost to which operators could work in designing solutions. If it became readily apparent that no solution was possible within the cost constraint, then the volume of wasted scarce network design resources would be minimised.

The combination of the two work streams would result in a cost benefit analysis that would suggest the likely minimum benefit or loss from implementation. Providing there was some form of consensus as to whether the cost benefit analysis result indicated a need for change, Ofcom could then proceed down its joint track of option 2 backed up by option 4, or in the alternative declare that there was no reason to implement a direct routing solution, as it has for all other porting call cases.

Section 2 - Overview of Ofcom's cost benefit analysis

Summary

Whilst the overall cost benefit analysis constructed by Ofcom is on the face of it relatively complex, as a result of the need to accommodate the alternative scenarios of implementing direct routing (fixed and mobile, all fixed, all mobile, mobile to mobile (M2M) etc, each individual scenario is straightforward, involving four basic components:

- The initial capital cost of constructing and implementing the particular direct routing solution;
- The ongoing opex costs of operating the solution;
- The unit rate of saving on a per minute basis in a given year of avoiding onward routing;
- The volume of calls in a given year that are onward routed and that could be directly routed.

The sum of the first two points becomes the costs of the solution, and the product of the last two represents the savings that could be achieved from the solution implementation. The costs and benefits are then assessed over a varying number of years post implementation (Ofcom uses both seven and ten in the consultation document) and discounted at the industry cost of capital to generate a net present value of benefits in 2009. Implementation build is estimated to occur in 2011, and thus the benefits commence in 2012, terminating in 2018 for the seven year version and in 2021 for the ten year. Thus the latter actually encompasses the period from 2009 to 2021, a thirteen year period, and the seven year benefit version a ten year period from 2009 to 2018.

Vodafone in this evaluation focuses on the M2M direct routing scenario given that this is the only one that Ofcom is suggesting produces a positive PV and hence is the only one worthy of implementation. The cost benefit analysis, as constructed by Ofcom for the M2M scenario, looks as follows on a year by year basis:

£m	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Savings	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Costs	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Net	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
PV 2009	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Cum PV	✂	✂	✂	✂	✂	✂	✂	**16.3**	✂	✂	**26.0**

Table 2.1: Ofcom's basic M2M cost benefit analysis

Once the solution is implemented, the net undiscounted beneficial flows are calculated at around £✂m per year (with a decrease in the last three years as replacement capital is incurred but is accounted for on an annualised basis). It can be seen that the Ofcom M2M outcome becomes positive in less than ✂ years of operation, and that over a ten year period a £26m positive benefit is obtained for the industry, that may then be passed on to the consumers. One obvious point that arises is the degree to which a £26m benefit over 10 years, or £2.6m a year, or £0.5m a year per operator can be considered to be sufficiently material, in the context of other areas of investment where potential consumer benefit is more clear cut. This point has been considered in Section 1 above.

It is necessary to evaluate the provenance and reliability of all of the inputs to the M2M cost benefit analysis. It is immediately noteworthy that the reason the result turns out positive so quickly (✂) is that the volumes of onward routed traffic ramp up significantly between 2009 – 2012; they rise from 5.1bn in 2008, the "actual" starting point, up to 9.5bn in 2012, the first year of implementation and then rise much slower over the next ten years to 14.6bn in 2021. Assuming a flatter and more even rate of growth in traffic would mean a much longer period before payback. For example, straight-lining the onward routed traffic increase from the 5.1bn in 2008 to the 14.6bn in 2021 would give a significantly revised set of benefits as shown in table 2.2 below.

£m	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Smoothed onward routed volumes billion minutes	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Savings	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Costs	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Net	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
PV 2009	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Cum PV	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂

Table 2.2: Cost benefit analysis with smoothed volumes

Breakeven is delayed by a further ✂ years, and the total quantum of assessed net benefit falls by a third – after seven years the net benefit is halved and still in single figures: one needs all of the ten years of assessment to derive a measurable net benefit from this version of the cost benefit analysis. Clearly therefore the issue as to whether this significant increase in traffic volumes is justifiable is an obvious area of focus.

However it must be emphasised that a M2M-only implementation is a partial solution for mobile terminating traffic that is currently onward routed, in that only the five (or possibly four after consolidation) major mobile network operators would be obliged to participate in direct routing[10]: fixed operators and any new mobile operator would be

[10] Those mobile operators on whom the obligation of direct routing would be laid are termed in this document "the participating operators"

under no such obligation, with their outbound traffic to mobile networks being allowed to be onward routed. So a call originating on a fixed network to a ported mobile customer would continue to be onward routed, as would a call originating on an out of scope small mobile operator[11] This position has multiple implications:

- Participating mobile operators would have to continue to operate onward routing for calls originating on the fixed and non-participating mobile operators, as well as operating direct routing for calls originating on their own network, potentially involving duplication of costs and processes.

- Thus each participating mobile operator will receive from another participating operator a mix of directly routed and onward routed calls to ported customers.

- There will be the need to be able to distinguish and correctly account for these different traffic flows.

- Given the legitimacy of onward routing when it is fixed originated (or from a smaller mobile operator) and the fact that mobile operators pass some of the traffic between themselves via transit operators, it may be necessary to build controls to ensure that only legitimate onward routing of traffic occurs. It is not evident that this potential requirement has been costed by Ofcom. In this connection it might be possible to investigate whether if direct routing is imposed on the participating operators it is appropriate to consider the onward routing charging methodology (i.e. the DCC at present) to see if there is a way to make M2M onward routing uneconomic for participating operators and thus eliminate the need for policing.

- This point is complicated by the fact that there may be occasions when onward routing by a participating operator may be legitimate or at least necessary from a practical point of view, for example on the day of porting, or as a result of some network problem.

- Under the previous Ofcom consultation it was envisaged that all communications providers needed to be able to exchange information on ported numbers. If under the present proposal the number of participating direct routing operators is limited to a virtually closed group of five (or four) then there are solution design implications in that it is not so clear that a central hub/CDB/bureaucracy is actually needed when such a limited number of operators are participating. This will have implications for the cost of building, implementing and running the most cost effective solution to the issue at hand. Obviously benefits are maximised when costs are minimised – therefore one needs to be absolutely clear that if a solution were to be mandated, it should be the lowest cost solution.

Vodafone's review in the sections below starts with evaluating Ofcom's calculation of the savings opportunity from direct routing, initially looking at the calculated unit rates and then subsequently at the likely volumes of onward routing that could be expected to be re-routed before proceeding to the assessment of the costs of the solution implementation.

[11] This would apply even in circumstances where the originating number on the out of scope mobile operator was in the number range of a participating mobile operator, i.e. had ported in from that operator.

An overall initial point needs to be made however that all the projections of future costs and volumes are inevitably just estimates, made over an extended period, in fact beyond the next decade, up to 2021. Where the issue before Ofcom is a simple binary decision of yes, implement direct routing versus no, do not implement it, a thorough investigation of the likelihood of alternative values of savings and costs, and hence alternative net results should be undertaken to be certain that the wrong decision is not being made, i.e. that Ofcom's intervention might lead to network costs being higher than they would be otherwise, and thus might lead to the passing of additional costs on to the consumer, rather than savings, as Ofcom is hoping.

Whilst the spreadsheet that calculates the costs and benefits does contain significant sensitivity adjustments, there is little evidence in the text that much of such analysis has been conducted – Ofcom's figure A5.11 contains the somewhat perplexing results that some positive sensitivities decrease the overall benefit, and vice versa, and there is an arbitrary assumption that Ofcom's input values and the resulting outcome represent a mid-point, with the range of possible parameter variation limited to plus and minus 20% around this point. Ofcom concludes in A5.103 "*we do not rule out the possibility of a negative NPV if there was substantial downside variation to several key inputs simultaneously. However we consider that scenarios that result in negative NPVs are less likely, as they rely on all of the key inputs simultaneously taking values which reduce the benefits and increase the costs relative to the base case*". In Vodafone's view, as we show below the "base case" is improperly located and Ofcom's conclusion is unwarranted.

Period of evaluation

In assembling the cost benefit analysis, Ofcom has as table 2.1 above shows assumed an implementation date of 2012, with a solution build in 2011, and considered either seven or ten years of post implementation outflows of cost and inflows of savings, discounting all of these by a cost of capital of 11.5% to produce a net present value in 2009. The headline result of £26m is obtained from the ten years of benefits; as table 2.1 above shows the NPV over seven years is £16.3m.

Vodafone has no particular problem with the use of 11.5%, but notes that some cost benefit analyses use a higher hurdle rate than this to deal with uncertainty and risk. A bigger issue is whether a ten year payback is really appropriate. Ofcom in its evaluation of the cost benefit analysis appears to be agnostic between a seven and a ten year evaluation: Ofcom's table 1 that summarises the central outcomes for each direct routing traffic scenario shows both, and the subsequent reporting of the sensitivity analysis of the M2M solution in paragraph 4.21 also discusses results over both seven year and ten years.

It must be remembered that in fact both seven and ten year scenarios are misnamed since the ten year outcome refers to the 2009 present value of an implementation in 2011 and benefits and onward costs from 2012 to 2021, and thus is really a thirteen year evaluation, whereas the seven year case covers the period up to 2018 and thus arguably is the ten year outcome.

There are several factors relevant to the appropriate period in the analysis:

- Uncertainty will increase with time – the values for the last few years must be taken as little more than guesstimates.

- A shorter period may be more reflective of the asset replacement cycle. We note that CDB central assets have been assumed by Ofcom to have only a seven year life, and thus the cost benefit analysis includes in years 8, 9, and 10 an allowance for replacement assets, but not at the real level of cash outflow that this will involve in year 8. Instead an annualised replacement capital payment value has been made in each of years 8, 9, and 10. If annualised asset costs are to be considered for these particular assets, the question arises as to why this is not done in every year for all assets, in which case there is no case for using any particular number of years over which to assess the benefits.

- The mobile industry generally uses a shorter period for any project appraisal as per the arguments made in the appeal against the previous MNP decision[12].

- In the last statement on MNP, November 2007 Ofcom previously used a cost benefit analysis that overlaid a six year benefit assessment for fixed originated and terminated porting on top of a nine year benefit assessment for mobile to mobile porting. An extension to ten years in the present circumstances is excessive.

There is no single right answer – Vodafone will return to judging the relevance of this later by evaluating the cost benefit analysis using not only Ofcom's extended period of ten years, but also seven and five years to see if a significantly different view emerges from this variable alone.

[12] For example Case 1094/3/3/08, Intervention by O2. Witness statement of Lawrence Wardle 16th May 2008

Ofcom's calculation of the level of savings

Ofcom derives its view of the savings from direct routing by multiplying the assessed volume of minutes that are currently onward routed (but could be switched to direct routing) by the unit cost per minute of onward routing. The model assumes implementation of direct routing for mobile to mobile traffic in 2012, and the cost benefit analysis considers the net benefit over an up to ten year period, so Ofcom's model requires the estimation of the unit rate of saving and the volume of re-routable traffic for the period 2012 – 2021. Ofcom's projections therefore require a view of likely unit rates and traffic volumes up to 14 years away from the base year of 2008. If that is not enough uncertainty, the starting point of volumes and to a lesser extent rates in the base year are not absolute and known values, but are the result of further estimations and calculations, so the 2012 – 2021 values adopted by Ofcom are the result of projections of estimates. Substantial scepticism must be attached therefore to any forecast of traffic volumes and unit costs 2012 – 2021.

Vodafone's review of the specific values that Ofcom has adopted looks at the provenance of Ofcom's estimates and calculations. Its primary focus is on whether Ofcom's estimates are sufficiently soundly and reasonably based to justify Ofcom's interim view that mobile to mobile direct routing should be mandated. There are two points at issue:

- How right must Ofcom be in their view of unit rates and traffic volumes in order to retain a positive result in the cost benefit analysis? Or to put it another way how sensitive is the positive result to changes in unit rates and traffic volumes?

- How reasonable are the assumptions and calculations that Ofcom has made in order to derive their view of unit rates and traffic volumes? Are there grounds for believing that some of the assumptions may be wrong, or unlikely?

In this light, Vodafone examines Ofcom's view of the unit cost of onward routing and the likely volumes of onward routed traffic that could be directly routed in the sections below. Our overall conclusion is that Ofcom needs to be very right in their assumptions to maintain a positive result: but there are in fact very good grounds for deducing that the values of unit cost and volume are sufficiently incorrect for the 2012 – 2021 period such that a negative rather a positive result is by far the more likely outcome from the cost benefit analysis (assuming Ofcom's view of costs).

In its review below Vodafone first considers the likely unit costs of onward routing 2012 – 2021, and then looks at Ofcom's view of re-routable traffic volumes, i.e. the volume that is estimated to be onward routed over this period.

In this consultation the overall unit cost of onward routing is made up of two separate elements, switching and transmission. This is unlike the previous consultation cycle, where only one cost element, that of switching, was used to derive unit costs.

Savings from direct routing – unit cost of switching

The switching cost element is fundamentally derived from the same source as in 2007, an Analysys Mason study, which is based in turn on an extract from the Ofcom mobile termination model built for the mobile termination statement of March 2007. This study produced a cost of switching for the average 2G/3G operator in 2007/08. In the Ofcom 2007 mobile number portability consultation process this value was adopted unchanged for all future years. Vodafone in its successful appeal against the mobile number portability statement suggested a more reasonable way in which this rate might be deemed to vary over time for the industry in total, related to the mix of 2G and 3G traffic and the underlying cost trends contained in the source termination model. It appears that Ofcom has more or less adopted the Vodafone method in this consultation.

The principal difference between the Vodafone suggestion of 2007-08 and the present Ofcom-implemented version of it relates to the fact that Ofcom has very reasonably taken into account the CAT/CC decision in 2009 resulting from the recently concluded termination appeal that the input value of 3G spectrum should be set so that 2G and 3G termination costs should be identical in 2010/11 (here modelled as 2010). As a result of this the level and the slope of the 3G unit rate of switching cost have changed as can be seen from table 2.3 below, which is a comparison between the annual percentage reduction calculated by Vodafone from the 2007 version of the model and the reduction derived from the same model with the 3G spectrum input as amended by the CAT/CC.

3G Termination rate cost reduction year on year	**2008 %**	**2009 %**	**2010 %**	**2011 %**	**2012 %**	**2013 %**	**2014 %**	**2015 %**	**2016 %**	**2017 %**	**2018 %**
2007 model	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
2009 version	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Difference	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂

Table 2.3: 3G termination rate reductions, year on year from the Ofcom MTR model

So the rate of year on year price decrease has accelerated in the 2009 update[13]. But the source of this change, i.e. the fact that the 2007 model's inputs have been adjusted to reflect the fact that the imputed fixed cost of 3G radio spectrum has been reduced by the CC/CAT, has nothing to do with the cost of switching, which is the only element of the termination model that is relevant to the assessment of the cost of onward routing. This suggests to Vodafone that whilst it was us who in the first place suggested as a matter of convenience that the overall rate of MTR reduction be adopted as an approximation of the price change in switching costs, it is in fact a rather poor proxy for it.

[13] For years beyond 2018/19, Ofcom assumes a zero price reduction, despite taking three years of further activity into the CBA – it is not clear why it has done this, since the MTR model projects values that change for these three years.

There is in reality a superior approach to the issue of extending of the Analysys 2007/08 method to produce results for switching costs for all the required years, namely incorporating the Analysys 2007/08 methodology into the termination model itself, so that results for all years can be can be calculated in and read directly from the termination model. The Analysys document reports results in 2007/08 (in the 2006/07 prices of the model) of 0.215p for 2G and 0.106p. Whilst there was insufficient time available during the 2008 appeal process to fully understand the basis of this calculation, Vodafone has been able to subsequently replicate it for 2007/08, as a calculation embedded inside the MTR model. Once one year has been calculated inside the model using the Analysys method, it is readily possible to extend the calculation across all relevant years, i.e. to use the MTR model itself to generate the switching costs for all years, rather than use some method of approximation of change over time, such as the overall rate of termination cost decline, which is impacted by a much wider set of changes than those related to the cost of switching alone.

In essence Vodafone has followed the somewhat cryptic clues left by Analysys, in particular in exhibit 4.3 of their July 2007 document[14]. Vodafone has broken down the calculated overall termination rate recovery for 2G and 3G respectively for each year into their constituent asset elements (by combining for each element the network element output for each year with the economic depreciation cost per unit output, and uplifting by the LU mark-up from the service costing sheet of the economic depreciation spreadsheet). Then for the asset elements identified by Analysys in their exhibit 4.3 as relevant to onward routing, 2G and 3G, Vodafone has applied the resource weightings appropriate to onward routing as estimated by Analysys, ✂ and so forth. The sums of the products of these calculations give a 2G and 3G onward routing cost for each year inside the termination model that come back to the values reported by Analysys. This calculation can then be readily replicated inside the model across all years.

Whilst not endorsing the onward routing method adopted by Analysys, Vodafone believes that this revised method of directly calculating the Analysys result from the termination model for all years is the most robust and reliable way of extending the Analysys single reported instance to all necessary years. The only remaining external adjustment required is to restate the 2006/07 prices of the MTR model into the 2008/09 prices used in the present consultation – using the MTR RPI methodology, this is a 6.7% uplift over the two years.

The calculation from the termination model is worked through in table 2.4 below:

[14] Analysys – Calculation of the costs of donor conveyance, 20th July 2007

ppm	2009	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Model output 2G	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Model output 3G	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
2G uplifted by RPI	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
3G uplifted by RPI	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
2G % for 2G/3G operator	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
2G/3G operator cost	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
3G operator traffic share	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Market average cost	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂

Table 2.4: Calculation of average switching cost

Table 2.5 below gives the results of this exercise in comparison with Ofcom's extrapolation of the unit rates over the period 2012 – 2021.

ppm	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Ofcom extrapolation	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Results taken directly from the MTR model	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Differences %	-3.2%	-4.4%	-5.4%	-6.6%	-7.8%	-8.8%	-9.9%	-14.0%	-15.9%	-16.5%

Table 2.5: unit cost of onward routing - switching

The differences in table 2.5 in themselves are obviously relatively small in 2012, but they do increase over time. Clearly they will have a significant impact on the overall savings particularly in the later years given the very large traffic volumes of ported traffic calculated by Ofcom.

But there is a broader point that relates to the source of the Analysys calculation, which is, as described above, the 2007 mobile termination model, which was developed for the purposes of termination rate charge controls for the period of April 2007 - March 2011, a period which obviously expires *before* the proposed implementation of direct routing in 2012.

A new consultation process has been underway for some months on the issue of appropriate termination rates for 2011 - 2015. One of the issues under debate is whether the existing LRIC+ modelling methodology should continue to be used, in part arising from the EU's discussion on the nature of the increment and the degree to which fixed and common costs are recoverable. The overall approach of the termination consultation process is described by Ofcom in paragraph 1.12[15]: "*with the possible exception of deregulation, all of the options identified would lead to a reduction in mobile termination rates. This raises a further question about whether we should adopt a policy of reducing termination rates as far and as fast as we reasonably can, within the boundaries of sound economic policy.*" At the very least, in the event that the LRIC+ model were to continue in use for termination rate setting, as Vodafone is arguing is the correct decision, the termination model will be refreshed with revised volumes and potentially other changes.

If the 2007 MTR model is not going to be used unchanged after 2011 for the purposes for which it was designed, it is highly questionable as to whether it should be used as a component of a largely different regulatory decision for 2012 - 2021. The relevance of the 2007 MTR model to deriving the switching costs of onward routing in 2012 - 2021 is therefore somewhat compromised – it is not clear that it will remain fit for purpose.

The termination review process is ongoing: Ofcom has arranged a meeting with operators to *"set out our views on assumptions that may impact the cost model"* and has announced that the next termination consultation will be published in Q1 2010. The degree to which the outputs of any revised termination model are likely to be different for the 2012 - 2021 period from the old model is unknown: a far clearer view of the likely level of switching costs generated by the termination model could emerge as the current termination consultation process develops over the coming months. It would be somewhat awkward if the overall positive case that Ofcom is making in the current consultation based on the old model were to be reversed into a negative result as a result of the publication in due course of the prospective new termination model.

It is impossible at present to predict the degree to which the 2007 MTR model will prove to be inaccurate on the level of switching costs modelled by the prospective MTR model, and how the latter will resolve the costing of calls which are not terminated on the RAN but are passed to another operator, and the impact this potential inaccuracy will have on the overall decision to implement onward routing. The only possible quantifiable illustration of this effect is to look at what the 2007 mobile termination model with the implanted Analysys calculation would produce as a switching cost output if the alternative Ofcom high data volume scenario were to be applied – to be clear this is not being used as an endorsement of this scenario for termination rate modelling, just as a suggestion of the possible potential range of variation of switching cost outputs using a LRIC+ model. The impact of this is shown in table 2.6 below.

[15] Wholesale mobile voice call termination, preliminary consultation, Ofcom, May 2009

ppm	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Ofcom extrapolation	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
2007 MTR model, high data volume scenario	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Differences %	-18%	-20%	-22%	-24%	-25%	-27%	-27%	-33%	-34%	-35%

Table 2.6: Unit cost of onward routing – switching, alternative 2007 output

Clearly therefore there is a significant range of potential outputs that could arise on the unit rate of switching from whatever termination model is being used as source: there is a presumption that termination regulation and any MNP decision should be kept in step in this regard.

But there is a further more general point on the suitability of the MTR model as an appropriate source. The existing Analysys Mason method for deriving switching costs, being based on the MTR LRIC+ model, is an average[16], not an incremental one. This form of costing would appear reasonable for an assessment of costs on an on-going basis, as is relevant to termination, where there is no suggestion that termination traffic will disappear. However the specific issue of the current MNP routing consultation is that Ofcom is looking to discover how an MNO's network costs would change if onward routing were eliminated (at least in part). So effectively there are two possible outcomes, the counter-factual, where onward routing continues and the factual, where direct routing is experienced for M2M ported traffic. Here potentially an incremental, rather than an average cost method might better reflect the real cost differential for an operator with and without onward routing.

Under an incremental approach, the relevant assets would be those additional MSCs that have been required since 1999 to convey onward routed ported traffic, and in particular, given the asset replacement cycle, those MSCs that would required for the assessed volume of onward routing traffic 2012 - 2021 that would be likely to disappear if direct routing were to be mandated between the major mobile operators. Vodafone would expect that cost modelling using an incremental rather than an averaging approach would, other things being equal, lead to a lower rate in 2012 - 2021 than that arising from the LRIC + model in tables 2.5 and 2.6 above. Vodafone is not clear therefore that the use of either the old or the future termination rate model to derive the cost of onward routing is necessarily the best way forward.

Vodafone submits that Ofcom in the current consultation is overstating the cost of the switching element of onward routing: the unit rate cost of switching adopted by Ofcom should be reduced by a minimum of 3-16% as per table 2.5 above when measured against the correct expression of the Analysys model using the 2007 MTR, but more realistically the unit rate should be taken down further to reflect the possible outputs of the prospective 2011 - 2015 MTR model or to reflect the implications of an incremental approach, which might well lead to a further reduction. As an approximation of this, Vodafone suggests using the outputs of table 2.6 above.

[16] I.e. it seeks to recover the total network costs incurred across all periods 1990 – 2040 against all services over all these periods.

Using Ofcom's forecasts of the volume of onward routed traffic that can be avoided by the implementation of an M2M solution, the savings on switching costs can be calculated as shown on table 2.7 below:

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Cum PV (10 yrs)
Ofcom volumes of onward routed minutes (bn)	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	
Ofcom extrapolation of unit cost ppm	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	
Resulting savings £m (discounted)	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Unit savings taken directly from the MTR model	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	
Resulting savings £m (discounted)	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
2007 MTR model, high data volume scenario	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	
Resulting savings £m (discounted)	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂

Table 2.7: Present values of alternative switching savings over ten years

Thus the Ofcom assessed ten year benefits of £✂m shrink to £✂m and £✂m when using potentially more realistic expectations of future unit rates, whilst still leaving the Ofcom volumes in place.

Savings from direct routing – unit cost of interconnect

New to this consultation is the consideration that as well as a switching cost of onward routing, there is also an interconnect or transmission cost to be brought into the calculations, reflecting the additional routing leg that results from onward routing. It is noteworthy that the interconnect cost contributes a significant proportion of the total unit cost of onward routing, just over one-third – indeed without this cost, the calculated benefits from eliminating onward routing would be considerably diminished. The following table 2.8 illustrates this point:

Unit cost of onward routing in ppm	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Switching	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Transmission	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Total	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂

Table 2.8: Breakdown of the unit cost of onward routing as per Ofcom

Once multiplied by the traffic volumes and then discounted by the cost of capital, Ofcom's model can be manipulated to show that that the PV of the potential savings over ten years of implementation of direct routing is £✂m, of which £✂m is obtained from switch savings, and £✂m from transmission savings. After deducting the PV of the costs of implementation of £✂m from the total of savings of £✂m, the overall positive NPV of £26.0m is obtained – clearly without the transmission savings, there would be no positive NPV, but a negative of £✂m.

Vodafone accepts there may be some element of transmission in onward routing. It is necessary however to examine the way this cost is developed, and to compare it against Vodafone's actual experience. The method is explained in paragraphs A5.21 onwards of the consultation. Ofcom has used a unit cost derived from fully utilised STM-1 links, assumed to be sourced on a rented basis from BT, with BT's apparent maximum volume discount. Each STM-1 on a five year basis costs £245k, and it has a calculated annual throughput of 360.7m minutes, giving rise to a unit cost per minute of 0.069p at current rates. This cost is then set to fall at 3.25% per annum, as per the current wholesale charge control on leased lines (which in fact relates only to the period to September 2012)[17].

We note that the statement on the leased line charge control observed that the regulation applies to existing TISBO products:

> "*1.3. The charge controls are being set in a dynamic and evolving market environment:*
>
> *• The UK communications market is seeing increased demand for bandwidth in the backhaul network, to support higher speed broadband services and the associated growth of internet traffic.*

[17] We note that this charge control is in fact currently under appeal by Cable & Wireless

> *• The Traditional Interface Symmetric Broadband Origination ("TISBO") market is going through a period of steady decline. BT is not expecting any significant volumes to remain on the Digital Private Circuit Network ("DPCN") platform beyond 2012/13 and expects most customers to have migrated to other products such as Ethernet.*
>
> *• Openreach is continuing to develop its Alternative Interface Symmetric Broadband Origination ("AISBO") portfolio. It is currently undertaking a significant investment in a national backhaul network based on Wave Division Multiplexing ("WDM") technology, to support new products such as Ethernet Backhaul Direct ("EBD"), which are designed to meet the growing demand for backhaul capacity. The networked nature of this product will mean greater efficiency and lower costs in backhaul provision.*
>
> *• BT has recently announced an ambitious Next Generation Access ("NGA") programme, which is likely to further boost demand for capacity to support high speed broadband services.*
>
> *1.4. In this context, we have sought to ensure that the charge controls provide appropriate incentives for efficient investment and for efficient migration from old to new products[18]."*

It is therefore reasonable to conclude from these observations that any successor product to leased STM-1s that may emerge in due course would be at a rather lower price for the period 2012 - 2021 than the very conservative assumption of current price discounted at only 3.25% per annum that Ofcom has used.

We are also aware that on 15th October Ofcom published an update note on case CW/00992/06/08 (disputes on wholesale PPC charges). This note expresses a view that BT has overcharged for 2Mbit/s PPCs and states: "*we also now have concerns about whether BT has overcharged the Parties and COLT for certain other PPC services (140/155 Mbit/s terminating segment services and 34/45 Mbit/s trunk services), in light of actual financial information becoming available for 2008/09".* This too may have some relevance to the assessment of the future cost of 155 Mbit/sec STM-1 inter-operator interconnect links.

Irrespective of how BT prices may be expected to fall in the future, it is not appropriate to use BT's price list as the basis of interconnect pricing, since ✂. Vodafone therefore suggests alternative prices to feed into the calculation, that are high and low values of a minimum discount of 50% and a maximum discount of 85% against Ofcom's 2009 cost per minute calculation.

This would have a significant impact on the benefits of onward routing, as the following table highlights. There are thus potentially three starting points – Ofcom's assessment of the unit cost in 2008 of 0.069p, 50% of this value, and 15% of this value. Assuming very conservatively that there is no price reduction from the existing 2009 rate for the two discounted versions of unit costs (as opposed to Ofcom's assumption of a 3.5% annual decline when using the much higher BT prices to set the opening level), then the rates and the calculated benefits become, again using Ofcom's volume assumptions as tabulated in 2.9 below:

[18] Ofcom, Leased Lines Charge Control, July 2009

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Cum PV (10 yrs)
Ofcom volumes of onward routed minutes (bn)	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	
Ofcom extrapolation of unit cost ppm	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	
Resulting savings £m (discounted)	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
50% discount from Ofcom 2008 rate	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	
Resulting savings £m (discounted)	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
85% discount from Ofcom 2008 rate	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	
Resulting savings £m (discounted)	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂

Table 2.9: Alternative transmission savings over ten years

Thus the more likely levels of the cost of transmission produce a much lower level of discounted available benefits than the base case in Ofcom's model, i.e. £✂m at 50% and £✂m at 15%, contrasted with Ofcom's £✂m.

The overall level of unit cost of onward routing

Putting together the alternative switching and transmission savings calculated above enables the following matrix of the costs of onward routing over ten years to be built as shown in table 2.10 below – note that this continues to employ Ofcom's traffic volumes. The column of switching savings, £✂m, £✂m and £✂m is taken from the right hand column of table 2.7 above, and the row of transmission savings, of £✂m, £✂m and £✂m from table 2.9 above.

£m PV over 10 years		**Transmission savings**		
		Ofcom	**50%**	**15%**
Switching savings:		✂	✂	✂
Ofcom	✂	✂	✂	✂
MTR model	✂	✂	✂	✂
MTR high scenario	✂	✂	✂	✂

Table 2.10: Potential gross savings over ten years from varying unit rates alone

Thus the potential gross savings from direct routing over ten years could range from £✂m using Ofcom's pricing for both transmission and switching costs, down to £✂m using lower estimates for both, all whilst maintaining Ofcom's volume forecasts. Ofcom has calculated the present value of the ten year costs as £✂m, so a positive outcome, although one that is significantly reduced, is still generated for most permutations, but some are showing as negative as table 2.11 below shows.

£m PV over 10 years	**Transmission savings**		
Switching savings:	**Ofcom**	**50%**	**15%**
Ofcom	**26.0**	**15.0**	**1.8**
MTR model	**21.9**	**10.8**	**-2.3**
MTR high scenario	**13.2**	**2.1**	**-11.0**

Table 2.11: Potential net benefits over ten years from varying unit rates alone

Over Ofcom's alternative evaluation period of seven years, the following matrix of benefits is produced:

£m PV over 7 years		Transmission savings		
		Ofcom	50%	15%
Switching savings:		✂	✂	✂
Ofcom	✂	✂	✂	✂
MTR model	✂	✂	✂	✂
MTR high scenario	✂	✂	✂	✂

Table 2.12: Potential gross savings over seven years from varying unit rates

Here the Ofcom calculated seven year PV of the implementation costs is £✂m. If one adopts Vodafone's conclusion that a unit rate solution that involves lower costs than Ofcom's for both switching and transmission is correct, then the darker shaded square of four savings towards the bottom right become the most likely outcomes – only one of them shows a benefit greater than the costs over seven years, as table 2.13 below shows.

£m PV over 7 years	Transmission savings		
Switching savings:	**Ofcom**	**50%**	**15%**
Ofcom	**16.4**	**7.0**	**-3.0**
MTR model	**13.9**	**4.5**	**-5.5**
MTR high scenario	**7.1**	**-2.3**	**-12.3**

Table 2.13: Potential net benefits over seven years from varying unit rates alone

Over a shorter payback period such as five years any net advantage falls further, as table 2.14 below shows.

£m PV over 5 years		Transmission savings		
		Ofcom	50%	15%
Switching savings:		✂	✂	✂
Ofcom	✂	✂	✂	✂
MTR model	✂	✂	✂	✂
MTR high scenario	✂	✂	✂	✂

Table 2.14: Potential gross savings over five years from varying unit rates

Under a five year payback period, the present value of the costs is £✂m. The savings for each of the outcomes in the darker shaded quadrant are lower than this, as table 2.15 shows.

£m PV over 5 years	Transmission savings		
Switching savings:	**Ofcom**	**50%**	**15%**
Ofcom	**7.0**	**-0.5**	**-8.1**
MTR model	**5.4**	**-2.1**	**-9.7**
MTR high scenario	**0.2**	**-7.3**	**-14.9**

Table 2.15: Potential net benefits over five years from varying unit rates alone

It must be emphasised that all of the calculations above employ without adjustment Ofcom's view of the volumes of onward routed calls that could be directly routed. They suggest however that by adjusting the unit rate alone puts a positive 2009 NPV into serious jeopardy.

The next stage of the review process is to consider the acceptability of the Ofcom volume estimates.

Savings from direct routing – forecast of relevant traffic

Annex 5 devotes considerable space and effort to forecasting the volume of mobile to mobile onward routed traffic for 2012 to 2021. Fundamentally the analysis breaks down into three separate but related components: the proportion of the customer base that is ported (and hence the proportion of mobile originated calls that are to a ported number), the proportion of mobile originated calls to a ported number that are actually onward routed, and the forecast of the total volume of mobile originated calls. The product of the three elements gives the Ofcom estimate of the volume of avoidable onward routed traffic in a given year.

So Ofcom states that in 2008 there were ✂bn mobile originated voice call minutes to another UK mobile number[19] (M2M minutes), and estimates that 15.3% of mobile customers had a ported number. Therefore 15.3% of ✂bn minutes, or ✂bn minutes were to a ported number, of which a further estimate is made that 50% involved onward routing and 50% do not: hence ✂bn minutes were onward routed. It should be clear from this that the opening position of ✂bn onward routed minutes is not an empirically derived measured value, but the product of a calculation of a calculation. There is room to doubt therefore as to whether this is in fact the correct starting value.

The values of two of these three elements are estimated by Ofcom to change over time. In 2012, the first year of direct routing implementation, Ofcom forecasts ✂bn M2M minutes, ✂% of customers that are ported, and continues with the 50% onward routing assumption: as a result Ofcom forecasts ✂bn onward routing minutes. Clearly the most significant change, driving a step increase in the in-scope[20] traffic volume from 5.1 bn to 9.5 bn (an 87% increase) is the volume of customers who are ported, increasing from 15.3% to ✂% in four years. Thereafter the growth rate is more subdued – in 2021, the last year for which benefits are taken, the forecast is for ✂bn total M2M minutes, ✂% customers, and the 50% onward routing assumption is maintained; the result is 14.6bn onward routed minutes that are available for the potential switch to direct routing. Table 2.16 below shows how onward routed ported traffic is estimated by Ofcom to grow.

[19] Both on-net and off-net

[20] By in-scope Vodafone is referring to the volume of currently onward routed traffic that could potentially be re-routed by the implementation of a M2M direct routing solution

Calculation of M2M onward routed traffic (bn mins)	**2008 Starting position**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
All M2M calls (including onnet)	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
% to ported numbers	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Calls to ported numbers	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
% that are onward routed	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Thus onward routed volume	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂

Table 2.16: Ofcom estimate of current and future onward routed ported minutes

Thus the onward routing volume is forecast to grow by an impressive 87% between 2008 and 2012, and a further 54% between 2012 and 2021. As was established in table 2.2 above (at the beginning of Section 2 of this document) projecting a straight line growth from 2008 to the same 2021 endpoint rather than a steeply rising but flattening curve considerably reduces the NPV of the benefits, from £26m to £17.6m over ten years and £16.3m to £8.3m over seven. It is obvious therefore that the overall NPV is very sensitive to assumptions on the volume of in-scope traffic; projections that are applied to estimate volumes some considerable distance into the future.

Given that it is the assumption of the percentage of calls to ported numbers that is the most influential element in this substantial increase in the forecast volumes of onward routed traffic, it is this factor that is considered first.

Proportion of the total customer base that is ported

Vodafone believes that Ofcom's forecast of the future customer base that is ported (and hence the proportion of traffic that is forecast to be to a ported customer) fails on an elementary sense-checking basis:

- The starting point is based on a calculation that is related to call volumes rather than an actual number of ported customers.

- Despite gathering extensive historic porting traffic volume data in a major Section 135 exercise December 2008 – January 2009 none of this data is presented or apparently used in the consultation.

- Applying the method that has been used to generate future porting customer proportions backwards into the past to project historic proportions leads to the number of ported customers falling back to zero as recently as 2006!

In figure A5.5 Ofcom shows a graph of forecast porting activity, in terms of fixed and mobile subscribers with a ported number. This is reproduced as 2.1 below, for mobile customers.

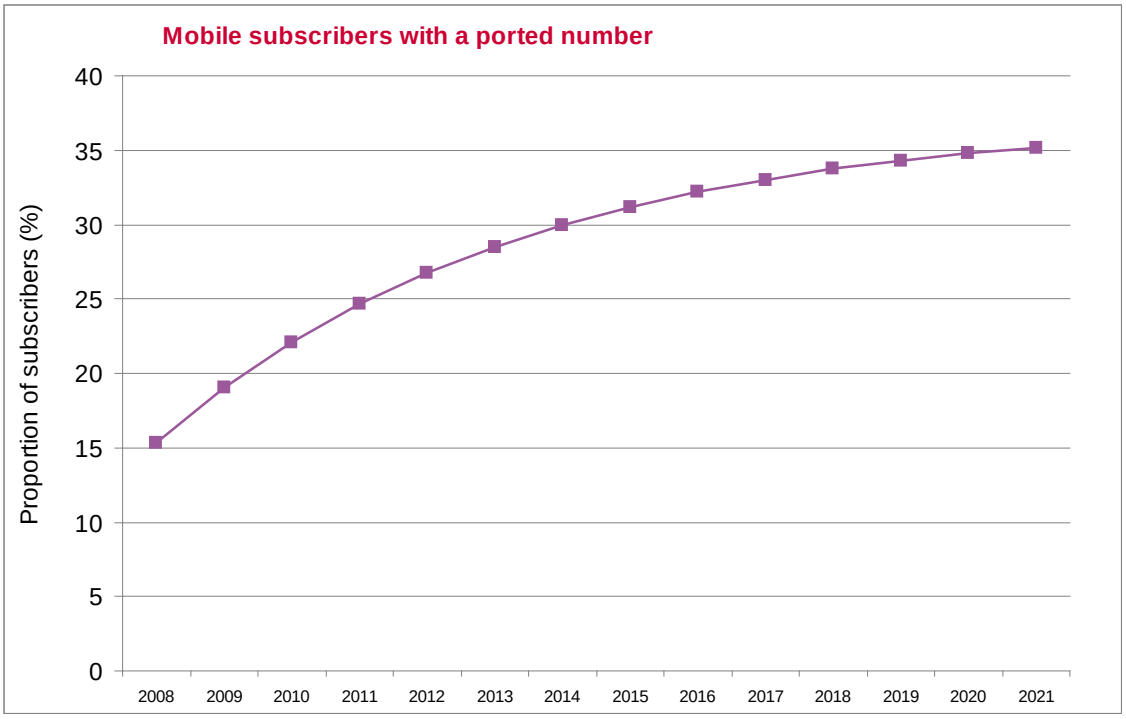

Figure 2.1: Ofcom's estimate of the growth of ported customers

Projection of this curve back into prior years suggests that it will cross the origin in 2006 or so, an observation that is confirmed by applying Ofcom's calculation backwards, as is discussed later[21].

The method that Ofcom has developed to estimate the future growth of ported customers is relatively convoluted and needs to be examined in some detail. As Vodafone has said before in previous consultation responses, by focusing too deeply on ported *customer* numbers rather than ported *traffic* itself, Ofcom is forcing itself to make a further set of assumptions relating to traffic use per ported customer (and how this may vary between established and prospective ported customers) – instead Ofcom should be attempting to forecast the growth of ported traffic, with reference to historical trends, rather than bother itself with the detail of potential un-ports, re-ports, and stop ports, all of which are not known or knowable and thus are inevitably estimates.

What in the event that Ofcom has done is to attempt to identify the current volume of ported traffic and used this to estimate the current proportion of customers who have

[21] Vodafone does not have access to data on the historic proportion of the industry base that uses ported numbers, but suggests it is unlikely to fit comfortably to the left of the graph above, without 2008 becoming some sort of inflection point, for no obvious reason.

ported, and then estimated how this proportion might grow in the future. It has then re-converted this proportion back into an estimate of the volume of ported traffic (by multiplying with a forecast of the growth of total mobile traffic) and then further adjusted this to derive the volume of that traffic that is onward routed, rather than that which is already directly routed. This movement from traffic to customers to traffic means that every step of the process is prone to estimation, uncertainty and error.

As a result of the relatively recent Section 135 exercise and from data collected in the previous consultation process Ofcom should be in possession of industry level ported traffic volumes over an extended time period that may enable it to attempt some form of trend analysis for projecting future growth. Vodafone's ability to comment on the utility of this historic ported traffic data, particularly when measured as a proportion of all outbound or inbound traffic, to be used as some sort of base to project future growth is however considerably hampered by Ofcom's failure to publish this data, even at an industry level. At the very least this recorded data should have been published with the consultation, in order for a discussion as to its possible utility as a base for forecasting to be conducted. Vodafone can see no obvious reason for this omission.

Ofcom's calculation of the ported customer proportion

Ofcom admits in A5.36 that it does not have a direct measure of the total number of people with a ported number (✂). So it starts its calculation by "*estimating the proportion of people who currently have a ported number by taking total ported minutes as a proportion of total traffic. Based on the assumption that people with ported numbers receive, on average the same volume of calls as people who have not ported, we can use the volume of ported minutes in relation to total traffic as a proxy for the percentage of people who have ported*"[22].

On the spreadsheet that accompanies the consultation, one can see that the total of fixed to mobile and mobile to mobile minutes in the reference year (presumably calendar 2008) was ✂m minutes, and the volume of "ported minutes, including call trap and directly routed minutes" was ✂m minutes[23], and hence Ofcom's view of the proportion of customers with a ported number is 15.3%. It is not clear however how the volume of ✂m minutes has been derived. ✂. The reliability of this estimate is fairly important to subsequent calculations, but Vodafone is not clear on its provenance.

This is not necessarily the best way to derive the starting position. The target traffic is the volume of mobile to mobile ported traffic that is currently onward routed. It would have been possible to attempt to reach this number from another direction. One might have started with the total volume of ported traffic, and then stripped out for those operators not currently running call trap the volume of their on-net tromboned minutes. From that the volume of ported traffic that was directly routed (i.e. on-net ported calls) could have been removed. The result would have been a volume of onward routed ported traffic, from which the proportion that was fixed originated could be discounted, to reach the target population of M2M onward routed porting traffic. Whilst this would still have involved approximations, it would at least have provided a cross check on what is very much an estimated rather than a precise actual starting position.

Having established, correctly or not, its starting point of ported customers/traffic, Ofcom then attempts to measure how this proportion might grow over time. In this endeavour

[22] Consultation A5.36
[23] It is assumed that these numbers are sourced from the recent S135

Ofcom adopts Vodafone's methodology, developed during the previous consultation sequence, of the gross annual porting volume which is reduced in net impact by re-ports, stop-ports, and un-ports, to derive a net porting change each year i.e. the difference between opening and closing proportion of total customers who are using a ported number. So based on December 2008 survey information, which suggests that 28% of people had switched network in the last two years, and therefore half or 14% had done so in the last year, and that 45% of those who had switched had ported their number, Ofcom concludes that 45% of 14%, or 6%, of mobile subscribers port each year. The proportion of the total base that is believed to be porting each year is a constant assumption in the model from 2008 through to 2021 – there is however no discussion of the merits of this assumption; Ofcom simply says in A5.57 "*we assume a constant proportion of subscribers port each year*". In fact whilst Ofcom's text refers to 6%, the underlying spreadsheet which performs the cost benefit analysis does not use the rounded value in its calculations, but the detailed product of the survey results, i.e. 14.0% * 45.0% or 6.3%[24].

This is all very interesting, but Ofcom has been previously warned about using survey data when real data is available. In our notice of appeal to the previous MNP statement we observed that "*it would have been more appropriate for Ofcom to exercise its section 135 powers to obtain accurate information as to actual rates of porting*"[25]. In fact Ofcom has recently made a section 135 request, but unaccountably has failed to use the results. The survey that Ofcom has used appears to have been of households with mobiles, and not of mobile subscriptions, and not of business subscriptions, so it is not clear how the responses actually can be related to active mobile customers. The obvious sense check of the survey results would be to see how this 6.3% annual porting assumption measured up against actual historic data. Vodafone can see no evidence of this being done.

Ofcom's latest Communications Market Report suggests that there were 76.8m active customers in 2008, up from 73.8m in 2007. Granted some of these would have been mobile broadband only subscriptions, but the average of mobile handset subscriptions must have been at least 72.5m. 6.3% of this is 4.56m – so this is the annual volume of ports implied in Ofcom's model. ✂ – Ofcom's survey based estimate is thus more than ✂ the real number.

There is another set of data provided by Ofcom on switching behaviour, in addition to the December 2008 survey used above: this is the 2009 Communications Market report, which on page 259 reports the proportion of consumers who have switched in the last 12 months as: Q2 2006 15%, Q2 2007 12%, Q1 2008 14%, and Q1 2009 8% - Ofcom not unreasonably reports this as "*switching levels fell in 2008*" (page 241). If 8% is a better and more reliable expression of the current levels of switching than 14%, and certainly it is more recent datapoint than the December survey used in this consultation, this may go some way towards explaining the unreasonably high future level of annual porting – 45% of 8% is 3.6%, ✂.

If the assumption of annual activity used to project future growth is ✂ the real volume, it is hardly surprising that Ofcom's customer and traffic numbers go awry immediately. As can be seen in the graph above, using the assumption that 6.3% of all customers port each year, Ofcom is predicting that in 2012 ✂% of customers will be using a ported number, up from the 15.3% in 2008. This then rises to ✂% in 2016 and ✂% in 2021.

[24] Merely rounding down to 6.0% In Ofcom's model reduces the overall NPV by more than 12%.
[25] At paragraph 81.6

But merely by changing this one cell in Ofcom's porting growth model, the annual volume of activity from 6.3% of the base to the ✂% implied by the calibration with the actual 2008 volumes, reduces the heroic results previously produced by the model – as table 2.17 below shows:

% of base with a ported number	2008	2012	2016	2021
Ofcom model	✂	✂	✂	✂
"Calibrated" result	✂	✂	✂	✂
Difference - absolute	✂	✂	✂	✂
Growth over base year – Ofcom	✂	✂	✂	✂
Growth over base year – "calibrated"	✂	✂	✂	✂

Table 2.17: Adjusting the annual proportion of ports to reflect 2008 actual levels

The criticality of this unwarranted assumption of 6.3% annual porting volume in the model is clear – using it, ported traffic grows by 87% from 2008 to the first year of planned implementation of direct routing, i.e. 2012. When substituting the actual 2008 proportion of ✂%, ported traffic grows by only ✂%, i.e. ✂ slower.

The reason for this enormous difference is the fact that the way that the Ofcom model works is that for each subsequent year that the annual volume of gross ports is applied, there are a series of counter-weighting adjustments. Using Ofcom's 6.3% value these are quantified in 2009 as follows:

- Ofcom reduces the opening base of 15.3% by an estimate of those customers who abandon their ported number (stop-ports), estimated at 1% of the existing ported base. Intuitively this would appear a little low, since it implies that a ported mobile number once allocated remains in use for a half-life of 50 years, but there is no obvious evidence as to what the correct proportion might be.

- Ofcom assumes that the 14% of the base that switch each year is a factor that is also applied to the opening base of porters, so 14% of the opening 15.3% base, less the 1% who stop-port, or 15.2%[26], i.e. 2.08% are previous porters. Ofcom actually makes this 1.96% since it deducts, erroneously in Vodafone's view a further 1% of the potential ports.

- Therefore 6.3% - 1.96% or 4.3% are new ports, i.e. customers assumed to be porting for the first time.

[26] Clarity of understanding of the principles that Ofcom has applied is not helped by the fact that the text in the consultation at A5.59 onwards that describes this process starts with the rounded opening position of 15%, whereas the spreadsheet which calculates the detailed results uses an absolute number that is approximately 15.319% - thus the actual numbers calculated for 2009 movements are subtly different from those reported in Ofcom's text. It is necessary to read the text in conjunction with the spreadsheet to follow the trail.

- Of the repeat ports of 1.96% or 2.08% (or whatever) of the base who are porting a second (or more) time, one quarter are assumed to be un-ports, i.e. are going back to their original operator, and are thus ceasing to be ported customers. The remaining three quarters are re-porters, i.e. proceed to a different operator than the donor operator, and thus remain ported customers, but as a result do not increase the stock of these customers.

- Overall therefore, at the end of 2009, the ported proportion has changed as follows:
    - Opening position 15.3%
    - Less stop-ports 0.2%
    - Less un-ports 0.5%
    - Plus new ports 4.4%
    - Closing position 19.0%

- In effect therefore these adjustments reduce the volume of gross ports of 6.3% to a net new ports value of 3.7%.

Ofcom then runs these assumptions for each subsequent year; after initial rapid growth the annual rate of net growth slowly starts to fall back as the volume of ported customers grows and hence the volume of un-ports and re-ports increases so that the volume of net new ports declines. It is the relationship between the opening base and the annual volume of ports that provides the overall growth dynamic – a high annual volume of ports increases the growth rate, and a high opening position retards it.

It should be emphasised that whilst the annual porting volume is sourced from the December 2008 survey, Ofcom provides no objective evidence for any of the values of stop-ports, un-ports and re-ports – thus the value of the element that is driving the ported customer base growth, i.e. net new ports, is little more than conjecture.

As well as running the model forwards from 2009, it is quite easy to run this method backwards from the 15.3% opening position at 1st January 2009, using the same parameters and logic, and goal seeking the opening balance for each year. It is surprising that Ofcom has not attempted this, since it is a fairly obvious check on the robustness of the method. If Ofcom is assuming that the results of its December 2008 survey, i.e. that 6.3% of customers port in every year is a reliable assumption for all future years, then it is not unreasonable to assume that this observation will apply to all historic years as well – this appears to be suggested by the survey results reported in the 2009 Communications Market report as referred to above implying some degree of consistency from year to year (although in fact there is some mention of falling levels of activity, suggesting possibly a higher value in prior years).

The result of this retrospective projection is not good, and confirms the intuition that can be drawn from figure 2.1 above:

% of the customer base	2008	2007	2006
Closing proportion at year end	15.319%	9.866%	3.901%
Total ports in year	6.300%	6.300%	6.300%
Of which un-ports	0.315%	0.125%	**No solution possible**
And re-ports	0.946%	0.374%	
Thus net new ports	5.039%	5.801%	
Stop ports	0.099%	0.039%	
Thus opening proportion	9.866%	3.901%	

Table 2.18: Using Ofcom's method to predict the past

There is no solution possible for 2006 – the only way to make the formula work for that year, given the closing proportion of 3.9% and an annual growth of 6.3% is to assume that porting started in May 2006, rather than 1999 as in reality, and scale the 6.3% annual porting proportion down accordingly. **This abject failure to predict the past gives no confidence that Ofcom's method can predict the future in any reliable manner.**

Re-calibrated ported growth estimation

The root of the problem of the failure to predict the past would appear to be the 6.3% annual porting assumption. Switching to the ✂% implied by the actual 2008 data gives a result that winds back to the zero point in ✂, rather closer to the launch date of porting in 1999 than before – this is a much more plausible result.

The effect of this "re-calibration" for both historic and future periods is shown in figure 2.2 below:

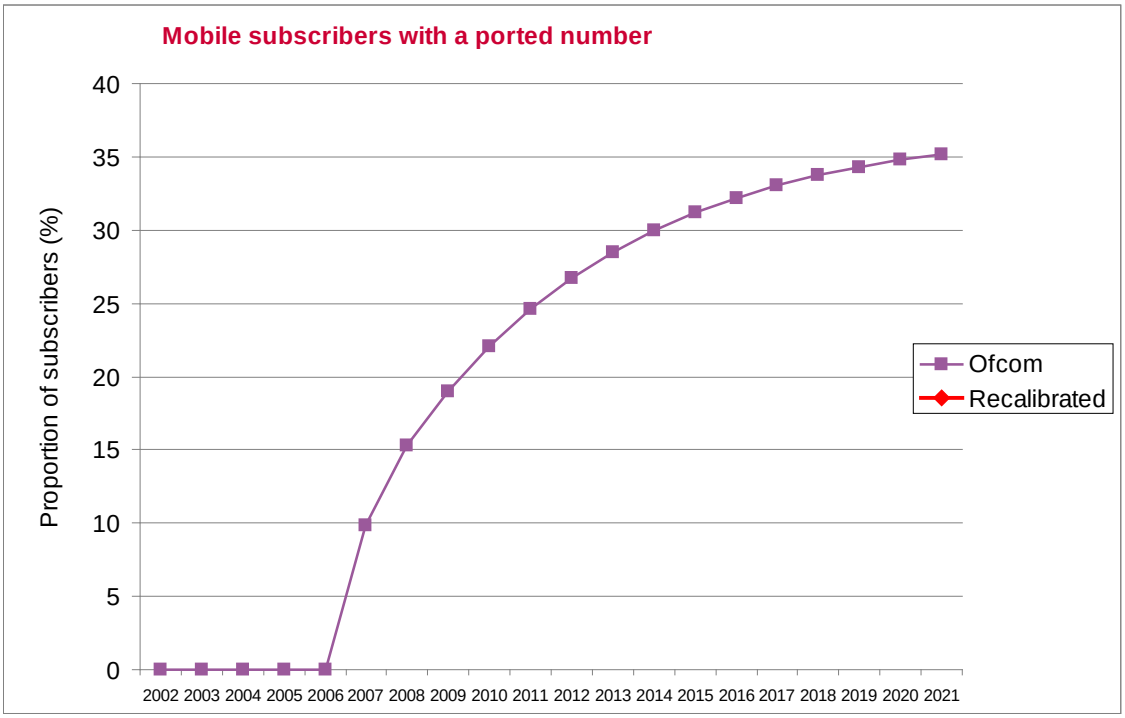

Figure 2.2: Alternative outcomes of ported customer growth (recalibrated redacted)

Both outcomes are derived using Ofcom's basic methodology, the only difference being that the annual porting percentage in the Ofcom version utilises the incorrect assumed 2008 proportion of annual ports of 6.3%, and in the recalibrated version the actual 2008 proportion of ✂. Both also reflect the principle developed by Vodafone in the course of the previous consultation cycle that the growth of porting would in due course flatten out, with the rise of un-ports, stop-ports and re-ports serving to reduce the volume of net new porting close to zero. Vodafone believes that this is a correct principle – at issue is the level at which this "steady-state" is arrived at.

The difference between the two outcomes is very significant, particularly in the context of the current consultation where the relevant traffic years are 2012 - 2021. Table 2.19 below demonstrates this in terms of the proportion of the base that is ported over each year:

% of base that is ported	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
A Ofcom original	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
B Recalibrated version	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
Difference (B-A)/A	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂

Table 2.19: Estimated % of base that is ported

The recalibrated version would suggest a volume of ported traffic across the 10 year assessment period that is ✂ the original Ofcom version.

Key to the Ofcom version of customers and volumes is a step change from 2008's 15.3% to the ✂% of 2012 in only four years. As discussed above, unlike Ofcom, Vodafone is not privy to the historic industry porting traffic volumes to ascertain if either the Ofcom or the recalibrated curves resemble in any way the actual historic experience of ported traffic growth.

Potential impact of network consolidation

A factor that may be relevant to the future level of porting is network consolidation, the degree to which the potential Orange/T-Mobile joint venture will restrict both the existing volume of onward routed ported traffic at the point of merger, since Orange to T-Mobile and T-Mobile to Orange historic and future customer ports and hence the associated ported traffic will disappear and also its subsequent growth will be retarded. Clearly this was not a matter that could be anticipated in the publication of the current consultation, but it must now be a relevant consideration – at the very least it will eliminate all current T-Mobile to Orange and vice versa ported customers, but it is reasonable to expect that it will both increase the proportion of un-ports (given that there are fewer alternative destinations) and potentially increase the overall proportion of already directly routed ported traffic, as discussed below.

Some attempt should be made to quantify this consolidation impact on the proportion of traffic that is ported, at least in a stylised manner. At present, between the five operators, there are twenty possible porting permutations, as table 2.20 below makes clear.

		From				
		A	**B**	**C**	**D**	**E**
To	**A**	-	BA	CA	DA	EA
	B	AB	-	CB	DB	EB
	C	AC	BC	-	DC	EC
	D	AD	BD	CD	-	ED
	E	AE	BE	CE	DE	-

Table 2.20: Porting destinations with five operators

The consolidation of two operators will mean that two of these permutations, e.g. CD and DC will disappear if it is assumed that C and D are T-Mobile and Orange respectively. Therefore two out of twenty permutations or possibly 10% of existing porting customers will cease to be ported customers at the point of merger.

Also there will only be three, rather than four alternative destinations for a repeat porter, and thus the proportion of un-porters (those forecast to be returning to their original operator) will rise to 33% from 25%. It is straightforward to adjust Ofcom's model to accommodate this change, from say 2011, for both the original Ofcom 6.3%

porting rate and the re-calibrated ✂ rate. The results of this adjustment are shown in the table below. Note that the overall level of annual porting activity, of 6.3% and ✂% respectively, is not being changed in the model post-consolidation:

% of base that is ported	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
A Ofcom original	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
A1 Ofcom original with consolidation in 2011	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
B Recalibrated version	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
B1 Recalibrated version with consolidation in 2011	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂

Table 2.21: Estimated % of base that is ported, allowing for network consolidation

The outcome A1, the Ofcom original version but in a 4 operator market from 2011 is on average ✂% lower (in relative terms) in porting penetration and hence implied traffic volumes than the Ofcom original, and B1 ✂% lower than B. So network consolidation will serve to decrease the proportion of ported customers and the total of M2M ported traffic to a non-trivial extent[27].

Alternative estimations of future porting proportions

Despite Ofcom using the apparent results of their December survey to project annual activity for the next thirteen years, it might be argued that the corrected ✂% ported proportion experienced in 2008 (or more broadly the level of activity experienced in 2008) may not a good guide to future annual gross porting levels. To provide some sort of variability it is worth examining the consequences of assuming intervening values of between ✂% and 6.3%. Vodafone is not endorsing higher percentages than ✂%, or suggesting that the ✂% is a lower bound outcome, but is merely running an experiment in Ofcom's model to derive a set of alternative outcomes, given that any particular outcome, however precisely calculated is fundamentally little more than a guess, even in the short-term, let alone over an extended period to 2021. The purpose of this is more to uncover what levels of porting one might have to believe are appropriate in the future (or how right Ofcom must be) in order to produce an overall positive cost benefit analysis.

Running Ofcom's ported growth model therefore with several different annual growth assumptions:

[27] There is in fact a further impact, on the proportion of ported traffic that is onward routed: this is addressed below

- with an annual porting volume of 6.3% as the original Ofcom version (A);
- 6.3% with network consolidation in 2011 (A1);
- ✂% as re-calibrated with network consolidation (B1); and
- intervening values of say ✂% ✂ (D) with 2011 consolidation assumed; and
- ✂% (also with consolidation) (C);

This gives the following results for the proportion of the base that is predicted to be ported in future years as shown in table 2.22:

% of base that is ported	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
A Ofcom original	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
A1 Ofcom original 6.3% with 2011 consolidation	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
C ✂% annual growth with consolidation	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
D ✂% annual growth with consolidation	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂
B1 ✂% annual growth with 2011 consolidation	✂	✂	✂	✂	✂	✂	✂	✂	✂	✂

Table 2.22: Estimated % of base that is ported under varying growth assumptions

Clearly a very wide range of results can be produced from very simple changes to input assumptions – scenario B1 gives in aggregate over the ten year period around ✂ of the overall ported customer proportion of scenario A.

The very real problem for forecasting is that the actual outcome for 2012 - 2021 is highly unclear. However it is clear to Vodafone, based on the information that we have available, that the Ofcom prediction of the proportion of traffic that is ported i.e. is to a ported customer, based as it is on an incorrect number of ports in 2008 is a high and extremely unlikely estimate of the future porting proportion. Any more realistic assessment of the proportion would be much more conservative, in both the growth rate between 2008 and 2012 and beyond, and in respect to the level at which growth flattens off. Whether any of B1, C or D above can reasonably be considered to be a mid-point forecast is open to question.

The proportion of calls to a ported customer that are actually onward routed

Having ascertained to the limit of reasonable possibility an estimate of the proportion of customers and traffic that is ported across the years 2012 to 2021, a further stage undertaken by Ofcom, and one that is not very clearly explained in the consultation (attempted in paragraphs A5.69 onwards) is to ascertain the proportion of the calls to ported customers that do and do not involve onward routing[28]. There are three call cases relevant to calls to mobile ported customers, only one of which in practice involves onward routing:

1. The call is made to a ported number which is on the same network as the originating customer. This arises where the recipient customer was originally a customer of a different mobile network, but has ported his number to the same network as the originator of the call. In effect this is an on-net call, which can be trapped by the call trap process, so that it will never leave the originating network.

2. The call is made to a ported number which is in the number range of the originating customer's network. In this case the existing porting methodology ensures that the originating network (since it is also the donor network) will already know the correct destination network where the call must be sent and the call, although off-net to a ported number, will be directly routed[29].

3. The call is made to a ported number which is both in the number range of another network operator than the originator and the recipient customer is not on the originating customer's network. In this situation there is no way that the originating customer's network can know that the recipient customer is using a ported number, and the call will be routed to the range holder (or donor network), which will find that the customer has ported to another network, and will onward route the call.

Thus only in case 3 will onward routing occur[30]. Ofcom has estimated that case 1 relates to 30% of ported traffic, and case 2 to 20% of the traffic, and that therefore by simple subtraction, case 3 must be the remaining 50% of the ported traffic. These percentages are kept as constants in Ofcom's modelling throughout the assessment period, i.e. up to 2021. Vodafone is of the view that neither the 30% nor the 20% assumption is rigorously developed or justifiable, and that as a consequence the residual of 50% for the in-scope onward routed proportion is not correct.

The assumption that 30% of ported calls could be considered to be on-net is taken, as A5.71 describes, from ✂ previous statement to Ofcom that when it implemented call

[28] The methodology adopted by Ofcom only becomes clear from inspecting (and following the logic of) the underlying direct routing CBA spreadsheet and those of its inputs that have not been redacted.

[29] It is this call case that was initially mistakenly treated as in-scope for the purposes of re-routing by Ofcom, as described in Section 1. Removal of this from scope reduced the ten year NPV from Ofcom's model from the apparent pre-consultation value of £58.3m to the current level of £26m (on a ten year basis) – a clear illustration of the sensitivity of the result to traffic volume assumptions.

[30] Strictly speaking there is a further restriction to case 3 in that the originating operator of M2M traffic may be a small mobile operator on which the current proposed direct routing obligation will not apply, and thus although the traffic will be onward routed there is no suggestion that it will be direct routed in the future and hence no saving can be claimed in the cost benefit analysis. This case is not specifically accounted for by Ofcom, and on the assumption that the volume may be small, Vodafone will also ignore it in this response.

trap, its ported in traffic volumes fell by 30% - but this was a percentage reduction observed across all of ✂ ported in traffic, i.e. not just the mobile originated ported in, but also the fixed originated ported in. This suggests that for ✂, in order for total ported in traffic to fall by 30%, mobile originated ported in (the only flow that can possibly relate to call trap) must in fact have fallen by a higher percentage. If one assumes as Ofcom did on a previous consultation that 30% of ported in traffic originates from fixed, then mobile originated ported in traffic would actually have to have fallen by 43% in order for the total ported in traffic to have fallen by 30%. This higher proportion accords more reasonably with the intuition that of mobile originated calls to other mobile customers, about half are to an on-net destination and half to an off-net destination. This would suggest that on the order of 50% of calls to ported numbers might be on-net rather than off-net, providing one postulates an even distribution of ported numbers across networks, a similar call distribution to ported and non-ported numbers and so forth.

In reality there are a number of implied assumptions being made here by Ofcom. It is not clear that one operator's experience will be representative of the total. For example one might expect a higher proportion than 43% for an operator that has experienced strong inward migration of ported numbers, and a lower proportion for an operator with a lower proportion of on-net calls. But if ✂, then the proportion of mobile originated calls to ported customers that are on-net should be closer to 43% than 30%.

There is a further consideration relating to network consolidation that needs to be taken account of here, in that the on-net proportion of traffic will rise significantly for each of T-Mobile/Orange, given the fact that calls that are currently sent off-net from T-Mobile to Orange and from Orange to T-Mobile will become on-net – this would suggest from an industry point of view that the 43% ✂ should be rounded upwards, say to at least 45%.

Case 2, the call where the originator and the range holder are the same operator and the call is thus directly routed off-net, rather than onward routed, is estimated by Ofcom in A5.73 at 20%: "*we have assumed that 20% of mobile originated minutes to mobile ported numbers will have the same originator and range holder, based on the fact that there are five large MNOs and the originator of a call to a ported number has a one in five chance of also being the donor*". This has the virtue of being simple, but is somewhat contradictory to case 1.

A more rigorous analysis might have considered that there are between five different operators twenty different porting combinations, illustrated in table 2.23 below, where BA indicates a port that has taken place from donor operator B to recipient operator A:

		From				
		A	**B**	**C**	**D**	**E**
To	**A**	-	BA	CA	DA	EA
	B	AB	-	CB	DB	EB
	C	AC	BC	-	DC	EC
	D	AD	BD	CD	-	ED
	E	AE	BE	CE	DE	-

Table 2.23: Porting destinations with five operators

Considering the table from the viewpoint of calls originated on operator A, reading across the first row there are four customer porting cases, BA, CA, DA and EA, which will set up call case 1 above, i.e. a call from A to a ported in customer of A. When however a customer of A calls a customer of B who has ported in from another network there are also four ported cases, one of which, AB, will be directly routed (since A knows that B is the recipient operator), and three CB, DB and EB, which will give rise to onward routing, since A not knowing that the customer has ported, will as normal send the call to C, D and E respectively. A similar proportion will apply to calls from A to the ported customers of other operators, so that in total there are sixteen ported customer off-net destinations of which four (25%) will be directly routed and twelve (75%) onward routed.

Ofcom's allocation of 20% of calls to directly routed offnet traffic on the basis of a one in five proportion is thus faulty. The more appropriate approach is to deduct the proportion of mobile originated M2M calls that are case 1, i.e. BA, CA, DA and EA, from the total of M2M calls to ported customers, and then allocate 25% of the remainder to case 2, directly routed offnet, and the balance to onward routed. Thus if case 1 were assumed ✂ to be 43% - say rounded down to 40%, then one quarter of the remaining 60% or 15%[31] would be case 2. Therefore the percentage of onward routed traffic should be 45% of the total, i.e. 100% minus both 40% and 15%, not the 50% assumed by Ofcom.

It is clear that the relative size of the case 2 and 3 proportions is dependant upon the number of operators. In the event of network consolidation from five to four operators, there will only be twelve porting destinations, not twenty, and only nine involving off-net traffic, of which three will be directly routed and six onward routed, as table 2.24 below shows.

[31] ✂

		From				
		A	**B**	**C**	**D**	**E**
To	**A**	-	BA	CA	DA	n/a
	B	AB	-	CB	DB	n/a
	C	AC	BC	-	DC	n/a
	D	AD	BD	CD	-	n/a
	E	n/a	n/a	n/a	n/a	n/a

Table 2.24: Porting destinations with four operators

So now of the remaining off-net traffic, i.e. cases 2 and 3 combined, one third will be directly routed, and two thirds onward routed. This would suggest a split of outbound M2M traffic to ported numbers of 45% on-net, 18% directly routed, and 37% onward routed, or rounding down case 1, 40% on-net, 20% directly routed and 40% onward routed.

From this analysis there are thus at least three possible outcomes for the onward routed proportion of M2M calls to ported customers:

- Ofcom's erroneous version of case 1 30%, case 2 20% , therefore case 3 50%;
- Case 1 40% rounded down from 43%, no consolidation, case 2 15%, case 3 45%;
- Case 1 45% rounded up post consolidation, case 2 18%, case 3 therefore 37%.

Vodafone is not asserting that this is the last word in sophistication, but merely logical developments of and corrections to Ofcom's method. We conclude therefore that Ofcom's assumption that onward routing traffic will be 50% of all calls to ported customers is too high – more likely estimates of the appropriate proportion are 37% to 45%. In effect therefore, on this factor alone, the calculated volume of onward routed traffic is overstated by potentially 10% to 25% (i.e. 45% rather than 50% = 10%, to 37% over 50% = 25%).

We accept that Ofcom, since it has based its whole traffic estimation methodology on the starting point of the volume of mobile to mobile traffic, has to estimate the proportion of calls to ported numbers that are onward routed in order to arrive at a meaningful traffic volume forecast, but it would appear that casual assumptions of 30% for case 1 traffic and 20% for case 2 traffic are too simplistic, giving rise to clear doubt on the accuracy of the estimate. Based on the way in which Ofcom has attempted to calculate the proportion of case 3 traffic, we would suggest that our values of 37% to 45% offer a more rigorous method of calculation than the relatively arbitrary 50%. We suggest that Ofcom looks a bit deeper to see what can be done to improve the quality of the estimate of this proportion, and/or builds a degree of uncertainty into the modelling.

The volume of M2M calls in total

The opening volume (for 2008) of mobile to mobile traffic is taken from the Section 135 return submitted by the operators, reported as ✂bn minutes. This volume is then grown by 1.77% compounded every year, a value that Ofcom reports as being derived from the 2007 mobile termination model, from the March 2007 statement. Vodafone cannot quite trace this proportion, calculating a rather lower 1.375% increase from 2008/09 to 2020/21 from the data in the demand spreadsheet of the Ofcom MTR model, but the difference is not particularly significant.

The overall forecast of onward routed mobile traffic volumes

Vodafone has concluded that two of the three elements that produce the volume of onward routed mobile to mobile traffic have been overestimated by Ofcom, i.e. the proportion of traffic to ported customers, and the proportion of traffic that is onward routed. Vodafone has come up with five alternative values of the former (including Ofcom's value, and three values of the latter. It is therefore possible to derive fifteen alternative sets of possible onward routed traffic volumes for 2012 - 2021. For convenience of comprehension, these fifteen outcomes are presented in table 2.25 below as ten year traffic volume totals, rather than individual annual volumes being reported. Given that both the Ofcom assumptions of 6.3% of annual porting volumes and 50% of calls to ported customers being onward routed look to be on the high side, Ofcom's value looks very much a high outlier rather than any reasonable estimate of a likely outcome of the product of these two variables.

Volume of onward routed ported calls, in millions of minutes, as a total over 2012 to 2021		**% of calls that are to ported customers**				
		A Ofcom 6.3%	**A1 Ofcom 6.3% with consolidation**	**C✂%**	**D ✂%**	**B1✂% calibrated with consolidation**
% of traffic that is onward routed	Ofcom 50%	✂	✂	✂	✂	✂
	45%	✂	✂	✂	✂	✂
	37% post consolidation	✂	✂	✂	✂	✂

Table 2.25: Onward routed M2M ported traffic volumes under varying assumptions, ten year totals

The extent of the spread of the range of outcomes is best shown by expressing the ten year total volumes as a percentage of the Ofcom result, as follows:

Volume of onward routed calls, as a % of the Ofcom base outcome i.e. 6.3% annual porting with 50% onward routed		**% of calls that are to ported customers**				
		A Ofcom 6.3%	**A1 Ofcom 6.3% with consolidation**	**C✂%**	**D ✂%**	**B1 ✂% calibrated with consolidation**
% of traffic that is onward routed	Ofcom 50%	**100%**	✂	✂	✂	✂
	45%	✂	✂	✂	✂	✂
	37% post consolidation	✂	✂	✂	✂	✂

Table 2.26: Onward routed M2M ported traffic volumes under variant assumptions – as proportions of Ofcom's central case

The level of benefits resulting from varying the onward routed traffic volume

It is relatively straightforward to examine the impact of these different volume assumptions on the cost benefit analysis, leaving all other elements (i.e. in particular the unit rate of saving) unchanged from Ofcom's values. The resulting gross savings are shown in table 2.27 below, when assessed over a ten year recovery period.

£m NPV of gross savings over ten years, multiplying volumes by Ofcom's view of unit rates		**NPV of gross savings**				
		A Ofcom 6.3%	**A1 Ofcom 6.3% with consolidation**	**C ✂%**	**D ✂%**	**B1 ✂% calibrated with consolidation**
% of traffic that is onward routed	Ofcom 50%	✂	✂	✂	✂	✂
	45%	✂	✂	✂	✂	✂
	37% post consolidation	✂	✂	✂	✂	✂

Table 2.27: Alternative £m NPVs of gross savings over ten years, varying traffic volumes only

As previously noted the present value of the costs of the solution build is £✂m, according to Ofcom. Therefore a mix of positive and negative results when the cost benefit analysis is conducted over a ten year period ensue from these volume variations, as table 2.28 below shows.

£m NPV of net benefit over ten years, multiplying volumes by Ofcom's view of unit rates		**NPV of gross savings**				
		A Ofcom 6.3%	**A1 Ofcom 6.3% with consolidation**	**C ✂%**	**D ✂%**	**B1 ✂% calibrated with consolidation**
% of traffic that is onward routed	Ofcom 50%	**26.0**	21.1	7.4	**-3.2**	**-14.8**
	45%	17.9	13.5	1.1	**-8.3**	**-18.8**
	37% post consolidation	4.9	1.3	**-8.8**	**-16.6**	**-24.9**

Table 2.28: Alternative £m NPVs of net benefit over ten years, varying traffic volumes only

Excluding the Ofcom outcome, seven of the other fourteen outcomes above give a positive result and seven a negative – but one does not need to relax Ofcom's assumptions of 6.3% annual routing proportion and 50% by very much before the positive result drops to a de-minimis level, before switching to a negative result with further relaxation. Effectively therefore one has to believe that Ofcom's estimates are very correct in order to arrive at a positive result even over the extended ten year recovery period.

Examining, as Vodafone did with changes to unit rates, the same adjustments over Ofcom's alternative assessment period of seven years post implementation gives the results given in table 2.29 below.

£m NPV of gross savings over seven years, multiplying volumes by Ofcom's view of unit rates		**NPV of gross savings**				
		A Ofcom 6.3%	**A1 Ofcom 6.3% with consolidation**	**C ✂%**	**D ✂%**	**B1 ✂% calibrated with consolidation**
% of traffic that is onward routed	Ofcom 50%	✂	✂	✂	✂	✂
	45%	✂	✂	✂	✂	✂
	37% post consolidation	✂	✂	✂	✂	✂

Table 2.29: Alternative £m NPVs of gross savings over seven years, varying traffic volumes only

Over the seven year cost benefit analysis, Ofcom has recorded the present value of the solution costs as £✂m. These can again be deducted from the gross savings of table 2.29 above to result in the net benefits of table 2.30 below.

£m NPV of net benefit over seven years, multiplying volumes by Ofcom's view of unit rates		**NPV of gross savings**				
		A Ofcom 6.3%	**A1 Ofcom 6.3% with consolidation**	**C ✂%**	**D ✂%**	**B1 ✂% calibrated with consolidation**
% of traffic that is onward routed	Ofcom 50%	16.4	12.3	1.7	**-6.4**	**-15.4**
	45%	9.9	6.3	**-3.2**	**-10.5**	**-18.7**
	37% post consolidation	**-0.4**	**-3.3**	**-11.2**	**-17.2**	**-23.9**

Table 2.30: Alternative £m NPVs of net benefit over seven years, varying traffic volumes only

Here materially positive NPVs are hard to find, with ten negative results being produced. Finally expressing the gross savings over a shorter five year period gives the following set of outcomes:

£m NPV of gross savings over five years, multiplying volumes by Ofcom's view of unit rates		**NPV of gross savings**				
		A Ofcom 6.3%	**A1 Ofcom 6.3% with consolidation**	**C ✂%**	**D ✂%**	**B1 ✂% calibrated with consolidation**
% of traffic that is onward routed	Ofcom 50%	✂	✂	✂	✂	✂
	45%	✂	✂	✂	✂	✂
	37% post consolidation	✂	✂	✂	✂	✂

Table 2.31: Alternative £m NPVs of gross savings over five years, varying traffic volumes only

Deducting from these gross savings the five year present value of the solution costs of £✂ produces the following set of NPVs as shown in table 2.32:

£m NPV of net benefit over five years, multiplying volumes by Ofcom's view of unit rates		NPV of gross savings				
		A Ofcom 6.3%	A1 Ofcom 6.3% with consolidation	C ✂%	D ✂%	B1 ✂% calibrated with consolidation
% of traffic that is onward routed	Ofcom 50%	7.1	3.9	**-4.2**	**-10.3**	**-17.1**
	45%	2.0	**-0.8**	**-8.0**	**-13.6**	**-19.7**
	37% post consolidation	**-6.0**	**-8.3**	**-14.3**	**-18.8**	**-23.8**

Table 2.32: Alternative £m NPVs of net benefit over five years, varying traffic volumes only

The overall conclusion from this section is straightforward:

- The determination of whether a materially positive result is generated in the cost benefit analysis is highly sensitive to traffic volumes;
- Both of Ofcom's principal assumptions underlying the estimates of future traffic volumes, i.e. the annual volume of ports and the proportion of ported traffic that is currently routed look to be significantly over-stated, or at best extremely unlikely outcomes;
- A relatively slight relaxation of either or both of these assumptions will rapidly erode any material net benefit, when considered over either a ten year or a seven year recovery period;
- Adjusting the assumptions to levels that would appear to be more soundly based to derive estimates of future in-scope traffic consistently produces a negative result;
- Basically therefore Ofcom only has to be a little wrong on their inputs in order for a positive outcome to be eliminated.

Given that the next stage of the evaluation process has to be to consider what might happen to the cost benefit analysis when both the unit rate of saving and the volume of traffic are considered to vary simultaneously from Ofcom's base case, there is a need to match these volume outcomes in table 2.25 above with the alternative unit savings outcomes defined above in table 2.10.

However with fourteen tabulated volume variations and potentially eight unit rate variations a full set of results would produce far too many alternatives for analysis, so for simplicity as an input only five possible alternative volume scenarios have been selected that are more or less evenly spread from the low[32] of the ✂% of the Ofcom

[32] As discussed above Vodafone is not implying that this is the lower bound of outcomes – a lower result could easily be derived by assuming that the current annual porting proportion of

base outcome produced by the ✂% annual porting volume with 37% onward routing option (shown at the bottom right of tables 2.25 and 2.26 above), up to the Ofcom 6.3% / Ofcom 50% high value (on the top left of the tables). Since Vodafone does not believe that either the 6.3% or the 50% assumptions can reasonably be construed as correct values, no alternative solution along these axes has been selected. The scenarios selected for subsequent multiplication by the alternative values of unit rates are highlighted in bold and shading in table 2.33 below.

Volume of onward routed calls, as a % of the Ofcom base outcome i.e. 6.3% annual porting with 50% onward routed		**% of calls that are to ported customers**				
		A Ofcom 6.3%	**A1 Ofcom 6.3% with consolidation**	**C ✂%**	**D ✂%**	**B1 ✂% calibrated with consolidation**
% of traffic that is onward routed	Ofcom 50%	**100%**	✂	✂	✂	✂
	45%	✂	✂	✂	✂	✂
	37% post consolidation	✂	✂	✂	✂	✂

Table 2.33: onward routed volumes under variant assumptions

✂% reduces over time to a lower level of porting activity e.g. on the basis of the decline in switching activity reported by Ofcom in its latest Communications Report

Computation of overall savings opportunity from mobile to mobile direct routing

In addition therefore to the Ofcom view of unit costs and onward routed traffic volumes that collectively give Ofcom's preliminary assessment of the potential savings 2012 - 2021, Vodafone in the sections above has devised four alternative views of unit costs and five alternative views of traffic volumes. To recap, the views of unit cost (as alternatives to Ofcom's view of switching and transmission costs) as shown in table 2.10 are:

A. Switching cost taken directly from the 2007 termination model and transmission cost discounted by 50%;

B. Switching cost taken from the 2007 termination model but using the higher volume scenario as a proxy for future revisions and transmission cost discounted by 50%;

C. Switching cost taken from the 2007 termination model and transmission cost discounted to 15%;

D. Switching cost taken from the 2007 model but discounted as a proxy for future revisions, and transmission cost discounted to 15%.

The five selected alternative views of traffic volumes (other than Ofcom's own version) from table 2.33 are:

1. 6.3% annual porting growth, consolidation in 2011, 45% onward routing proportion;

2. ✂% annual porting growth, consolidation in 2011, 45% onward routing proportion;

3. ✂% annual porting growth, consolidation in 2011, 45% onward routing proportion;

4. ✂% annual porting growth, consolidation in 2011, 37% onward routing proportion;

5. ✂% annual porting growth, consolidation in 2011, 37% onward routing proportion.

Putting together these alternative volumes and rates and constructing a five by four matrix of outcomes of their products, gives a set of alternative benefits over ten years expressed in PV terms as table 2.34 below (shown together with the original Ofcom outcome of £✂m PV of benefits):

10 year NPV of savings £m		Estimates of unit cost of onward routing				
		Ofcom	A	B	C	D
Volume scenarios	Ofcom	✂				
	1		✂	✂	✂	✂
	2		✂	✂	✂	✂
	3		✂	✂	✂	✂
	4		✂	✂	✂	✂
	5		✂	✂	✂	✂

Table 2.34: Calculation of benefits under varying volume and unit rate assumptions

It should be recalled that the ten year present value of the costs according to Ofcom is £✂m. Of the Vodafone outcomes therefore, *only* A1 produces benefits that are greater than the costs and all of the remaining outcomes generate less benefits than the quantum of costs even over a ten year period, as table 2.35 below shows.

10 year NPV of net benefits £m		Estimates of unit cost of onward routing				
		Ofcom	A	B	C	D
Volume scenarios	Ofcom	**£26.0m**				
	1		£0.6m	**- £6.7m**	**- £10.4m**	**- £17.7m**
	2		**- £9.4m**	**- £15.4m**	**- £18.4m**	**- £24.4m**
	3		**- £17.1m**	**- £22.1m**	**- £24.6m**	**- £29.6m**
	4		**- £23.8m**	**- £27.9m**	**- £30.0m**	**- £34.3m**
	5		**- £30.8m**	**- £33.9m**	**- £35.5m**	**- £38.7m**

Table 2.35: Calculation of net benefits under varying volume and unit rate assumptions, after deducting Ofcom's view of costs

Ofcom in its evaluation of the cost benefit analysis as discussed above appears to be agnostic between a seven and a ten year evaluation, so re-plotting the outcomes on a seven year payback basis gives the benefit results in table 2.36 below:

7 year NPV of savings £m		Estimates of unit cost of onward routing				
		Ofcom	A	B	C	D
Volume scenarios	Ofcom	✂				
	1		✂	✂	✂	✂
	2		✂	✂	✂	✂
	3		✂	✂	✂	✂
	4		✂	✂	✂	✂
	5		✂	✂	✂	✂

Table 2.36: Calculation of seven year savings under varying volume and unit rate assumptions

Over a seven year basis, Ofcom has calculated the PV of the costs as £✂m – thus *none* of the Vodafone outcomes will produce a positive net benefit over a seven year period, as shown in table 2.37 below.

7 year NPV of net benefit £m		Estimates of unit cost of onward routing				
		Ofcom	A	B	C	D
Volume scenarios	Ofcom	£16.0m				
	1		**- £3.7m**	**- £9.4m**	**- £12.1m**	**- £17.8m**
	2		**- £11.5m**	**- £16.2m**	**- £18.4m**	**- £23.1m**
	3		**- £17.5m**	**- £21.4m**	**- £23.3m**	**- £27.2m**
	4		**- £22.9m**	**- £26.1m**	**- £27.7m**	**- £30.9m**
	5		**- £28.3m**	**- £30.8m**	**- £32.1m**	**- £34.6m**

Table 2.37: Calculation of seven year net benefits under varying volume and unit rate assumptions, after deducting Ofcom's view of costs

Taking this a little further and considering the implementation over a shorter five year evaluation period, i.e. to 2016, the results are similarly dire, as table 2.38 below shows.

5 year NPV of savings £m		Estimates of unit cost of onward routing				
		Ofcom	A	B	C	D
Volume scenarios	Ofcom	✂				
	1		✂	✂	✂	✂
	2		✂	✂	✂	✂
	3		✂	✂	✂	✂
	4		✂	✂	✂	✂
	5		✂	✂	✂	✂

Table 2.38: Calculation of five year savings under varying volume and unit rate assumptions

Over five years the PV of the costs of the solution as calculated by Ofcom is £✂m; this gives a negative net present value in every single Vodafone solution and only £7.1m positive in the Ofcom view of benefits, as 2.39 below.

5 year NPV of net benefit £m		Estimates of unit cost of onward routing				
		Ofcom	A	B	C	D
Volume scenarios	Ofcom	£7.1m				
	1		**- £8.6m**	**- £12.9m**	**- £14.9m**	**- £19.3m**
	2		**- £14.5m**	**- £18.1m**	**- £19.7m**	**- £23.3m**
	3		**- £19.0m**	**- £22.0m**	**- £23.4m**	**- £26.5m**
	4		**- £23.3m**	**- £25.8m**	**- £26.9m**	**- £29.4m**
	5		**- £27.4m**	**- £29.3m**	**- £30.2m**	**- £32.2m**

Table 2.39: Calculation of five year net benefits under varying volume and unit rate assumptions, after deducting Ofcom's view of costs

Comparison between the five year and seven year outcomes show that for volume scenarios 4 and 5 and rates scenarios C and D the results of the seven year and the five year outcomes are very similar – this is presumably because in years 6 and 7 the inflows and outflows are more or less equal, i.e. there is no or very limited contribution being made to the capital investment.

Perhaps the best way to look at the issue of the estimation of the appropriate level of saving to be included in the cost benefit analysis is that given the difficulties and uncertainties of forecasting both the volume of onward routed traffic in 2012 – 2021 (or whatever shorter period is best fitted to decision making) and the level of unit costs over the same period, when set in the context that Ofcom's assessment of both of

these appears to be on the high side, is how right must Ofcom be to preserve a positive result?

As Vodafone has shown in table 2.28 above, even if one assumes that Ofcom's assessment of unit rates is completely correct, adjusting the traffic volumes to the level implied by the current rate of annual porting, ✂%, rather than the 6.3% Ofcom has input will produce a negative NPV of £(14.8)m over ten years. Similarly, by assuming that the Ofcom view of volumes is correct but adjusting to more reasonable estimates of the unit rates, a negative result is arrived at, even over ten years, as table 2.11 shows.

But if one assumes that Ofcom is only a little wrong on both volumes and unit rates, and looks at the least negative Vodafone solution, A1 above, that produces £0.6m positive NPV over ten years, a negative £3.7m over seven years, and a negative £8.6m over five years (tables 2.35, 2.37 and 2.39 respectively), one can see that the adjustments that have been made in this case to Ofcom's assumptions are minor. On volume the Ofcom 6.3% annual porting assumption is maintained and all that has been adjusted is network consolidation in 2011 and onward routing is reduced from 50% to 45%. On rates, the switching costs have been taken directly from the Ofcom termination model without other adjustment, and the interconnect costs reduced by only 50%.

Vodafone concludes that Ofcom must therefore be very right on both savings levers of rate and volume in order to produce a positive net benefit from the cost benefit analysis. However, as discussed in the sections above, this is not the case: there is every indication that the Ofcom values for traffic volumes and unit savings are most likely significantly above levels that could reasonably and realistically be derived, particularly given the uncertainty of any estimation of rates and volumes from 2012 to 2021.

Ofcom has conducted its own sensitivity analysis on the principle that savings volumes and onward routing costs could be either 20% above or 20% below the Ofcom outcome. Vodafone rejects this supposition that the Ofcom outcome is a central outcome around which alternative values might reasonably be deemed to spread. In reality Ofcom's outcome is very much a high outlier and it is hard to see how the values could possibly go up by 20%, and there is every reason to suppose that both the input values could go down by more than 20%. For example the most obvious way to push the volumes up by 20% would be to assume an annual porting rate of even higher than the assumed rate of 6.3%, which in itself appears to be ✂ the current rate, rather than reflective of the current rate as Ofcom has assumed it to be. Or to push the unit rate of onward routing up by 20% one most likely has to believe that the current termination market review process will have the outcome of allowing higher termination rates than are allowed at present.

Vodafone suggests that it is necessary for Ofcom to have another go at the estimations of traffic volume and unit rate of onward routing costs over the period 2012 – 2021, in the light of the potential network consolidation and Vodafone's other arguments, to build up a more reasonable picture of the possible range of savings outcomes to feed into the cost benefit analysis.

We accept that of course it is impossible to arrive at a single definitive answer as to the value of the savings over five, seven and ten years, given the uncertainties that exist over all the elements that collectively derive the overall savings outcome, i.e. the current volume of M2M onward routed traffic and the way in which it might grow, the

unit costs of switching and of transmission. This uncertainty clearly increases with time, so the degree to which any investment decision relies for a favourable result on very distant future benefit flows is also relevant.

What we are not arguing is that this uncertainty should be an excuse for either inaction or a reason for precipitate action. So we are not saying that because it is impossible to determine the “real” level of future savings nothing should be done to see if onward routed traffic can be avoided. However we are saying that one cannot arbitrarily fix on a particular level of savings in the hope that it will prove to be greater than the costs and on those grounds commit the industry to substantial investment that may or may not ultimately prove to be worthwhile, but bears the risk that it will actually decrease rather than increase consumer welfare, as well as diverting operator resources from more effective activities.

What may be a more fruitful way forward is to look at the possibility of establishing a reasonable floor of benefits, i.e. a level of benefits that is unlikely to be undershot. Providing the level of costs can be definitively established to be no more than this level, then any error in estimation of the benefits will be upside in nature. The establishment of this saddle-point is difficult, but not impossible.

Costs of deploying a direct routing solution

Ofcom's CDB solution

In A5.80 onwards Ofcom builds up its view of the initial and ongoing costs of a solution that avoids onward routing, under a variety of permutations (all traffic, F2F, M2M, M2F plus F2F, M2M plus F2M etc). Since in the overall cost benefit analysis Ofcom reaches the provisional conclusion that it is solely the M2M onward routing avoidance case where a positive net benefit is achieved as shown in table 2.40[33] below,

	NPV £m	
	7 years	**10 years**
All calls	-118	-108
Fixed to fixed	-130	-137
Mobile to mobile	**16**	**26**
Fixed to mobile and mobile to mobile	-81	-86
Fixed to fixed and mobile to fixed	-205	-215

Table 2.40: Ofcom's overall cost benefit analysis

it is only this particular scenario that is examined in any detail by Vodafone. Ofcom identifies and quantifies several heads of expenditure for the M2M solution, as outlined in table 2.41 below.

Outflows in £m	**Initial capex**	**Opex years 1 to 10**	**Replacement capex in years 8, 9 & 10**
UK Porting	✂	✂	✂
UK CDB	✂	✂	✂
Operator specific costs	✂	✂	✂
Total	✂	✂	✂

Table 2.41: Ofcom assessment of M2M solution costs

Overall, based on a solution build in 2011 and 10 years of subsequent outflows over the period 2012 - 2021, these assessed outflows in aggregate after discounting at 11.5% cost of capital, amount to a 2009 present value of £✂m; over seven years the costs are a discounted £✂m and over five years £✂m.

[33] This table is a reproduction of Ofcom's table 1 in the consultation

Ofcom suggests[34], as a general comment on the costs of all solution permutations, rather than specifically on the M2M scenario that:

> "*the costs provided will be an upper bound for the following reasons:*
>
> *a) A number of stakeholders have expressed the view that the specification developed by UK Porting was in respect of some aspects, over engineered and contained a number of capabilities that were inserted at the request of a minority of operators. Nevertheless we understand that these aspects were retained in the final specification in order to expedite progress and there was insufficient time to consider how to optimise the solution due to the tight timescale. We have not adjusted the operator specific cost estimates which were based on the UK Porting specification, thus the costs are likely to be overstated in particular if the requirement is to support only a limited set of call types.*
> *b) A number of operators have made representations to us that the timescales associated with implementing the previous UK Porting solution were tight, and as a result were increasing the complexity of simultaneously implementing and testing both the porting requirements and already planned network upgrades, and that this complexity was driving up costs.*
>
> *A5.91. Both of the above factors are likely to result in our estimates above being upwardly biased."*

We welcome Ofcom's recognition that the rushed timetable of UK Porting was unsafe, and may have led to an incorrect appreciation of the correct costs (and risks) of implementation, but we believe that it is too simplistic to assume that a more considered programme would lead to a reduction of costs over those projected by UK Porting. One of the principal problems with the unrealism of the timetable imposed on UK Porting was that artificial deadlines were imposed. So for example the request for quotation (RFQ) for the CDB that was sent out to prospective suppliers ✂.

Had Vodafone's successful appeal not halted the programme, and UK Porting (or its associated legal vehicle Portco) had proceeded to accept the quote for the CDB that forms the basis of Ofcom's current estimate (✂), it is inevitable that substantive modifications, variation orders and so forth would have been required in order to arrive at a fully functional CDB; this would only have added to rather than decreased the cost. Vodafone therefore cannot regard the view of CDB costs presented by Ofcom as complete. In any event Ofcom has not actually taken the value of the ✂ CDB quote into the model, but discounted it further on a basis (that is referred to but not explained in the text) that would appear to be little more than arbitrary[35]. Vodafone's view

[34] In A 5.90 and following

[35] This discounting would appear to relate to the idea that M2M throughput would be lower than an all operator solution, even though the M2M solution was anyway the only one immediately envisaged by UK Porting – the cost/volume adjustment made by Ofcom would on the face of it seem excessive. It also gives rise to a further question that if installation costs are that sensitive to traffic volume, why when Ofcom is envisaging a more than doubling of mobile ported traffic over the period would the 2008 dimensioning be sufficient, as Ofcom appears to assume, without further capital expansion?

therefore is that the CDB costs that Ofcom has factored in to the cost benefit analysis are likely to be incomplete and insufficient.

In terms of operator specific costs, Ofcom makes it clear that the source for these is not UK Porting, but data provided to Ofcom as part of the recent Section 135, i.e. it post-dates the successful MNP appeal. It is not obvious therefore that the fact of the rushed timetable imposed by UK Porting can be realistically interpreted, as Ofcom attempts, into any expectation that the costs supplied might be on the high side. Vodafone made it clear in its response to Ofcom on the Section 135[36] that the cost data therein supplied ✂. It is more likely that the under-specification of the CDB and the process in general would mean that there are additional unrecognized areas of operator expenditure not yet accounted for, tending to increase not reduce the cost levels.

One area of possible under-costing that arises out of Ofcom's provisional view, different from the UK Porting approach, that a M2M only solution could be implemented as a standalone event, rather than the precursor to a subsequent full implementation of direct routing for all operators, both fixed and mobile, is that two routing methodologies will inevitably be operating simultaneously at least on a semi-permanent basis. Given the fact that all fixed operators and all small mobile operators will not have to implement direct routing, but will be able to continue to onward route, some operators will be onward routing and others will be required to employ direct routing. So therefore those five (or four) participating operators for whom mandated direct routing will apply for their own originated traffic will continue legitimately to exchange onward traffic with each other where that traffic has originated not on their own network, but has been sent to them from a non-participating operator. Thus not only will parallel recording and accounting systems need to be developed and maintained to separate and correctly account for onward routed and directly routed traffic, but also there is a potentially larger problem of how participating operators are going to demonstrate compliance with the regulation.

Will for example each participating operator need to develop systems to interrogate all incoming onward routed (ported in) traffic they receive to detect the ultimate originator to filter out, denounce and reject inadvertent incorrectly onward routed traffic, or will participating operators before re-routing inbound traffic and thus making it onward routed (ported out) have to make certain of the network of call origin and reject calls that originated with a participating operator (given the problem imposed by the fact that a number in the range of a participating operator may have ported out to a non-participating operator)? Whatever solution to these issues has to be adopted, it is unlikely to have been factored in to the UK Porting based specification which envisaged universal direct routing: any solution is thus unlikely to be free of cost.

On balance therefore Vodafone's view of the UK Porting and operator outline assessment of costs reported by Ofcom in the current consultation is that they are more likely to represent an under-recording, not an over-recording of the costs of implementing a central database led solution. Whether the costs are materially under-estimated however is impossible to know.

The Ofcom view of costs amounts to over a ten year period of implementation is a present value of £✂, over seven years £✂m, and over five years £✂m. Increasing both capex and opex by a constant percentage has a linear impact on this, so a 10% increase would add £✂m to the ten year CBA, or £✂m to the seven year CBA.

[36] ✂

In terms of the basic Ofcom outcome of £26m, the impact of a 10% cost increase on its own is fairly muted:

Net present value of cost benefit analysis	Ofcom	10% cost increase	Resulting NPV
10 years of assessment (to 2021)	£26.0m	✂	✂
7 years of assessment (to 2018)	£16.4m	✂	✂
5 years of assessment (to 2016)	£7.1m	✂	✂

Table 2.42: Sensitivity of cost changes to Ofcom's outcome

But given the conclusion from the sections above that Ofcom's view of the savings opportunity from the re-routing of M2M onward routing traffic is substantially on the high side, the practical impact of an increase in the solution costs is to produce a more adverse result, with the result that only a very minor deviation from Ofcom's benefit calculations would be required to produce a negative result.

Alternative direct routing solutions

One subject alluded to above is that even if one were to assume that Ofcom's assessment of the potential savings was secure, a direct routing solution that could be derived with lower costs than the CDB solution above would secure a higher level of benefits. This is a matter that Ofcom has failed to investigate, that having concluded that the CDB solution produces a favourable result in the M2M case it has not considered whether there is an alternative method of achieving direct routing that can achieve the same result at a lower cost and thus generate additional benefits.

The problem with the CDB method is implied in the name, that it requires a central database, with a central organisation to run and control it, providing also a single point of failure in the call routing system. Whilst such a design element may be an important requirement when faced with the participation in it and use of it by every single UK telecoms operator, its relevance becomes less on any solution that is limited to a very small number of operators (who also share common standards). Vodafone believes that in a world with five/four participating mobile operators the CDB solution is an over-engineered, excessively centralised and over expensive solution. There are other ways of facilitating M2M direct routing for ported traffic. Given that the costs of implementing and running these alternatives would appear to be likely to be significantly less than the cost of a CDB solution, they must always be able to offer a superior result in a cost benefit analysis to a CDB solution.

So where Ofcom is envisaging a M2M direct routing solution for the five (or possibly in the future four) major mobile operators alone there is every possibility that a simpler solution than a CDB based one is possible. Given that a simpler solution should mean a cheaper solution, overall operator (and hence consumer) benefits should be greater

from this. Vodafone sees no point in establishing a CDB system for mobile direct routing between such a small group of participants.

One further problem with a CDB based approach is that it is in practice a "big bang" approach requiring a shift in handling of all outbound calls. Such a methodology inevitably requires a significant period of migration and stability testing prior to any go live, that not only increases the cost but also increases the risk of failure. We believe that the best way forward is an industry led investigation that should examine the possibilities of a "lightweight architecture" to achieve direct routing, in terms of both method and implementation path. ✂.

Vodafone does not know what might be the overall cost to the mobile industry of the implementation of any particular solution, or whether multiple alternatives could be determined and what an appropriate timetable for each might be in the context of all mobile operators' core network strategies. We do know however that the cost of these is very likely to be significantly less than of a CDB direct routing solution. We see several points arising from this:

- If one assumes that the Ofcom M2M savings assessment is correct, then a higher level of positive benefits could be derived from an alternative solution over those obtainable from a CDB solution.

- In Vodafone's view the Ofcom M2M savings represents a substantial over-estimate and the Ofcom CDB solution costs an underestimate, so that a positive case cannot be made for the mandating of a CBD solution.

- Given the current ignorance of the absolute size of the solution costs for any alternative method it is impossible to know whether such a solution would actually produce a positive result, given the considerable uncertainty on the levels of the saving. However any such solution offers a much more realistic prospect for a favourable outcome than the CDB solution.

Vodafone submits that the CDB solution should not be pursued and that alternative solutions should be looked at with a view to determining feasibility and the likely levels of implementation costs, and that a fresh look be taken on estimating re-routable onward routing volumes and the unit cost of onward routing. The objective of the latter exercise, given the impossibility arriving at any absolute level of savings should be to obtain a lower bound estimate of the minimum likely savings that could be achieved by direct routing of M2M traffic. These savings values could then set the effective cost limits for engineering an appropriate solution.

Purely by way of illustration if we assume that Vodafone's lowest savings solution presented above in tables 2.34 to 2.39, D5, is a genuine floor then over five years the 2009 NPV of the savings would be £✂m, over seven years £✂m, and over ten years £✂m. These levels might then be seen to set the maximum permissible industry implementation costs in order to produce a favourable outcome. Assuming the same timings as Ofcom of a solution build in 2011 and implementation in 2012, then a hypothetical solution that had a capital investment of £✂m followed by £✂m annual opex would cost £✂m NPV over five years, £✂m over seven and £✂m over ten. So if Vodafone savings scenario D5 were correct, then any solution would have to be engineered with costs no more than roughly £✂m capex and £✂m opex in order to guarantee consumer benefit. If the floor were not D5, but some lower level, then only a lower level of solution costs could be permitted.

This use of a threshold floor of savings to set the maximum level of permissible implementation costs might prove to be the most appropriate way to proceed with solution design and development. There would still remain a question of materiality, of whether the degree to which the probable savings might exceed the costs produced a sufficient surplus to justify the financial and technical resources that would be expended on the change in the context of all the other demands made on network operators, but that is a subject to be returned to in any future consultation.

Section 3 - Consultation questions - routing

These questions are responded to in general in the main body of our consultation response, in sections 1 and 2 above. A difficulty with providing an extensive specific response to each question is that many of them address a point of detail predicated on Ofcom's faulty conclusion that a direct routing M2M solution can be currently seen as providing benefits to industry and the consumer. These questions cannot generally be meaningfully answered as a result of Vodafone's conclusion that Ofcom cannot make their case.

Question 3.1: Do you agree that there is a problem in the way mobile originated calls to ported mobile numbers are routed? If not, why not?

We do not entirely agree with Ofcom's analysis. Onward routing is not inappropriate or inefficient in any absolute measure, any more than using a transit operator to route calls rather than directly interconnect them is "wrong". The alternative to onward routing, direct routing can only be judged to be more efficient in circumstances where the costs of its implementation are less than the costs of the alternate, i.e. onward routing – and hence the change to direct routing may be seen in this circumstance to reduce overall operator costs.

Equally there is no more of a "problem" with onward routed mobile to mobile traffic than there is with onward routed fixed to mobile traffic or onward routed fixed to fixed traffic or onward routed mobile to fixed traffic. The only difference between the four is that in the case of onward routed mobile to mobile traffic Ofcom believes that direct routing can provide a cheaper solution. As Vodafone explores in this consultation, we see that Ofcom is wrong, in which case mandating a direct routing M2M solution will increase, not decrease operator costs, reducing not increasing consumer benefit.

Question 3.2: Do you agree with our assessment of the issues associated with onward routing?

We agree in part. We agree that the key issue is one of economic efficiency and cost-effectiveness, which is an empirical matter. Where we part company with Ofcom is in its apparent confidence in its cost-benefit analysis, which we do not believe is warranted at present. Accordingly, we do not think the provisional conclusions Ofcom draws from that analysis are reliable as they stand, for reasons discussed more fully in section 2 of this response.

Ofcom discusses in turn the possibility of commercial or technical failure, quality of service, and service interoperability/interworking. We agree with the bulk of this discussion and the conclusion that these issues are secondary to the primary issue of economic efficiency. We are mystified, however, by the fact that Ofcom seeks to suggest that these issues "*may, nevertheless, be potentially significant*" in spite of a complete lack of evidence to this effect. Ofcom cannot seriously place any weight on direct routing as a means of addressing possible technical or commercial failure in circumstances where it proposes to continue onward routing indefinitely not only for F2F, F2M and M2F traffic, but also for M2M as regards new mobile entrants. Similarly, Ofcom explicitly acknowledges that it has found no evidence to suggest quality of service has been an issue of any significance [3.27] yet feels

compelled to speculate on a possible future benefit that it cannot specify or quantify. Any reduction in transmission links and switching is already taken into account quantitatively in the cost-benefit analysis. Finally, Ofcom correctly diagnoses that service interoperability is not an issue particular to onward routed calls but then goes on, without explanation, to suggest that the adoption of direct routing "might nevertheless lessen the effect of this issue".

While we recognise that Ofcom has previously sought to attach weight to these issues, and that this may in part explain its apparent reluctance to discount them entirely, the attempt to elevate them into potentially significant issues in the face of all evidence to the contrary is weak and unconvincing. Ofcom implicitly recognises this by not seeking to place weight upon them. To do otherwise would strain credulity.

We therefore welcome the fact that such dubious putative secondary benefits form no part of Ofcom's discussion of its policy objective in paragraphs 3.33 to 3.35. We largely agree with the way Ofcom has formulated this objective, despite our reservations about the soundness of Ofcom's provisional conclusions.

Section 4

Question 4.1: Do you agree with our proposed approach for assessing the net benefit? If not please explain why not.

Question 4.2: Do you agree that we have identified the relevant cost drivers resulting from a move to direct routing? If not please explain why not.

We are unhappy with the title of the section "assessing the level of the inefficiency" since as discussed in Section 1 and elsewhere this is a misstatement of the issue, which simply put is "which is more cost effective, onward or direct routing?" Apart from that however, Ofcom's explanation of its method and the relevant cost drivers is perfectly reasonable.

Where we believe Ofcom is wrong in its general approach is that having determined to its satisfaction that a universal "all operator" direct routing solution did not "cost in" (by reason of an in excess of £100m negative NPV) it should have reconsidered the solution builds for each of the remaining four permutations, to see if it was possible to derive a solution for each on an individual basis that might cost rather less than the over-engineered CDB approach, since clearly a lower cost solution, if possible, would have increased the benefits.

As described in the main body of the consultation, Vodafone's view is that a favourable NPV cannot be produced for a CDB M2M solution, since the value of the savings is overstated and the costs of the CDB solution likely to be understated. Vodafone suggests an alternative direct routing M2M solution should have significantly lower costs to implement. Vodafone does not know whether such a solution would actually cost out, given the uncertain nature of its costs, and the difficulty in deriving an appropriate valuation of the degree of saving, but considers the investigation of this should be Ofcom's next step.

Section 5

Question 5.1: Do you agree with our assessment of doing nothing? If not, please explain why.

No. Given that Ofcom's case that direct routing is more cost effective than onward routing is not proven, and is certainly wrong in the case of a CDB solution, the fact that the operators have not independently derived a solution that would appear to increase rather than decrease costs cannot be inferred as a co-ordination failure (particularly in the face of the "planning blight" arising from Ofcom's interventions since 2006).

It may be that if it were to be demonstrated in the future that a simpler direct routing solution, commonly designed, will unequivocally generate material industry benefits and if then despite that the operators fail to implement such a solution without due cause, then a co-ordination failure might be seen to have occurred – but it is wrong to decide that there is currently such a failure.

Question 5.2: Do you consider that an industry agreed solution is likely to emerge that would deliver direct routing no later than 2012? If not, please explain your reasons. Would you be supportive of such a solution?

It is too early to say, given that it has not been established whether any cost effective direct routing solution is possible. If such a solution were to be possible, then in principle Vodafone would support it, provided it generated sufficient certainty of benefit to make the diversion of resources worthwhile. Clearly the appropriate timetable for this hypothetical outcome would be dependant on the phasing that maximised net industry and consumer benefits.

Question 5.3: What steps do you consider Ofcom should take to ensure that such an industry commitment is serious? Do you agree with the proposed steps set out by Ofcom or are there additional measures that should be taken?

We do not think that Ofcom's current timetable of spring 2010 for 'commitment' plus 'plan' is realistic given the current state of the cost benefit analysis. Only if a solution emerges that is sufficiently positive for the quorum of participating operators is any further work on implementation and framework for mutual commitments likely to be justified.

Question 5.4: What steps do you consider should be taken to ensure that any industry solution that emerges does not foreclose the opportunity for other mobile operators to participate in the short term or longer term?

This cannot be answered at present. It must be remembered that all that is under consideration is a change to the routing of porting traffic, and nothing to do with the ability to port.

Clearly in principle if industry reaches the stage where a direct routing solution that demonstrably provides benefits is implemented then extending the scope of that solution to other operators may either increase or reduce those benefits, depending on whether the savings from the additional re-routed traffic brought into

scope is greater or less than the cost of implementing the extension. Simplification of the solution method would appear to give the best chance of minimising the costs of its extension.

Question 5.5: If there was a firm commitment to an industry-led solution, what role would you expect Ofcom to play?

If industry were to commit to a hypothetical cost effective direct routing solution, if one can be found, then we would hope that Ofcom would provide necessary assistance for example by removing any regulatory uncertainty that may arise.

Question 5.6: Do you agree with Ofcom's proposal for a backstop to mandate direct routing in the event that an industry initiative fails? Do you agree that reviewing the situation in late 2010/early 2011 is appropriate before deciding on the need to mandate?

No. This suggestion is founded on the false premise that the CDB direct routing solution will be cost efficient.

Question 5.7: Do you agree with our assessment of Option (3)? Please set out your reasons.

Question 5.8: If Ofcom was to take Option (3) forward, what would be the costs involved in (i) making changes to wholesale billing systems and (ii) other costs? Please explain the basis of your estimates.

Vodafone agrees with Ofcom's conclusion that option 3 should not be pursued, but differs from Ofcom as to why. Vodafone's reasoning is that it is not proven that direct routing is more cost effective so creating incentives to pursue the wrong outcome is not appropriate.

It may or may not be appropriate to revisit the subject of porting routing charges once the issue of direct routing has been resolved. Vodafone sees that at that point either M2M traffic will be directly routed and it may be sensible to consider the basis of routing charges for the remaining set of onward routed traffic, or that the most cost effective routing method for mobile ported traffic will be determined (at least for the near future) to continue to be onward routing.

Question 5.9: Do you agree with Ofcom's assessment that mandating direct routing for mobile originated calls to ported mobile numbers is likely to be the most effective way of removing routing inefficiencies? If not, what other factors that we should take into consideration, and why are they relevant to our analysis?

Question 5.10: Do you agree that if Ofcom were to mandate direct routing, the obligation should be designed in a way that would avoid mobile operators having to use direct routing where the scale of ported traffic is not sufficient to justify the up-front investment to implement direct routing?

Question 5.11: Do you agree that by framing the obligation in a way that obliges mobile operators to route calls to mobile ported numbers in the same way as non ported traffic

should avoid the risks of any unintended consequences? If not, please comment on how this obligation could best be framed.

Question 5.12: Do you agree that the obligation to provide information on ported mobile numbers should apply to all mobile network operators from the start and not just the five incumbent MNOs? Do you agree that if there is a central database of ported mobile numbers, this should contain all ported mobile numbers including those of newer entrants who would not be obliged to implement direct routing from the start?

Question 5.13: What do you consider to be an appropriate timescale for implementation of direct routing from the point at which Ofcom issues a final decision? Please provide a full and detailed explanation as to why you agree or disagree with the 2012 target date proposed by Ofcom.

No. The case that direct routing is more cost effective than onward routing has not been made. Vodafone is certain that a CDB solution is not cost effective and its implementation would actually increase operator costs and reduce customer benefits rather than achieve Ofcom's policy objective. It has yet to be established whether any lower cost alternative may emerge where the costs of implementation are demonstrably less than the reasonably assessed minimum benefits.

Equally if it transpires that several solutions are possible, in order to maximise consumer benefit, the solution that involves the lowest *overall* network costs would appear to be the most appropriate.

Any detailed issues on timetable, obligations of non-participating operators etc must await the potential emergence of a cost effective least cost solution.

Section 6

Question 6.1: Do you agree that it is appropriate for Ofcom/industry to appoint a qualified independent third party to work with industry to develop a provision technical specification for direct routing? If not, please state why

Question 6.2: Do you agree with the criteria for selecting an independent expert/consultancy? If not, please state what different/additional skills or qualities this independent party should bring?

Question 6.3: If you would like to recommend suitable experts/consultancies to Ofcom, please do so, on a confidential basis.

Question 6.4: Do you agree that three months is an appropriate period of time to produce a provisional technical specification from which stakeholders can derive reasonable accurate cost estimates? If not, explain why and detail what you consider to be an appropriate time scale.

Question 6.5: Do you agree that a further three months is a sufficient period of time to derive cost estimates based on the provisional technical specification? If not, please explain why and detail what period you think would be appropriate.

Question 6.6: Do you agree that the conditions we have set out as being necessary to make this process successful in its aims are appropriate?

Question 6.8: Do you agree with Ofcom's proposed next steps following responses to this consultation? If not, how do you think Ofcom should proceed to bring this assessment of calls to ported numbers to a final decision?

Ofcom's view of the next steps depends on whether industry goes down option 2 and commits to an industry-led solution or whether in the absence of this Ofcom invokes option 4 and mandates direct routing.

- Under option 2 industry would be expected to submit an agreed project plan with public CEO commitment by spring 2010 for a solution to be in place by at latest during 2012.

- Under option 4:

    - An independent expert would be brought in to be "*helpful in enabling industry to develop, agree and document a provisional technical specification which would provide for mobile calls to ported mobile numbers to be directly routed*[37]".

    - This expert would be appointed once Ofcom has received and considered responses to the current consultation.

    - The expert would be given three months to finish this work, and operators a further three months to derive cost estimates from the specification and submit them to Ofcom.

    - Finally "*once industry has submitted its cost estimates to Ofcom and, assuming the benefits of direct routing continue to yield a positive NPV, Ofcom will decide if there is a case for mandating direct routing and will then proceed to implementing the necessary changes to GC18 as appropriate*.[38]"

In Vodafone's opinion all of this activity is premature. Given that Ofcom's assessment of the future costs and volumes of onward routing is unsafe, a direct routing CDB solution cannot be said to provide a favourable outcome, and therefore Ofcom cannot suggest that the imposition of one via either option 2 or option 4 would be in the best interest of consumers. Whether a lower cost solution can be developed that would provide a favourable result is an open question.

Before embarking on any commitment to operator investment (or expecting a voluntary one from the operators) therefore Vodafone suggests two key next steps for Ofcom:

- It informs the operators that they are freed from the straight-jacket of a CDB solution and invites them to sit down together to investigate what direct routing solutions might be possible given the very limited number of suggested participant operators, together with indicative costings and timings.

- It has another go at estimating the future costs of onward routing, in terms of unit costs and possible volumes. But given the uncertainty inherent in estimation of these values for some extended period, Ofcom should focus on

[37] Consultation at 6.13
[38] Consultation at 6.19

establishing as far as is possible a likely lower reasonable bound of potential savings per year.

As a first stage we would suggest that the potential minimum savings be derived (and agreed with operators), since this would indicate a ceiling of cost to which operators could work in designing solutions. If it became readily apparent that no solution was possible within this cost constraint, then the volume of wasted scarce network design resources would be minimised. The result would be a cost benefit analysis that would suggest the likely minimum benefit or loss from implementation.

Providing there was some form of consensus as to whether the cost benefit analysis result indicated a need for change, Ofcom could then proceed down its joint track of option 2 backed up by option 4, or in the alternative declare that there was no reason to implement a direct routing solution, as it has for all other porting call cases.

Annex 5

Question A6.1: Do you have any comments on the assumptions used in the CBA?

Section 2 of this document is a detailed examination of the CBA. We find that Ofcom's assumptions are wrong - a positive result cannot be obtained for M2M direct routing when using realistic input assumptions. Ofcom needs to attempt to develop a more reasonable minimum view of the annual costs of onward routing (and thus the potential saving) and to incorporate this into the cost benefit analysis to determine the maximum cost allowable of a direct routing solution, and then see if a solution can be built to that level.