

Wholesale mobile voice call termination

Market Review Volume 3 – Supporting annexes

Consultation

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Annex 1

Responding to this consultation

How to respond

- A1.1 Ofcom invites written views and comments on the issues raised in this document, to be made **by 5pm on 23 June 2010**.
- A1.2 Ofcom strongly prefers to receive responses using the online web form at http://www.ofcom.org.uk/consult/ as this helps us to process the responses quickly and efficiently. We would also be grateful if you could assist us by completing a response cover sheet (see annex 3), to indicate whether or not there are confidentiality issues. This response coversheet is incorporated into the online web form questionnaire.
- A1.3 For larger consultation responses particularly those with supporting charts, tables or other data - please email MCTreview@ofcom.org.uk attaching your response in Microsoft Word format, together with a consultation response coversheet.
- A1.4 Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.

Paul Jacobus Floor 4 Competition Group Riverside House 2A Southwark Bridge Road London SE1 9HA

- A1.5 Note that we do not need a hard copy in addition to an electronic version. Ofcom will acknowledge receipt of responses if they are submitted using the online web form but not otherwise.
- A1.6 It would be helpful if your response could include direct answers to the questions asked in this document. It would also help if you can explain why you hold your views and how Ofcom's proposals would impact on you.

Further information

A1.7 If you want to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please contact Paul Jacobus on 020 7981 3574.

Confidentiality

A1.8 We believe it is important for everyone interested in an issue to see the views expressed by consultation respondents. We will therefore usually publish all responses on our website, <u>www.ofcom.org.uk</u>, ideally on receipt. If you think your response should be kept confidential, can you please specify what part or whether all of your response should be kept confidential, and specify why. Please also place such parts in a separate annex.

- A1.9 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and will try to respect this. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.
- A1.10 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's approach on intellectual property rights is explained further on its website at <u>http://www.ofcom.org.uk/about/accoun/disclaimer/</u>

Next steps

- A1.11 Following the end of the consultation period, Ofcom intends to publish a statement in late 2010.
- A1.12 Please note that you can register to receive free mail Updates alerting you to the publications of relevant Ofcom documents. For more details please see: <u>http://www.ofcom.org.uk/static/subscribe/select_list.htm</u>

Ofcom's consultation processes

- A1.13 Ofcom seeks to ensure that responding to a consultation is easy as possible. For more information please see our consultation principles in Annex 2.
- A1.14 If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at <u>consult@ofcom.org.uk</u>. We would particularly welcome thoughts on how Ofcom could more effectively seek the views of those groups or individuals, such as small businesses or particular types of residential consumers, who are less likely to give their opinions through a formal consultation.
- A1.15 If you would like to discuss these issues or Ofcom's consultation processes more generally you can alternatively contact Vicki Nash, Director Scotland, who is Ofcom's consultation champion:

Vicki Nash Ofcom Sutherland House 149 St. Vincent Street Glasgow G2 5NW

Tel: 0141 229 7401 Fax: 0141 229 7433

Email vicki.nash@ofcom.org.uk

Annex 2

Ofcom's consultation principles

A2.1 Of com has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A2.2 Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

During the consultation

- A2.3 We will be clear about whom we are consulting, why, on what questions and for how long.
- A2.4 We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened Plain English Guide for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.
- A2.5 We will consult for up to ten weeks, depending on the potential impact of our proposals.
- A2.6 A person within Ofcom will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organisations interested in the outcome of our decisions. Ofcom's 'Consultation Champion' will also be the main person to contact with views on the way we run our consultations.
- A2.7 If we are not able to follow one of these principles, we will explain why.

After the consultation

A2.8 We think it is important for everyone interested in an issue to see the views of others during a consultation. We would usually publish all the responses we have received on our website. In our statement, we will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 3

Consultation response cover sheet

- A3.1 In the interests of transparency and good regulatory practice, we will publish all consultation responses in full on our website, <u>www.ofcom.org.uk</u>.
- A3.2 We have produced a coversheet for responses (see below) and would be very grateful if you could send one with your response (this is incorporated into the online web form if you respond in this way). This will speed up our processing of responses, and help to maintain confidentiality where appropriate.
- A3.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom would encourage respondents to complete their coversheet in a way that allows Ofcom to publish their responses upon receipt, rather than waiting until the consultation period has ended.
- A3.4 We strongly prefer to receive responses via the online web form which incorporates the coversheet. If you are responding via email, post or fax you can download an electronic copy of this coversheet in Word or RTF format from the 'Consultations' section of our website at <u>www.ofcom.org.uk/consult/</u>.
- A3.5 Please put any parts of your response you consider should be kept confidential in a separate annex to your response and include your reasons why this part of your response should not be published. This can include information such as your personal background and experience. If you want your name, address, other contact details, or job title to remain confidential, please provide them in your cover sheet only, so that we don't have to edit your response.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS				
Wholesale mobile voice call termination Market Review				
To: Paul Jacobus:				
Name of respondent:				
Representing (self or organisation/s):				
Address (if not received by email):				
CONFIDENTIALITY				
Please tick below what part of your response you consider is confidential, giving your reasons why				
Nothing Name/contact details/job title				
Whole response Organisation				
Part of the response If there is no separate annex, which parts?				
If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?				
DECLARATION				
I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.				
Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here.				
ame Signed (if hard copy)				

Annex 4

Market definition supporting analysis

Market definition

- A4.1 This annex sets out the detailed economic analysis that underpins our proposed view on the relevant economic market, which was set out in summary in Section 3. In particular, we cover the following points in this Section:
 - A summary of the regulatory context and our proposals;
 - Our analytical approach to market definition;
 - A discussion of some of the key characteristics of the market;
 - An overview of what we mean by wholesale mobile voice call termination;
 - Our analysis of the relevant product markets. This is informed by considering indirect (demand and supply) and direct (demand and supply) constraints;
 - Our analysis of the relevant geographic markets; and
 - Our conclusions on market definition.
- A4.2 This annex focuses on our economic assessment. For those less familiar with the overarching regulatory framework that establishes the requirements for Ofcom to conduct market reviews, we have included, in annex 6, more detail of this framework.

The regulatory context and our proposals

A4.3 As noted in Section 3, the European Commission (the Commission) has identified voice call termination on individual mobile networks as a reference market that we are required to review, with reference to the particular circumstances in the UK.¹ The analytical approach that we have adopted in this review, as with others, follows the well-established competition law principles that are reflected in detail by the Commission in its relevant Guidelines, Recommendation and associated Explanatory Memorandum (see annex 6 for further details of those documents). By applying that approach, we have arrived at the proposed market, which we have set out in paragraphs 3.4, and again in 3.72, of Section 3.

¹ Identified as Market 7 in, Commission Recommendation on Relevant Product and Service Markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services, Annex, p.8, at http://ec.europa.eu/information_society/policy/ecomm/doc/library/proposals/rec_markets_en.pdf

Our analytical approach to market definition

- A4.4 The established approach to market definition provides a systematic way to identify the boundaries of competition between products and services. The definition of the relevant market requires the identification of the immediate 'competitive constraints' that a hypothetical provider of a product or service faces and which would realistically prevent it from setting prices of those services above the competitive level. Market definition is not an end in itself, but a means to undertake an analysis of whether any provider or providers might have market power, for the purposes of determining in the context of this review whether *ex ante* regulation is required or not.²
- The 2007 Commission Recommendation³ identifies the starting point for the overall A4.5 assessment of wholesale markets to be the accurate identification of the relevant retail market for the period of the review. The retail markets form the starting point in the competitive assessment of wholesale markets because it is central in determining the extent to which the independence of price setting behaviour in the downstream markets acts to indirectly constrain the autonomy of price setting in the wholesale market. In other words, the input sold in the wholesale market (here this is MCT), is a derived demand for the voice call service sold in the downstream market (here this is a mobile voice service) and for this reason the competitive boundary at the retail level crucially conditions the boundary at the wholesale level.⁴ The candidate retail market needs to reflect those product and geographic dimensions appropriate to the current and prospective operation of the market in the UK, independent of the infrastructure being used. It therefore needs to include a clear evaluation of the expected and foreseeable technological and economic developments that are likely to affect the operation of the market in the UK for the forthcoming four year period that ends in 2015. It is only when this market has been defined that the subsequent exercise to identify the relevant wholesale market. which follows the same form of analysis, is then carried out (see paragraphs A4.29-A4.115).⁵

http://ec.europa.eu/information society/policy/ecomm/doc/library/proposals/rec markets en.pdf ⁴ Specifically, if a wholesale supplier raised the price of the input substantially above the competitive level this would in turn make the wholesale customer of that supplier less competitive on the retail market (where that wholesale input represents a significant element of the retail cost). This would have the effect of reducing its share (where there is a reaction to higher prices by end-users) of the relevant market and, ultimately, its purchases from the wholesale supplier.

² Explanatory note: Accompanying document to the Commission Recommendation on Relevant Product and Service Markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services, SEC(2007) 1483/2, 13/11/2007, at

http://ec.europa.eu/information_society/policy/ecomm/doc/implementation_enforcement/article_7/sec_2007_1483_2.pdf

³ Commission Recommendation on Relevant Product and Service Markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services, C(2007) 5406 rev 1, at

⁵ Explanatory note: Accompanying document to the Commission Recommendation on Relevant Product and Service Markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services, SEC(2007) 1483/2, 13/11/2007, at

http://ec.europa.eu/information_society/policy/ecomm/doc/implementation_enforcement/article_7/sec 2007 1483 2.pdf

- A4.6 Market definition, whether retail or wholesale, begins with the narrowest identifiable market, for a defined focal product (or product group) and area. This candidate market is then expanded from the narrowest point as appropriate given the competitive constraints on the provision of the relevant product or service (see paragraphs A4.29-A4.115). For example, in paragraphs A4.20-A4.28, we consider whether the market should be expanded to include the retail mobile communications products a MCP provides to its own subscribers.
- A4.7 There are two main sources of competitive constraint: demand-side substitution and supply-side substitution. A 'hypothetical monopolist test' (HMT) is often used to identify how close demand-side and supply-side substitutes are to the focal product in question. A product is only considered to constitute a separate market if a hypothetical monopoly supplier could impose a small but significant, non-transitory increase in price (SSNIP) above the competitive level without losing sales to such a degree as to make this price rise unprofitable. A 5-10% increase in the price is usually used to assess the effect of a SSNIP. If such a price rise would be unprofitable, because consumers would switch to other products, or because suppliers of other products would begin to compete with the hypothetical monopolist, then the market definition should be expanded to include the substitute products. It is only when the price increase is profitable and the price rise sustainable that this set of products then defines the relevant market and no further substitutes are considered, and the narrowest relevant market has then been identified.
- A4.8 In addition to product dimensions to the market definition, it is also necessary to assess the geographic dimension to it. In some cases, geographic markets are found on a national basis and in other instances the market may have a regional or local dimension. In order to assess the scope of geographic markets, the market assessment would look at the extent to which competitive conditions are sufficiently similar (as between different areas) such that a wider geographic market (e.g. a national market) can be defined. To do this, geographic market analysis often considers various competitive indicators such as whether pricing is the same across different geographies (suggesting a common pricing constraint) or looking more directly at indicators of the degree of competition between different geographic areas.
- A4.9 The approach to market definition that we have adopted in arriving at our proposed market follows this common methodology.

Characteristics of the market

Players and technologies

A4.10 The UK mobile industry comprises an extensive and diverse range of MCPs. The central players have traditionally been the 'big five' MNOs – H3G, O2, Orange, T-Mobile and Vodafone.⁶ H3G operates a 3G network, while the other four have deployed both 2G and 3G networks.⁷ In September 2009, Orange and T-Mobile's parent companies announced their intention to merge their UK operations into a

⁶ For a more detailed discussion of the centrality of network operators within the context of a wider mobile supply chain, see Ofcom's Mobile Evolution, Ofcom's mobile sector assessment, Statement, 17 December 2009, at <u>http://www.ofcom.org.uk/consult/condocs/msa/statement/MSA_statement.pdf</u>. ⁷ "2G" refers to GSM technology and its subsequent releases (e.g. GPRS, EDGE), while "3G" generally refers to UMTS and its subsequent releases (e.g. HSPA).

joint venture, which was subsequently notified to the Commission.⁸ On 1 March 2010, the Commission agreed the proposal, contingent on certain undertakings given by the companies to address the competition concerns arising from the transaction.⁹ With the Commission's agreement the 'big five' becomes the 'big four'.

- A4.11 The big four MCPs have also expressed interest in developing 4G networks, such as LTE. LTE introduces new network features (for example, new radio access technology) and it is expected to provide substantial improvements over 3G services, such as faster uplink and downlink speeds and higher spectral efficiency. Although a limited scale LTE network has been launched by TeliaSonera in Sweden, the deployment timescales and growth of LTE in the UK mobile market is at present uncertain.¹⁰
- A4.12 In addition, having purchased suitable spectrum in recent auctions, a number of new players have entered, and a number are considering entering, the market with their own networks. For example, Cable & Wireless (C&W), Mapesbury Communication (M-Com) and COLT Mobile Telecommunications (COLT) all purchased DECT guard band spectrum at auction in 2006. Both C&W and M-Com are providing mobile services. M-Com's network serves specific areas of London (targeted on certain ethnic groups to whom services are tailored and marketed), while C&W uses its spectrum to support services using both fixed and mobile networks (marketed as a fixed-mobile convergence (FMC) brand) offered to corporate customers.
- A4.13 As well as operators with their own networks, there are a large number of retail services offered by players which purchase wholesale services (often termed Mobile Virtual Network Operators or MVNOs) in the UK.11 The share of mobile subscriptions held by MVNOs and service providers was 12.7% in 2008, up from 10.8% in 2004.12 These operators do not have a single business model or approach, and their wholesale supply arrangements vary. Some are 'white label' MVNOs which resell the services of their partner MNO with little or no modification. At the other end of the scale, some MVNOs have their own billing systems and customer service operations, enabling service differentiation and cross-bundling of services including mobile and other platforms such as fixed telecoms or pay TV.

⁸ Prior notification of a concentration (Case COMP/M.5650 — T-Mobile/Orange), 2010/C, 16/01/10, at, <u>http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:010:0026:0026:EN:PDF</u>

⁹ Specifically, in order to address the competition concerns identified by the Commission, the parties concluded a revised radio access network sharing agreement with 3UK, and will divest 15 MHz of spectrum at the 1800 MHz level. *Mergers: Commission approves proposed merger between UK subsidiaries of France Telecom and Deutsche Telekom, subject to conditions*, IP/10/08, 1 March 2010, at

http://europa.eu/rapid/pressReleasesAction.do?reference=IP/10/208&format=HTML&aged=0&langua ge=EN&guiLanguage=en. For further information on this case (M.5650), see http://ec.europa.eu/competition/mergers/cases/index/m113.html#m_5650

¹⁰ See for example <u>http://wirelessfederation.com/news/17066-vodafone-plans-to-wait-until-2012-for-</u> Ite-deployment/ and

http://www.mobileeurope.co.uk/features/114701/Mobile_World_Congress_review_-Playing_it_safe.html

¹¹ An MVNO is defined as virtual in that it does not deploy and operate an end-to-end mobile network ¹² See Figure 4.24 of the UK Communications Market Report 2009 (UKCMR 2009), available at http://www.ofcom.org.uk/research/cm/cmr09/

Name	Partner/s (where known)	Service offered
Lycamobile	Orange, O2	Targets ethnic and immigrant population through low cost international calls
Virgin	T-Mobile	Targets the mass market of retail customers
Family Mobile	T-Mobile	Tie-in product for IKEA – targets IKEA employees and members of its loyalty programme
Tesco Mobile	O2	Tie-in product for Tesco supermarket – competitive voice service proposition
Asda	Vodafone	Tie-in product for Asda supermarket – proposition based on competitive prepay voice
Talk Talk Mobile	Vodafone	Brand operated by Carphone Warehouse

Table 1: Selection of MVNOs operating in the UK

Source: Ofcom, 2009

A4.14 Voice over internet protocol (VoIP) is an increasingly popular form of voice communication in the UK. For example, according to UKCMR 2009, 70% of people with access to VoIP use it, and the use of VoIP (across all platforms) is growing.¹³ While early VoIP was largely confined to fixed devices (PCs and laptops, or accessed via fixed handsets), VoIP on mobile devices is increasing, with availability of applications that facilitate VoIP calls. Some operators are launching services which rely mostly or entirely on VoIP, such as Jajah and Truphone. Services provided by these operators can also be used on mobile devices. Such services do not necessarily have to be routed via a circuit-switched 2G/3G mobile network. For example, Truphone will direct calls over Wi-Fi whenever it is available.

¹³ See UKCMR 2009, in particular pp. 251-252

- A4.15 In addition, mobile users can choose to have the call routed to one of a number of end points. For example, once a subscriber has a Truphone number, he can choose to have calls to that number routed either to a mobile phone, or a fixed line such as their home PC. MCPs which use circuit-switched mobile networks also allow their subscribers to forward calls to their mobile number(s) to a fixed line.
- A4.16 In the past, circuit-switched technology was widely used to terminate mobile voice calls. There was therefore a tight coupling between the access connectivity and the voice termination service. More recently, the development and growth of IP connectivity on mobile networks means that any application (including voice) can be provided as an IP service. Thus, there is no longer such a definitive link between voice call termination service and the type of access connectivity.
- A4.17 In addition to the players and technologies affecting the services offered in retail markets, there are also important players at the wholesale level. Transit operators are operators which pass calls from one network to another (distinct from originating or terminating the call). A transit service fills the gap where a communications provider has not established direct interconnection with a given MCP. Generally, the transit operator does not set the termination rate it bills the originator for the termination rate plus its transit fee. In other words, if a call is transited the originating operator pays both the termination rate and the transit cost.
- A4.18 The above discussion has set out that the technological landscape has changed significantly since the time of our last market review. At that time, 2G and 3G circuit-switched technologies were the only technologies widely used to offer mobile voice call services. Now, there is wider use of IP termination as a means of delivering mobile services, together with the real prospect of future deployments using packet-switched technologies to offer mobile voice services. Different firms use different technologies to offer mobile voice services and we now see, in addition to the more familiar big four MCPs, a number of smaller participants offering competing mobile voice call termination services capable of shaping the future service landscape. However, common to all forms of the current and prospective means of offering mobile voice call termination is the use of a mobile number.
- A4.19 We consider the impact that these new players and new technologies have had in our assessment of the competitive conditions that currently operate, and which are likely to prevail over the medium term. Specifically, we consider the prospective role played by the new market entrants and new technologies in conducting our analysis of demand and supply-side substitution. In so doing, we examine whether it is more appropriate to refer to the termination of calls to a mobile number than termination on a particular type of access network in reaching a technologically neutral approach to market definition.

Cluster markets

A4.20 We set out above some of the context to the technologies and players associated with MCT services. Another consideration relevant to MCT services is the presence or not of so-called 'cluster markets'. A 'cluster market' is a term used to describe markets where there are some 'transactional complementarities' in buying products together i.e. where retail consumers realise savings from buying a set of products as a package from one provider rather than buying them separately. As a result, retail consumers buy a package of products and evaluate the price and quality of the package overall rather than its constituent parts. As such, firms which offer only some of the retail products may not be able to constrain the prices charged for the cluster.

- A4.21 In the context of this review, retail consumers buy a 'package' of mobile services which may include, for example, outbound voice calls, termination of inbound calls, SMS (and SMS termination) and mobile broadband services. Some stakeholders (for example, T-Mobile in response to the May 2009 consultation) have argued that the different elements of such a retail package, even though not demand-side substitutes for each other, are still linked because they are supplied and consumed together. Under these circumstances, suppliers of mobile services compete for customers on the price of the overall bundle and not the price of its individual components. In this situation, a supplier could not raise the charge for voice call termination while keeping the price of the other services in the bundle the same, as consumers would switch to other networks in response to the rise in the price of the bundle. Thus, the services are subject to a common pricing constraint. The extent of the constraint on its ability to raise MTRs would depend on the level of competition in relation to the provision of the whole package of services.
- A4.22 However, as set out in paragraphs A4.103-A4.108 below, there does not seem to be strong evidence that the MTR is a major consideration for consumers in choosing a bundle to the extent that mobile termination rates are constrained by the need to maintain the attractiveness of the bundle. In particular, the evidence suggests that the wholesale price of incoming calls is not a major factor in consumers' purchasing decisions. Therefore we do not think it would be appropriate to regard MCT as part of a cluster market on the basis of the available evidence.

Two-sided markets

- A4.23 A separate but related consideration is the concept of two-sided markets. A twosided market is a market in which a firm acts as an intermediary to create an indirect relationship between two distinct customer groups. For example, newspapers can be seen as an intermediary between one market - the subscribers/readers interested in consuming the newspaper's content – and the other – advertisers who consume the newspaper's available advertising space to reach the readers of the paper. Typically in a two-sided market "the relationship between end-users must be fraught with residual externalities' that customers cannot sort out for themselves"¹⁴ – i.e. there will be a greater value to a customer on one side of the market if the customer group on the other side of the market is larger (i.e. advertisers will place a larger value on advertising space if the newspaper has a wider readership).
- A4.24 More specifically, in the case of voice call termination, customers of a particular network either make calls or receive calls. Those customers making calls value mobile telephony more as the number of people able to receive their call grows; call recipients value the service more if there are more people able to call them. MCPs charge their subscribers a retail price for making a call from their numbers, and earn revenue from their subscribers when they receive calls (albeit indirectly) by charging wholesale mobile termination rates to other networks trying to connect a call to their number range.
- A4.25 In a two-sided market, it can be efficient to set prices in ways that mean the cost of provision is borne more heavily by one side than the other.¹⁵ In a two-sided market,

¹⁴ Evans, D.S and Schmalensee, R (2008), "Markets with two-sided platforms", *Issues in Competition Law and Policy (ABA Section of Antitrust Law 2008),* 28, p.667-693, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1094820

¹⁵ For example, some basic pay TV television channels derive most of their revenues from advertisers, but also receive some subscription revenues from viewers.

the total volume of transactions depends on the price structure (the share of the total charge borne by each side) as well as the level of the combined price (the sum of the charge to each side).¹⁶ As a result, the price to one side may not fully reflect the cost of providing the service to that side. A number of two-sided markets feature prices on one side of the market which do not cover costs or indeed, charge at all (e.g. free newspapers, where readers are not charged and costs are entirely recovered from advertisers).

- A4.26 We take account of the two-sided nature of the market in our analysis. For example, changes in MTRs may affect the behaviour of both callers and call recipients (see paragraphs A4.61-A4.108). We also analyse how this may influence the effectiveness of any possible intervention, for example through the 'waterbed effect'.¹⁷
- A4.27 However, this does not necessarily mean that the two sides should be considered to be in the same market i.e. that there should be a *single* market covering both call origination and call termination. The competitive conditions and constraints on the two sides of the market are different.¹⁸ The level of competition in the market for call origination (which is relatively high) does not impose a competitive constraint on call termination. Although competition in the retail market may reduce or even eliminate excessive profits (through the waterbed effect), it does not remove the ability to set excessive prices for termination.
- A4.28 As acknowledged in paragraph A4.25, in some cases the efficient structure of prices in a two-sided market may involve some services being subsidised by setting the price of other services above cost. However, with no competitive constraints on MTRs, MCPs may have an incentive to set mobile termination rates above the competitive price level (and this has in fact historically happened when MTRs were not regulated). Therefore, our view is that the two sides should be considered distinct, but inter-related, markets i.e. MCT should be viewed as a separate market, albeit with close links to other services.

Our proposed starting point for the definition of retail mobile voice call termination

A4.29 As set out in paragraph A4.6, we start by considering the narrowest appropriate retail market definition and then progressively widen this as needed. In light of this, we have to identify some of the most important features of MCT and the implications of these at the retail level. We then focus on determining the narrowest definition based on the core features of MCT at the retail level.

mobile sector generally to be effectively competitive – see, for example, *Mobile Evolution: Ofcom's mobile sector assessment*, 17 December 2009, section 4, at

http://www.ofcom.org.uk/consult/condocs/msa/statement/MSA statement.pdf

¹⁶ Rochet, J-C and Tirole, J (2004), "Defining two-sided markets", mimeo, University of Toulouse, available at <u>http://www.brousseau.info/semnum/pdf/2004-03-01_tirole.pdf</u>

¹⁷ The waterbed effect is where a change in one set of prices leads to changes in prices in a different part of the market. For example, many of the respondents to the May 2009 MCT Consultation and to previous consultations have highlighted how a reduction in MTRs may induce operators to raise retail prices. There is a wide body of literature on the waterbed effect in relation to telecommunications, such as Schiff, A (2008) "The 'waterbed effect and price regulation", Review of Network Economics, Vol. 7, Issue 3, pp.392-414 and Genakos, C. and Valletti, T. (2009) "Testing the 'waterbed effect in mobile telephony", Journal of the European Economic Association (forthcoming), available at <u>http://www.sel.cam.ac.uk/Genakos/Genakos%20Valletti-Testing%20Waterbed%20Effect.pdf</u> ¹⁸ Whereas the call termination market is essentially characterised as a monopoly, we have found the

- A4.30 As identified in paragraph A4.3 the reference service that we are considering in this review is wholesale "voice call termination on individual mobile networks".
- A4.31 Call termination is the service necessary for a communications provider to connect a caller with the intended recipient of the call on a different network. If call termination were not available, a network operator could only terminate calls to other customers on its own network. This service is referred to as wholesale because it is sold to and purchased by the network operators rather than retail customers.
- A4.32 As set out in paragraphs A4.12-A4.16, there are a growing number of MCPs offering different services and using different technologies. For example, some offer voice services using internet telephony (such as VoIP) which can be used on mobile devices. Some MCPs can use both circuit-switched voice and internet telephony to provide mobile services, whether this is a circuit-switched mobile network (e.g. UMTS macro cells) or other wireless networks e.g. Wi-Fi.
- A4.33 As stated above, how we approach these developments in our market definition can best be addressed through focusing on the core features of MCT at the retail level – it is a voice service and it is mobile. At the retail level, callers value successful calls, not call attempts; put another way, it is the end-to-end call which is important rather than individual parts (such as termination). Two questions are therefore central to defining the retail market: what is 'a voice call' and what is 'mobile'. The specific question of what is meant by the termination of a call is addressed in the subsequent definition of the wholesale market.

What is a 'voice call'?

- A4.34 Traditionally, voice calls have been delivered using circuit-switched technology, which requires network infrastructure designed to open and maintain a continuous connection between the caller and the recipient during the call.
- A4.35 We are now seeing the growth of new methods of delivering a call, such as VoIP, which do not use a 2G/3G circuit-switched mobile network. We therefore need to determine whether different forms of delivering calls are considered to be sufficiently comparable by consumers as to form part of the same market.
- A4.36 The starting point for market definition is the narrowest possible market. As in previous reviews, this begins with the retail service under examination an end-toend circuit-switched voice call to a mobile number. We then determine how far this should be widened. In accordance with the SMP Guidelines, such widening may be justified on the basis that either:
 - Voice services delivered using new technologies will impose a constraint on wholesale charges for circuit-switched mobile call termination due to retail competition; or
 - There are homogeneous competitive conditions and/or common pricing constraints in providing voice over IP compared to voice over circuit-switched technology at the retail level.

What is 'mobile'?

A4.37 Consumers value mobile services for allowing them to contact (and be contacted by) others while they are otherwise unavailable (for example, when they are away

from their fixed line or PC), including while they are 'on the move'. For example, while DECT handsets can be used from any point in range of its base, mobile services allow consumers to use telecommunications services almost anywhere (although making allowances for poor reception in some areas). Consumers particularly value being able to use services seamlessly e.g. being able to make a call without repeatedly having to redial.

A4.38 The distinction between these and other services (such as fixed services) has been recognised in regulation through dedicating a specific mobile number ranges (075/7/8/9) with the exception of personal numbering (070) and radio paging (076) to these services. These numbers are allocated according to a specific service definition. The National Telephone Numbering Plan¹⁹ defines a mobile service as:

"...a service consisting in the conveyance of Signals, by means of an Electronic Communications Network, where every Signal that is conveyed thereby has been, or is to be, conveyed through the agency of Wireless Telegraphy to or from Apparatus designed or adapted to be capable of being used while in motion."

- A4.39 This definition suggests a starting point for our definition to be a call terminated, or routed, to an end-user device which is capable of being used on the move. We are aware that this is not a perfect definition of the mobility valued by consumers. For example, the definition does not specify over what distance a handset has to be "capable of being used while in motion", while consumers place most value on mobile services when they can be used virtually anywhere. However, we consider that the definition of mobile used in the Numbering Plan is a sufficient proxy for the service valued by consumers to provide a starting point for our market definition.
- A4.40 In the following section (paragraphs A4.47-A4.113), we consider how far this definition should be broadened to determine the appropriate scope of the relevant retail market, including whether it should be expanded to include any other products. In practice the smallest unit of analysis is individual services marketed to specific user groups.

Our proposed starting point for the definition of wholesale mobile voice call termination

- A4.41 As set out above, we start from our narrow retail definition of an end-to-end circuitswitched voice call to a mobile number. If we find that the retail definition should not be any wider, and we mapped this retail definition onto our wholesale definition, then this would imply that the narrowest possible wholesale market is circuitswitched voice call termination to a specific mobile number. However, the wholesale market definition process needs to consider a number of other dimensions both at the retail and wholesale level.
- A4.42 Regardless of how calls originate, they can be terminated in a number of ways. For example, a call can be connected using a 2G connection, a 3G connection (both of which are circuit-switched) or over IP. In addition, in the future we are likely to see the development of packet networks such as LTE, which may deliver all services, including VoIP.

¹⁹ Available at <u>http://www.ofcom.org.uk/telecoms/ioi/numbers/numplan030809.pdf</u>

- A4.43 Therefore, in our analysis at the wholesale level we have considered whether our market definition needs to include different 'types' of mobile call termination, based on either:
 - the direct competitive constraint imposed by the substitutability of one type of wholesale mobile call termination for another; or
 - the existence of homogeneous competitive conditions and/or common pricing constraints in providing termination.
- A4.44 Central to the types of alternative mobile call termination that we considered in our analysis (see paragraphs A4.117-A4.123) is the need for interconnection between the originating operator and the operator which holds the mobile number. This interconnection can be managed through either a direct relationship between the originator and the number range holder, or indirectly via a transit operator. We therefore focus on the point of interconnection with the number range holder.

The role of market research

- A4.45 In this market review we have relied on evidence already available to us, which we think is sufficiently reliable and current to enable us to accurately determine what the relevant market is. That evidence comes from market research commissioned by us for other recent reviews and studies. In particular the research that we have considered here includes:
 - research commissioned by us for our *Mostly Mobile* consultation (MSA II);²⁰
 - research commissioned by us for our May 2009 Consultation (the Jigsaw research);²¹
 - research commissioned by us into transparency in telephone numbering (Futuresight Research);²²
 - our UK Communications Market Report 2008 (UKCMR 2008);²³ and
 - our UK Communications Market Report 2009 (UKCMR 2009).²⁴
- A4.46 Responses to our May 2009 consultation did not suggest there have been significant enough shifts in the retail market to warrant commissioning specific further research in this area.

²¹ Wholesale mobile voice call termination: Preliminary consultation on future regulation, Consultation, 20 May 2009, Annex 10.1, Comments on Market Research, at

http://www.ofcom.org.uk/consult/condocs/mobilecallterm/annex10_1.pdf, and Annex 10.2, *Mobile Calling Patterns Research, JN: 99703*, at

http://www.ofcom.org.uk/consult/condocs/mobilecallterm/annex10_2.pdf.

²⁰ *Mostly Mobile: Ofcom's mobile sector assessment*, Second consultation, 8 July 2009, Annex 10.1 and 10.2, at <u>http://www.ofcom.org.uk/consult/condocs/msa/msa.pdf</u>

²² Consumer Transparency in Telephone numbering, Research, February 2009

²³ The Communications Market Report, 14 August 2008, at http://www.ofcom.org.uk/research/cm/cmr08/

²⁴ The Communications Market Report, 6 August 2009, at

http://www.ofcom.org.uk/research/cm/cmr09/cmr09.pdf

Product market definition

Indirect competitive constraints

- A4.47 The purpose of our market definition exercise is to determine the relevant wholesale products. However, as discussed in paragraph A4.5 above, the retail market may inform the wholesale definition, including those based on indirect constraints. MCPs buy call termination in order to offer their customers the ability to make end-to-end calls (that is, MCT is an input to retail mobile telephony). Therefore, the demand for wholesale MCT is ultimately derived demand arising from consumers in retail markets. It is therefore possible that events or conditions in the retail market (e.g. consumers' switching behaviour) could affect the demand for MCT products upstream at the wholesale level.
- A4.48 Having identified the narrowest retail market, we now assess whether it is appropriate to widen the retail market beyond this narrow product set. We then assess whether the conditions in this retail market are such that other wholesale products or services (other than a narrowly defined MCT focal product based on circuit-switched technology) would impose indirect competitive constraints in the wholesale market. Such indirect constraints could arise due to either demand-side substitution or supply-side substitution in the retail market.
- A4.49 We conduct this analysis of retail markets assuming there are no upstream remedies that rely on a finding of SMP in the wholesale mobile voice call termination market.

Retail demand-side substitution

Could retail demand-side substitution constrain termination rates?

- A4.50 If customers reacted to increases in MTRs by reducing their demand for calls to the particular operator whose MTRs have increased above the competitive level (either by switching to an alternative, or just reducing or ceasing their demand for calls), this may render a SSNIP unprofitable (indicating that retail switching might constrain the ability to set termination rates).²⁵ It is not necessary for all consumers to reduce the number of voice calls for an increase in MTRs to be unprofitable switching by a sufficiently large group of marginal consumers would be enough.
- A4.51 Three factors affect how far retail demand substitution would influence the profitability of an increase in wholesale MTRs: (i) how far a change in the MTR would affect the retail price faced by consumers, (ii) how far consumers would react to any change in retail prices such that the profit earned by the wholesale provider was reduced and (iii) the extent to which the MCP unilaterally increasing MTRs could hope to capture retail subscribers from its rivals. We discuss the first two factors in detail below; however, although the third factor is very important it is more difficult to predict. When we consider these three factors jointly it seems highly unlikely that the indirect competitive constraints would be sufficiently strong.As such based on the assessment of indirect constraints the relevant market would remain narrow.

²⁵ While the terminating operator may lose revenue from a consumer reducing their demand for calls, it would also avoid costs from supplying the termination service. It is therefore the net effect on profitability which we will consider.

Relationship between MTRs and retail prices

- A4.52 If a 5-10% increase in the MTR led to only a very small increase (or no change) in retail prices, then it may not affect calling behaviour materially. The effect of an increase in MTRs on retail prices depends on:
 - The extent to which the increase in MTR is actually passed through to the consumer. A MCP (or a fixed line provider) may choose not to increase retail prices for calls to mobiles despite an increase in MTRs (or may do so in part, not in full).
 - The proportion of the retail price that is due to the MTR. For example, if the MTR makes up 80% of the retail price, an increase in the termination rate will have a much bigger impact on end prices than if it is only 20% for any given level of pass through.
 - The extent of pass-through is not clear cut.

MTRs may contribute between 20-50% of average retail price of mobile to mobile calls; the contribution of MTRs to fixed to mobile calls is harder to determine based on fixed retail packages

- A4.53 For M2M calls, operators' pre-paid voice charges for off-net calls are 15-25p²⁶ per minute, which implies that MTRs are between 20-50% of the retail price.²⁷ This is similar to an estimate by Enders, which found MTRs were roughly 50% of retail prices.²⁸
- A4.54 F2M calls are harder to analyse, as there are few equivalents to pure pre-paid pricing. Fixed telephony contracts tend to require line rental payments and certain call set up fees.²⁹ Pence-per-minute charges for fixed-to-mobile calls tend to vary more, for example from almost 6p up to 30p, depending on provider, time of day and the call plan selected.³⁰ The complexity of retail tariffs makes it difficult to assess the effect of MTRs on prices. In its response to the May 2009 consultation, O2 claimed that the highest MTR was 21% of Virgin's daytime retail call charge, and its own average termination rate was 38.5% of BT's daytime charge. The 'Terminate the Rate' campaign, however, claim that MTRs can account for up to 80% of the price per minute of a F2M call, while FleXtel claimed it can be 90% of the originating communications provider's cost of originating a call. All of these

²⁶ Pure Pricing, UK Mobile Pricing fact book, Q4, 2009 and Pure Pricing Monthly Update, January 2010

²⁷ By focusing on prepaid services we can more easily assess the price of individual call minutes as there are fewer bundling effects or fixed components to the charges, other than a minimum call charge, usually equal to one minute's charge.

²⁸ Enders Analysis, UK mobile termination rates: down but not out, 20 January 2009.

²⁹ For example, BT charges a line rental fee of £11.54, and typically a 9.9p call set-up fee (see http://www.productsandservices.bt.com/consumerProducts/displayCategory.do?categoryId=CON-HOME-PHN-R1&s_cid=con_cic_aff_buyat_vidAJM_broadband&vendorid=AJM); TalkTalk charges a typical call set up fee of 9.25p, and line rental of £11.49 (see

http://broadband.talktalk.co.uk/pricing/ew and http://broadband.talktalk.co.uk/pricing/anytime)

³⁰ Sky charges 5.87ppm for evening calls to mobiles with its Sky Talk Unlimited package, not including a 9p call set-up fee (see

<u>http://www.sky.com/shop/export/sites/www.sky.com/shop/PDF/SkyTalkTariffGuide.pdf</u>) while Virgin charges up to 30.63ppm for daytime calls to some mobile networks on its 4p Plan and Talk Plan, not including a 11p call connection charge (see <u>http://allyours.virginmedia.com/pdf/003817-Residential-Cable-Apr-V7.pdf</u>)

figures may be accurate but are selective, given the variations in retail tariffs available.

Bundling will also have an effect on the retail price of F2M calls, even though these A4.55 have tended to be excluded from fixed bundles. Fixed providers set rates for out-ofbundle calls as part of marketing to make their overall service offer as attractive to consumers as possible. Typically, price competition is more aggressive on some call types than others, and margins are higher for calls that are not included in the headline bundles (such as calls to mobiles). (Mobile operators adopt an analogous approach, although their bundles typically include calls to other providers' mobile number ranges. There is therefore a similar argument that mobile-to-mobile prices specifically may not change as a result of reductions in MTRs, as cost savings are used to reduce the price of a range of products). Therefore the individual price of fixed calls to mobiles may be more likely to respond to an increase (and less likely to respond to a decrease) in MTRs than retail prices and revenues overall, as fixed operators seek to protect (or increase) the attractiveness of their focal product (the bundle). This means that the benefits to consumers arising from a fall in MTRs may flow in the form of reduced charges for other components of the bundle, other than calls to mobiles. It is for this reason that we do not agree with the submissions that T-Mobile and O2 have made that argue that evidence about the level of the cost of F2M calls demonstrates that reductions in MTRs have not benefited retail consumers as they have not been passed through to retail prices. In fact, rather than observing that fixed operators have absorbed MTR reductions in the form of higher revenue and profit, the evidence suggests that overall retail prices for fixed services have fallen, even if retail prices for fixed to mobile calls have decreased proportionally less.³¹

Assessment of likely impact of a SSNIP

A4.56 The critical issue for market definition is what effect a *small but significant* rise in MTRs will have on retail prices. Below we consider the effect of a SSNIP in MTRs on retail prices assuming that MTRs make up 20%, 50% and 80% of retail prices. This is to capture the full range of possible effects of a SSNIP at the wholesale level feeding into retail tariffs.

% of retail price accounted for by MTRs	Effect on retail prices of 5-10% increase in MTRs
20	1-2%
50	2.5-5%
80	4-8%

Table 2: Possible effects of a SSNIP in MTRs on retail prices

Source: Ofcom calculation

³¹ This issue, and the evidence for our view, is discussed in detail in our recent statement, *Fixed Narrowband Retail Services Markets; Identification of markets and determination of market power*, 15 September 2009, at

http://www.ofcom.org.uk/consult/condocs/retail markets/statement/statement.pdf.

- A4.57 The upper end of the estimates for 50% and 80% would increase retail prices by 5 to 8% (which itself is sufficient to constitute a 'SSNIP') and so could cause consumers to reduce their use of calls to mobiles. (This assumes that operators make no attempt to keep the prices of calls to mobiles down to remain attractive to customers which would dampen the effect of changes in MTRs on retail prices). At the lower end, it would seem unlikely that consumers would be sensitive enough to retail prices to alter their behaviour due to a 1-2.5% change in prices for a particular call type.
- A4.58 Given that this analysis does not rule out the possibility that; firstly, increases in MTRs could be passed on to consumers in the form of increased retail charges; and secondly, that those retail charges could affect retail usage, we have tested the hypothesis that this effect is material against the available evidence on actual market behaviour. We stress that this is a conservative approach to ensure we consider fully the possible relationship between wholesale input prices and retail prices. For the reasons noted above, we think that both of these points are contestable, as any increases in retail charges may not be specifically on calls to mobiles (deadening the price signal given to retail customers).
- A4.59 If retail charges increased significantly, this might encourage consumers to switch mobile provider rather than modify their calling behaviour. If a monopoly supplier of MCT, with a significant proportion of retail customers, raised MTRs above the competitive level to all competing MCPs, and this encouraged consumers to change their mobile provider, we would expect consumers to switch away from the competing MCPs, and that that operator (which raised its MTRs) would capture a significant proportion of all the consumers who switched. So, even if we expected a significant proportion of the consumers of rival wholesale MCPs to switch in response to an increase in MTRs set by a given MCP (which we do not), we would expect that MCP to capture a significant proportion as retail customers.

Consumers' reaction to changes in retail prices of M2M and F2M calls

A4.60 Consumer reactions to changes in the retail price of incoming calls under calling party pays (CPP) are discussed in paragraphs 3.28-3.30 of Section 3. We note that given these arrangements, a rise in MTRs may still trigger changes in behaviour either by callers or call recipients. We consider those prospective reactions of those two parties in turn below.

Reaction by callers

- A4.61 In addition to MTRs affecting retail prices, we consider that three conditions must be satisfied for callers to react to an increase in the price of calls to mobiles:
 - Callers must be sufficiently aware that they are calling a mobile and that they are calling a specific network;
 - Callers must be sufficiently aware of the price of calling that particular network; and
 - Callers must be sensitive to changes in the prices of calling the network they want to reach i.e. an increase in the termination charge above the competitive level must cause consumers to adapt their behaviour to find an alternative satisfactory way of contacting the person they want to call.

- A4.62 We consider each of these conditions in turn against the available evidence in the market.
- A4.63 **Callers must be sufficiently aware that they are calling a mobile and which network they are calling.** With regard to the first condition, awareness of the distinction between calls to mobiles and other call types seems well-established (for example, the Jigsaw research shows that 87% of respondents knew when they were calling a mobile). However, only 24% knew to which network this number is subscribed. Even for the numbers respondents called most often, less than half (45%) knew which operators these numbers were associated with.
- A4.64 **Callers must be aware of the price of calling that particular network.** Less than a third of subjects in the Jigsaw research (30%) had any idea of the price of calling other networks, and only 7% knew exactly. The Futuresight research gave a more mixed picture on how informed consumers felt about the price of making calls. From this, 58% of respondents to the quantitative survey reported feeling well informed about call prices. However, this survey did not differentiate between different types of calls (for example between calls to fixed and mobile numbers, or on-net and offnet mobile calls). The qualitative research undertaken for this study suggested that overall respondents felt uninformed and tended to rely on assumptions and rules of thumb to influence their behaviour.³² This suggests that consumers still have limited knowledge of the actual price of calling particular networks. Previous research suggests that consumers tend to overestimate the price of all types of phone calls.³³
- A4.65 **Callers must be sensitive to the price of calling the network they want to reach.** With regard to the third condition, data on how consumers react to changes in retail prices induced by changes in wholesale charges is limited. Some research suggests that calling behaviour is fairly insensitive to the price of calls. The Futuresight research suggested that, when calling a mobile, only 18% of landline users and 12% of mobile users thought about the price of the call.
- A4.66 However, where the price of calls is significantly out of line with expectations, this may induce a response.³⁴ As part of the Futuresight research, consumers were asked about experiences of 'bill shock' and whether this had affected their sunsequent behaviour. It was found that, for fixed and mobile contract users, higher than expected bills resulted in some action or change in behaviour by around 60% of consumers. Pre-pay users were less likely to respond, with about a third changing their behaviour as a result of unexpected extra charges. However, for a significant proportion of users (29% of fixed and contract mobile users and 26% of pre-pay mobile users), incurring higher than expected prices made no difference to their behaviour.
- A4.67 Although the Futuresight research provides some evidence on consumers' propensity to react where prices are different to those expected, we do not consider that this evidence is sufficient to be relied upon in the context of a SSNIP test. In particular:

³² The Futuresight report speculates upon the reasons for the differing results from the qualitative and quantitative surveys on this question. It identifies a bias that may have been introduced by the ordering of the questions in the two surveys as a possible cause. Thus, in isolation it is unclear which result is more compelling. However, when considered alongside the Jigsaw research, the results may suggest that consumers are largely uncertain of the price of calling a particular network.

³³ See <u>http://www.ofcom.org.uk/consult/condocs/numberingreview/research</u>.

³⁴ This should not be viewed as equivalent to a SSNIP test, for the reasons set out in the following paragraph.

- The survey did not differentiate between reactions when the bill was only higher due to calling a mobile number. We cannot therefore determine how sensitive consumers are to the price of calling a mobile specifically, rather than to the price of calls generally.
- The survey did not identify how much 'higher' the bill had to be before the consumer noticed, nor what they had expected the bill to be. There may have been significant differences in what the respondents were reacting to, and the difference between the expected and actual bill may have been considerably more than 5-10%.
- Expected prices may have been above the competitive level, and so a further increase may lead to a greater response. If we were to assess markets based on observed switching in this case, markets would be drawn too broadly. This is known as the 'cellophane fallacy'.
- A4.68 Therefore, it does not show how consumers might react to a 5-10% increase in prices at the wholesale level (assuming at least part of this is passed through to the retail level).
- A4.69 Consumer behaviour will only change if there is a viable alternative. We consider that there are a number of services that could potentially be viewed by callers as being substitutes, which are set out in paragraph 3.35. The SSNIP test framework requires us to consider each substitute individually (see paragraphs A4.70-A4.102 below). However, we recognise that it may be the case that, while no individual alternative is a close enough substitute to impose a constraint on MTRs, the existence of a number of possible alternatives may provide consumers with enough choice to make a SSNIP on the narrowest product unprofitable. We consider whether this is the case in paragraph A4.114.

Mobile-to-fixed as a substitute for off-net mobile to mobile calls

- A4.70 A caller may react to a rise in the price of calling a mobile by seeking to call the desired party on their fixed line instead. A significant proportion of mobile users use their mobile services in their home (although, of course, the location of the mobile user being called is likely to be unknown prior to the call being placed).³⁵ Most UK households (80%) have both a fixed line and members who have mobile services, although 12% of households are mobile-only.³⁶ Therefore, the option of using a fixed line will be a plausible strategy for a material proportion of callers, some of the time.
- A4.71 However, there are obvious differences between fixed and mobile services that mean that this option may be an insufficiently close alternative to constrain mobile operators. Contacting someone on a fixed line requires that the desired recipient is at a specific location, whereas mobiles can be taken anywhere and used wherever coverage is available from the MCP to which the recipient subscribes. Calling someone on their mobile is more likely to enable immediate contact with the called party. Immediacy of contact is often an important factor in deciding to call someone on their mobile rather than contact them through other means.

³⁵ In 2008, we found that seventy per cent of mobile users use their mobile to make calls in the home. *Communications Market Report*, Research Document, 14 August 2008, at <u>http://www.ofcom.org.uk/research/cm/cmr08/cmr08_1.pdf</u>.

³⁶ See Table 22 in Annex 13.

- A4.72 This picture may change, if fixed and mobile networks become increasingly similar in terms of functions, or even converge. Developments that reflect possible fixed/mobile convergence (FMC) include services designed to add mobility to fixed services, as well as mobile services being able to utilise, in part, fixed networks in some circumstances.³⁷ For example, Vodafone One Net is an integrated fixed and mobile voice service that is hosted by Vodafone, but which is underpinned by a managed services agreement with BT Wholesale for IP-enabled voice and broadband services. FMC services allow the terminating operator to choose how to route a call depending on the recipient's access to different networks. In certain circumstances (e.g. when the called party is at home or in the office), the FMC service could, in effect, have a viable choice between terminating on a fixed network and a mobile network. However, for all the services currently in the market, the question of whether the call is terminated on a fixed or a mobile network is determined by the recipient's behaviour or by the terminating operator, not by the caller. FMC products are still relatively underdeveloped and it is our current view that they are unlikely to be taken up widely enough within the period covered by this review that they would materially impair a MCP's ability to raise MTRs.
- A4.73 Therefore, our view is that it is unlikely that a call to a fixed line will represent a satisfactory substitute for a call to a mobile in a sufficient number of situations to impose an effective constraint on mobile termination rates.

Mobile-to-mobile as a substitute for fixed-to-mobile calls

- A4.74 A caller facing a high fixed-to-mobile charge may choose to place a call using their own mobile, rather than use their fixed line. According to research conducted for our Fixed Narrowband Retail Market review³⁸, 33% of respondents agreed with the statement '*I would drop my landline if mobile was cheaper*' applied to them. In addition, as part of the UKCMR 2008³⁹ respondents were asked, where they had used their mobile at home, why they had done so. The two most popular answers were 'to use up inclusive minutes' (29%) and 'to take advantage of some calls which were cheaper to make from mobiles' (28%). However, such substitution is only important in as far as it affects the profitability of a SSNIP for MTRs. The terminating operator determines the termination rate charged for a call both from a mobile and from a fixed line to its mobile number range, and so is able to effectively limit the impact such substitution has on its profits.
- A4.75 The possible exception to this is on-net calls⁴⁰, which tend to be cheaper than offnet mobile calls as the retail prices do not involve a payment to another operator for termination. These calls are obviously available only to callers who are on the same network as the called party. The Fixed Narrowband Retail Market review found that the majority of consumers perceive *all* calls to be cheaper from a landline, with the exception of on-net calls. However, this relies on the caller using a mobile on the same network as the call recipient. The findings from the Jigsaw research set out in paragraph A4.63-A4.64 suggest that awareness of which network a user is calling is reasonably low, although it is higher for numbers people call more frequently. In addition, as part of this research, respondents were asked "*why did you choose*

³⁷ An example of the latter development is the femtocell. Femtocells are still an emergent technology, and there is considerable debate over how widespread rollout will be – see, for example, http://www.mobilenewscwp.co.uk/Features/291238/the_hard_femtosell.html.

 ³⁸ Consumer Preferences in Narrowband Communications, Research Report, Research Document, 19 March 2009, at <u>http://www.ofcom.org.uk/consult/condocs/retail_markets/consprefs.pdf</u>
³⁹ UKCMR 2008, Figure 5.3.

⁴⁰ "Off-net MCT" in this context refers to the provision of MCT to other Communications Providers, as distinct from self-supply of "on-net MCT" by a MCP to itself.

[name of current provider] as your mobile phone supplier", and to list the order of importance when they gave more than one answer.

- The general cost overall was by far the most popular reason given, mentioned by 29% of respondents.
- The next most frequently referred to (reliability of service) was mentioned by about half as many (15%).
- Only 5% of all mobile users and 9% of mobile only users identified the cost of calls to the same network as a major influence on their choice.
- A4.76 This suggests that substitution towards on-net mobile calls at the expense of fixedto-mobile calls may be unlikely to constrain MTRs even for those callers who are on the same network as the called party. In any event, callers cannot, generally, choose whether to make on- or off-net calls when they wish to call a particular number.
- A4.77 The relevant test is whether a user would switch from fixed to on-net (or off-net) calls in response to a SSNIP to such an extent that the SSNIP became unprofitable. Given there is already a difference in price between the two types of call, it is likely that users who are aware of this difference and can make such a switch would probably already have done so. Therefore, a SSNIP may be unlikely to prompt additional switching (although it may quicken the decision of those already planning to switch). In any case, we note that the proportion of on-net minutes has been declining, from almost 65% of all mobile-to-mobile minutes in 2003 to approximately 56% in the first three-quarters of 2009.

On-net mobile-to-mobile as a substitute for off-net mobile-to-mobile calls

- A4.78 Termination charges for off-net calls could be constrained by substitution to on-net calls because, as set out above, such calls do not involve a termination payment. This requires the calling party to be on the same network as the call recipient. In order for this effect to be widespread enough to constrain termination rates, it would also be necessary for either the caller or the call recipient to use more than one network to originate/terminate their calls.
- A4.79 As we set out in paragraph A4.63, consumer awareness of which network they are calling seems to be quite low, although for the most frequently called numbers it is closer to one-half. More importantly, according to the UKCMR 2008, only 11% of adult mobile users have more than one mobile phone or SIM card with different numbers.⁴¹ Of those who do, only 6% stated that the main reason for this was to take advantage of lower prices from different operators.⁴² This suggests that such substitution may not be widespread enough to effectively constrain the termination rate charged for off-net calls.
- A4.80 A possible exception is where consumers belong to a closed user group. Closed user groups are groups of people whose members care about the cost to the other members of calling their mobile number. For example, a business may provide a group of co-workers (or even all of its employees) with mobile phones from the

⁴¹ While it would have been preferable to review the evidence on the number of mobile users that have more than one Mobile Number, including VoIP identities, we consider that the evidence presented here provides an indication of the order of proportional magnitude.

⁴² CMR 2008 Figures 5.62 and 5.65.

same MCP; a family may also choose to all subscribe to the same MCP. If enough consumers belong to a closed user group and can co-ordinate their purchase decision such that they switch away from the MCP which raises its MTR above the competitive level, this may make the price rise unprofitable.⁴³

A4.81 However, we observe that many MCPs offer special rates and discounts for calling certain nominated numbers on the same network.⁴⁴ As a result, those who are sensitive to the price of others calling them can already benefit by co-ordinating their network choice and choosing such tariffs. The Jigsaw research suggests that only 7% of respondents chose their network because friends/family were on that network as well. We do not consider that a 5-10% increase in wholesale MTRs is likely to encourage a significant number of other consumers to adopt this behaviour such that this price increase would prove to be unprofitable.

Short message service (SMS)

- A4.82 While SMS is a very popular form of communication, people sending those SMS text messages could communicate in a call, and vice versa. Therefore, we have considered the extent to which SMS serves as a substitute for, or a complement to, voice calls.
- A4.83 There are functional differences between the services that may limit how interchangeably voice and SMS can be used. For example, SMS messages are limited in length and so, relative to a voice call, may not be able to transfer all of the information a caller wishes to impart at one time in one message. In addition, SMS is sent on a 'store and forward' basis, so there can be a delay in the message being received. This makes a dialogue through repeated messages back and forth more problematic, particularly during peak network loading times. This is in contrast to a voice call, where the conversation happens in real time.
- A4.84 The relationship between SMS and voice calls is complex and depends upon the need of the parties at a particular time. In some situations, SMS and voice calls may be substitutes, for example where the caller only wishes to provide a small amount of information which does not necessarily require any input or response from the recipient (e.g. "I will be an hour late"). At other times, SMS may be a complement to a voice call, enabling the call to be set up. For example, the originating party may send a text message to confirm the recipient is available for a call at a subsequent time e.g. "Call you at 6 o'clock". In some situations, there may be no relationship between SMS and voice calls, as the situation may require one form of communication rather than another e.g. where longer, more in-depth, and/or immediate response(s) are required, a voice call may be preferred, whereas SMS may be more suitable when the originating party wants to leave a message without interrupting the recipient (e.g. if they know the recipient is in a meeting). This suggests SMS may not represent a satisfactory substitute for a call to a mobile in a

⁴³ As noted in paragraph A4.59, it is possible that a closed user group, when deciding to all migrate to the same MCP, may choose the MCP which raised its MTRs above the competitive level. This is less likely to undermine the profitability of the SSNIP, as it will still earn revenue from these consumers as retail customers although it wouldn not earn termination revenue from those customers making intergroup calls

⁴⁴ For example, Vodafone offers a plan whereby a customer can nominate three other Vodafone numbers, along with their own, to get unlimited calls between the four members of the group for £5 a month, see

http://online.vodafone.co.uk/dispatch/Portal/appmanager/vodafone/wrp?_nfpb=true&_pageLabel=tem plate10&pageID=PPP_0039. O2 offers a similar package, where five O2 customers can get unlimited calls, SMS and MMS within the group for £7.50 a month, see <u>http://yourfamily.O2.co.uk/familybolton</u>

sufficient number of situations to impose an effective constraint on mobile termination rates.⁴⁵

A4.85 Even where SMS is a satisfactory substitute, voice and SMS termination to a given mobile number is provided by the same MCP. The conditions of the supply of SMS termination are very similar to the conditions of the supply of voice call termination i.e. only the MCP which holds the number the originator wishes to contact can terminate the SMS, and only this MCP can set the charge for this service. Thus, this MCP can set termination charges for SMS so as to limit the competitive pressure such substitution would place on its voice call termination rates.

Email, instant messaging (IM) and social networking sites (SNSs)

- A4.86 Like SMS, email does not guarantee immediate contact, as the sender must wait until the recipient is online and checks their email account unless they have a mobile device enabled to receive emails. While, of course, the ways that people can be online (or at least access emails) continue to proliferate, and the amount of time that people spend online is increasing, this is still a significant constraint. IM can provide more immediate contact and can be used more easily for establishing and maintaining a dialogue between two parties than email, but only if the desired party is signed into their account. As we identified in our research, SNSs serve a broadly similar purpose to email and IM, in that they are primarily for communicating with a large group of people rather than an individual or small group.⁴⁶ For this reason the same findings apply to SNSs as they do for the potentially close substitutes of email and IM.
- A4.87 The growth of mobile broadband could help to make email and IM closer substitutes by allowing mobile users to access Internet services from mobile devices such as smart phones. The most immediate and closest substitute is likely to be between these services and SMS (where the nature of the services is very similar). As with SMS, if this ability resulted in users checking their emails or spending more time signed into IM accounts, this could increase the immediacy of contact through these methods and so make them closer substitutes for voice calls. However, it seems unlikely that for the period of this market review that they will be very close substitutes.
- A4.88 Data from MSA II⁴⁷ suggests that only 13% of mobile phone users use IM on their mobile, and only 5% use it for email access. This suggests that use of these mobile broadband applications may not be widespread enough for people to consider them close substitutes for a mobile voice call.
- A4.89 However, *UKCMR 2009* shows that 13% of mobile users had accessed email on their phone, but that the proportion was much higher for smart phone users (35%) and considerably higher for iPhone users (75%). Smart phones are designed to make using mobile broadband easier. Therefore, as more people take up smart phones it is possible more people will begin using such applications. Take-up of smart phones is increasing, with smart phones making up 15.6% of all handset

date:<u>http://www.ofcom.org.uk/advice/media_literacy/medlitpub/medlitpubrss/socialnetworking/report.p</u> df

⁴⁵ Grzybowski, L. and Pereira, P. (2008) 'The Complementarity between calls and messages in mobile telephony', *Information Economics and Policy*, Volume 20, Part 3, pp. 279-287 found that voice calls and SMS are compliments.

⁴⁶ Social Networking: A quantitative and qualitative research report into attitudes, behaviours and use, Research Document, 2 April 2008, at

df ⁴⁷ See Figure 7 of that document.

sales in Q1 2009, compared to 3.7% in Q1 2005. Recently, Vodafone suggested that smartphone sales will account for 30-40% of its unit sales in the 2010/11 financial year.⁴⁸ However, use of these applications will only constrain MTRs if a sufficiently large number of people consider that communicating via these media is a close substitute for voice calls. At this time we think it unlikely that this will be the case within the period of this market review.

A4.90 One important, but (for our purposes) unquantified issue is that one of the benefits of a voice call which all three of these options (and SMS) lack is the conveyance of paralanguage (e.g. the pitch, volume and intonation of speech). These elements are often fundamental to the meaning of a communication. Although text-only communications have developed various means of expressing paralinguistic elements (e.g. emoticons, capitalisation), these are often imperfect and can still lead to misunderstandings. In its response to our May 2009 Consultation, C&W noted:

"...there are many circumstances in both the business and consumer environments where there is no substitute for a voice call."

Call-back arrangements

- A4.91 Call-back refers to a situation where the direction of a call is 'reversed' and the calling party is called back, either by the call recipient (in the case of an ad hoc arrangement) or by a provider of a specialised call-back service . Call-back could render an increase in MTRs unprofitable if the profitability of outgoing calls is lower than that of incoming calls, and call-back is carried out in sufficient volume.
- A4.92 Ad hoc call-back requires co-ordination between the caller and call recipient. In particular, it requires that the recipient is willing to become the caller and hence pay the price for the call. In many cases there would seem to be little incentive for the recipient to do this. Under CPP, the called party pays nothing, but if they became the caller, they would pay for the call. Hence, even if the call charges were shared between them, the original called party would still pay more than they would if they just received the call. According to the Jigsaw research, 17% of respondents who use a mobile phone request a call back at least once a week. However, more than half (58%) never request a call back. This suggests that ad hoc call-back arrangements may be significant for some users, but are not widespread across all users.

VoIP

- A4.93 Rather than make a circuit-switched voice call, a caller may choose to make a VoIP call. Some of these calls (for example, Skype calls) are made using user-names rather than mobile numbers. However, others (such as Truphone calls) can be made to and from mobile numbers.
- A4.94 In previous market reviews, we considered that, while VoIP services may develop into a substitute for circuit-switched mobile voice services, they were still in their infancy and so their possible effect on MCT was still unclear. Since that time, we have seen considerable developments in this area. There are a growing number of

⁴⁸ Vodafone Group plc Interim Management Statement for the 3 months ended 31 December 2009, available at

http://www.vodafone.com/etc/medialib/attachments/q3_2010.Par.79960.File.dat/q3_ims_presentation.pdf

mobile internet telephony providers, such as Truphone and Jajah, which charge MTRs even though calls are not terminated on a 2G/3G circuit-switched network, and charge their subscribers for making calls. This charge (on a per call basis) is often comparatively low or, in some cases, zero. They also charge their subscribers a significantly higher rate for receiving calls where these calls are forwarded to other mobile numbers.

- A4.95 There have been a range of reactions by established market players to the growth of these services. There are five common strategies undertaken by incumbents in reaction to VoIP around the world⁴⁹:
 - Block access to VoIP services over 3G e.g. Vodafone, which excludes it from data allowances in some of its packages.
 - Offer VoIP on certain handsets only.
 - Charge for VoIP access.
 - Allow VoIP traffic over networks in partnership with third-party providers without specifically charging for it.
 - Partner with a VoIP provider for 'free' voice calls to gain market share e.g. H3G which offers free Skype to Skype calls.
- A4.96 These developments make it increasingly necessary to determine where VoIP calls sit in relation to the market definition of mobile voice call termination. It is clear that, for VoIP calls between fixed points (such as home PCs), similar arguments hold as in relation to substitution of a call to a mobile for a call to a fixed line namely that the importance of convenience and immediacy of contact limits the extent to which these services can be considered substitutes.
- A4.97 It is important to note that, while a caller may *initiate* a VoIP call, whether it is *terminated* as a VoIP call is what matters from the point of view of the SSNIP test. If the number range holder chooses to terminate the call using circuit-switched technology, this call will still be subject to a normal MTR under the current MCT regulatory regime. Thus, the question is how far end-to-end VoIP calls (i.e. calls both originated and terminated as VoIP calls) will constrain a SSNIP in mobile termination rates.
- A4.98 One consideration is how far consumers, rather than the terminating operator, can choose to make an end-to-end VoIP call. If the consumer cannot choose to make/receive an end-to-end VoIP call as opposed to a call terminated in another way, then end-to-end VoIP calls will not be a constraint. At present, it is not possible for the caller to influence how the call is delivered. However, in some circumstances it is possible for the recipient to influence how they receive the call.
- A4.99 A second factor is how far consumers would want to make a 'pure' VoIP call as opposed to a circuit-switched call. If consumers considered VoIP calls to be inferior to circuit-switched calls, they may view them as a more limited substitute or, in the limit, as being too poor quality to be considered a substitute. In some ways VoIP services can be inferior to circuit-switched voice calls. For example, using VoIP over Wi-Fi while in motion is more likely to result in interruptions to service and more dropped calls than using a 2G or 3G network, as the latter type of networks have

⁴⁹ Source: Informa Telecoms & Media research

better integrated handover between cells. In addition, the quality of some VoIP services can be erratic compared to the quality of circuit-switched voice calls.

- A4.100 However, consumers' expectations of service quality are lower for mobile calls than fixed calls. For example, survey evidence suggests that consumers may realise that some areas have poorer mobile reception than others and so accept that they are more likely to experience dropped calls or interruptions to service when using a mobile. Reliability is the only measure of satisfaction where fixed outperforms mobile.⁵⁰ Thus, VoIP services may be more comparable to circuit-switched mobile services than to fixed voice services. In addition, improvements to mobile networks in terms of coverage, capacity and the increasing availability of VoIP-enabled mobile devices may be increasing the perception of mobile VoIP as a suitable alternative. On the other hand, improvements to coverage mean that consumer expectations of mobile services may be increasing, so circuit-switched mobile voice calls are still likely to be viewed more favourably than VoIP. The Jigsaw research found that reliability of service was a key factor in current network choice for 15% of respondents.
- A4.101 For the purposes of the HMT, we are interested in people who would change their behaviour *in response to a SSNIP* in mobile termination rates. VoIP is not an entirely new service, and so it is possible that the majority of users that will eventually use VoIP within the period of this review may already use it or are actively planning to use it. The evidence referred to in paragraph A4.14 shows that the majority of those with access to VoIP already use it, and that the use of VoIP is growing. This suggests that there has been and most likely will continue to be some migration to and take-up of VoIP without any change in the price of non-VoIP voice calls.
- A4.102 This means that, when applying the SSNIP, we should only be concerned about those customers not currently planning to switch to VoIP and whether they would be likely to make such a switch in response to a SSNIP. It could be argued, given that there are already opportunities for consumers to make significant cost savings by using VoIP, that those who are likely to switch to VoIP will probably do so without a SSNIP, and that a relatively small increase in the price of circuit-switched mobile calls as the result of an increase in MTRs may not encourage others to do so. Thus, we believe that VoIP is unlikely to constrain a SSNIP in mobile termination rates.

Reaction by call recipients

- A4.103 The CPP regime means that increases in MTRs do not directly affect call recipients. This suggests that call recipients would be less likely to react to increased MTRs than callers. Nevertheless, increases in MTRs may provoke a reaction by call recipients if:
 - the three conditions set out in paragraph A4.61 (namely, callers are sufficiently aware that they are calling a mobile on a specific network; callers are sufficiently aware of the price of calling that particular network; and callers are sensitive to changes in the prices of calling the network they want to reach) are met; and
 - mobile subscribers (that is, call recipients) value incoming calls to such an extent that they will modify their behaviour such that a SSNIP becomes unprofitable. For example, if a price increase caused a sufficiently large reduction in these calls

⁵⁰*The Consumer Experience,* November 2008, at <u>http://www.ofcom.org.uk/research/tce/ce08/research.pdf</u>

then this could induce subscribers to change networks or, in the case of those with more than one mobile phone, to give out different numbers for incoming calls.

- A4.104 The evidence presented in paragraphs A4.63-A4.102 suggests that the conditions with respect to the *calling* party's behaviour may not be met. This section considers whether the condition above relating to the call recipient's behaviour is met.
- A4.105 As mentioned in paragraph A4.75 above, respondents to the Jigsaw research were asked what the main factor in their current choice of network had been. No one mentioned the cost to others of calling them as an influential factor in choosing their network. A small proportion (7%) chose their network on the basis that friends/family were on that network as well. While part of the reasoning behind this may be that on-net calls are cheaper and so it will cost less for this group to contact the respondent, it would also mean that the cost to the respondent of calling their close contacts will be lower. This is likely to be the more important consideration to most respondents, as it reflects the most popular consideration ('general cost overall'). In any case, 7% is a small proportion of respondents, which suggests this is not an important factor for many.
- A4.106 One way a constraint on MTRs could arise would be if consumers used multiple numbers in order to minimise the cost to others of calling them (by providing a choice of network on which to reach them). Evidence that this type of behaviour occurs at a significant level in the market is, in fact, very limited. As mentioned in paragraph A4.79, only 11% of adult mobile users have more than one mobile phone or SIM card with different numbers. Of those who do, for 84% the SIM card on which they make most calls or texts is the same as that on which they receive most calls or texts. This suggests that most people who use more than one SIM card are not receiving calls on a separate number than the number they use to make calls. In addition, when asked why they used more than one SIM/phone, allowing friends to call or text on the number which offers them the lowest cost was the main reason for only 4% of respondents. By far the most popular response (given by 35% of respondents) was to separate numbers for work and personal calls.
- A4.107 As mentioned in paragraph A4.98, another way MTRs might be constrained might be by recipients choosing to receive calls as VoIP calls rather than as circuitswitched calls. At present it is easier for a call recipient to decide to receive circuitswitched calls instead of VoIP calls (by switching off their packet connectivity, thus forcing the terminating operator to route the call via the circuit-switched network) rather than vice versa, although such functionality is developing (but not widespread).⁵¹ However, the recipient still has relatively little incentive to do this in a CPP regime as they do not pay for receiving the call and so will not save money by doing this. In addition, VoIP providers rely on either the 2G/3G data connection or access to Wi-Fi. The packet access rates of these services are unregulated and so, as set out in paragraph A4.99, the service quality cannot be guaranteed. MNOs are therefore unlikely to be constrained by this in their setting of MTRs, particularly where the VoIP provider relies on access to their data connection. Furthermore, we do not foresee these applications developing sufficiently within the period of the next market review as to become mainstream applications.

⁵¹ For example, the iCall application for the iPhone allows the recipient to switch a call from 3G to Wi-Fi if they are in range of a Wi-Fi hotspot without interrupting the call. It is possible that such applications may develop for other smart phones and even for 'normal' phones. This would allow recipients to easily switch between IP termination and circuit-switched termination, and so may increase the likelihood of this imposing a constraint.

A4.108 We therefore consider that the available evidence suggests that the behaviour of call recipients is unlikely to constrain MCPs' ability to set excessive MTRs.

Retail supply-side substitution

Could retail supply-side substitution constrain termination rates?

- A4.109 For retail supply-side substitution to impose a constraint on MTRs, an operator that does not currently offer calls to mobiles would need to be able to switch into such provision. This would entail bypass of the MCP which holds the mobile number that the caller wishes to contact. Instead, it would use its own network technology to connect a call to that number, thus undermining any price set above the competitive level. In other words, the new provider would have to be able to provide a voice call service which was not reliant on the provision of termination by the holder of the called number.
- A4.110 As mentioned in paragraph A4.79 in relation to the called party's behaviour, a consumer may have more than one mobile number (sometimes on a single device). However, once a caller has dialled a particular mobile number, only the operator to whom that number has been allocated can terminate the call. Thus, the operator that has control of the mobile number range that contains the dialled number has control over the routing of calls to that number.
- A4.111 As already described, we now also observe that a MCP has other options for terminating a call such as using data services, for example Skype calls to a 3G or Wi-Fi network. In this situation, circuit-switched termination may be viewed as less of an 'essential input' in a voice call. However, although there are more methods for routing and terminating a call now than at the time of previous reviews, it is still entirely the decision of the recipient's network which methods it makes available and which is ultimately employed for any given call. As a result, this will not place a competitive constraint on the MCP's termination charge.
- A4.112 At present, it is not possible to offer retail calls to a mobile number without depending upon the MCP to which that number belongs to terminate such calls. We are not aware of any technologies that are widely available and taken up which allow a call provider to bypass the recipient's MCP. In addition, our current view is that it is unlikely that such technologies will develop by 2015 to such an extent that they would represent a material constraint on MTRs.

Conclusions on the relevant retail and indirect competitive constraints

- A4.113 The narrowest possible retail market is a circuit-switched voice call to a specific mobile number associated with a subscriber to a particular MCP.
- A4.114 We do not consider that callers and/or call recipients are likely to behave in a manner that would constrain a MNO's ability to set wholesale MTRs above the competitive level. This is partly because we have not been able to identify any alternative methods of communication that would individually or collectively provide a suitable substitute for a voice call to a mobile number in a sufficient number of instances to present a constraint on a hypothetical monopolist of termination rates.⁵²

⁵² It should be noted that, even were other services included in the relevant retail market, this would not automatically imply there was an indirect constraint. The relevant test would be whether a SSNIP

- A4.115 In addition, we do not consider it likely that, within the period covered by this review, it will be possible to bypass the MCP to which a call recipient's mobile number was allocated in order to connect a call to that number. Thus, we consider that there are no material retail supply-side substitution possibilities.
- A4.116 As we have drawn our retail market in this way, it follows that the wholesale market should not be defined any wider based on indirect competitive constraints. We have discussed below however whether there are any possible direct competitive constraints at the wholesale level.

Direct competitive constraints

A4.117 Direct competitive constraints could arise in the wholesale market if there are realistic alternatives to acquiring MCT from a given provider, or providers not currently offering MCT could quickly and easily enter to offer MCT to a particular group of customers. Hence, these competitive constraints could arise due to demand-side substitution or supply-side substitution.

Wholesale demand-side substitution

A4.118 An operator wishing to offer calls to a specific mobile number possessed by a customer of a specific MCP must purchase termination from that MCP or it will not be able to terminate such calls. Therefore, purchasing wholesale voice call termination from a different provider will not be a substitute for call termination from the holder of the desired mobile number, and so does not impose a direct constraint upon termination charges. As discussed in paragraph A4.112, we do not consider it likely that there will be technological developments that will make retail supply-side substitution more likely. Our current view is that, during the period under consideration, there is little prospect for termination to be provided, in relation to calling a specific number, other than by the MCP to which that number was allocated.

Wholesale supply-side substitution

- A4.119 Wholesale supply-side substitution requires that firms not currently providing MCT to a specific number in a MCP's number range be able to move into such provision at short notice and without incurring substantial sunk costs in response to an increase in termination charges.
- A4.120 When a MCP has total control of its mobile number range, no other operator can intervene into the termination process and 'steal' termination from the number-holding MCP. Wholesale supply-side substitution of this nature would require an active decision and positive action by the call recipient to manually switch SIM cards or phones, or adopt a multiple SIM handset, in order to receive calls from different networks. As set out in paragraph A4.107, we do not currently observe such behaviour to any great degree in the market, and consider it unlikely that this will develop to a great extent, in the period covered by this review.
- A4.121 A separate consideration is whether there are different 'types' of termination. We have shown that end-to-end VoIP calls will not impose a constraint in the retail market and so should not fall within the retail market definition. However, we also

in wholesale termination charges (which might translate to a much smaller increase in prices at the retail level) would induce enough consumers to switch to the alternative services in the market to impose a competitive constraint.

suggested that consumers may not be sensitive to whether calls are terminated via circuit-switched technology or via IP. Thus, a number range holder can choose to terminate a call via circuit-switched technology or via IP piggybacking on the consumer's existing wireless broadband or Wi-Fi access, but either way it is the number holder's choice (with the exception of the limited set of circumstances set out in paragraph A4.108). However, they do not tend to distinguish between the two for the purposes of setting charges for termination (and have little incentive to do so).

- A4.122 In addition, the distinction between IP and circuit-switched termination may become blurred in the future. For example, LTE uses packet-switched technology and voice may be delivered as another service over the packet-switched network. Thus, even operators that currently offer predominantly circuit-switched calls may use both circuit and packet-switched technology to deliver voice termination services within the period under review.
- A4.123 It is therefore our view that IP termination should be considered within the market for wholesale voice call termination, not because it imposes a competitive constraint on circuit-switched termination but because it is provided under a equivalent pricing regime whereby the terminating provider can control the MTR.

Conclusions on direct competitive constraints

A4.124 The MCP that controls a number range also controls termination to the numbers in that range. Our view is thus that an originating operator cannot purchase termination from another network in order to terminate calls to these numbers (and hence there are no wholesale demand-side substitutes), nor can other providers switch in to provide voice call termination to these numbers (and hence there are no wholesale supply-side substitutes). Our current view is that there are no significant direct competitive constraints on a MCP's ability to set MTRs above the competitive level. This is true for termination via IP as well as termination via circuit-switched technology, and MCPs do not distinguish between the two 'types' of termination with respect to the price charged to other communications providers, and so it is our view that IP termination should also fall within the market for wholesale voice call termination to be assessed.

Broadening market definition beyond mobile voice call termination provided for an individual number

- A4.125 The market definition analysis summarised above considered whether there are likely to be any significant constraints on a MCP's ability to set MTRs for voice calls to an individual mobile number. Our proposed conclusion is that there is not any significant constraint. However, we see strong arguments for widening the market definition from individual mobile numbers, to the level of all of the numbers in a particular allocated number range held by a single MCP. In particular, we consider that the provision of off-net MCT to different numbers held by the same MCP should be included in the same market because:
 - A MCP is likely to face homogeneous competitive conditions in providing wholesale mobile voice call termination to the different numbers in its number range, which implies that its conduct in supplying this service in relation to different numbers is likely to be similar; and
• The MCP faces a common pricing constraint through its billing system which would make it difficult/costly to charge different prices for MCT to different numbers even if it wanted to.

Mobile voice call termination provided by Mobile Communications Providers other than the established MNOs

New entrant MCPs with their own networks

A4.126 As we observed in paragraph 3.38 of Section 3, many new entrant MCPs employ very different business models to the established big four MCPs. For example, some new entrants chose to target specific geographies, in contrast with the big four MCPs which all have near national coverage⁵³. Furthermore, new entrant MCPs also have very different approaches to network rollout, with less reliance on building out their own macro sites and greater use of smaller cells (e.g. pico cells) and, in some cases, the use of mobile roaming agreements. However, common to all new entrant MCPs is that each is allocated UK mobile number range(s), which provides the path enabling them to deliver mobile services to the end-user. The 'exclusive' nature of this number range allocated to MCPs and and which the MCP controls, enables it to set MTRs. For this reason we have concluded, in paragraph 3.52, that our analysis applies equally to the four big MCPs and to new entrant MCPs which are capable of setting their own MTR.

<u>MVNOs</u>

- A4.127 We commented in paragraph A 4.26 that there is a strong MVNO sector in the UK, made up of a very diverse set of operators. The extent to which a MVNO could influence the termination rate it receives depends upon its relationship with its partner MNO.
 - It is our understanding that, at present, calls to most UK MVNO's subscribers are routed directly to the host MNO's network and originating operators pay this MNO a terminating charge set by that host MNO. Thus calls to these MVNO's numbers would fall within the market of MCT provided by the host MNO.
 - Where an MVNO has its own allocation of mobile numbers, it would be able to control the termination charge for calls made to these. MVNOs with control over wholesale termination charges are likely to face similar incentives as other MCPs when setting termination charges to other networks. This is because calling parties and originating operators have no choice but to use that provider's wholesale termination services to deliver calls. Thus where a MVNO is able to control the MTR, termination of calls to that MVNO's number range would represent a separate market.

New entrant MCPs

A4.128 As set out in paragraphs A4.14-A4.15, we have also observed the entry of operators that do not offer services using a typical mobile network at all. Instead, they terminate calls by transferring them as a data service across the internet (for example, over a Wi-Fi network) to a mobile number. Not only does this mean that they have a very different cost base to traditional MCPs, but in some cases a call to

⁵³ The MNOs providing 2G services currently have GSM coverage over 99% of the UK population. In addition, providing at least 80% population coverage is a condition of their 3G licenses, which all 5 UMTS MNOs have now either met or exceeded.

a mobile number provided by one of these operators may, at different times, be routed to a mobile device and at others to a fixed line. For example, when a number is registered with an operator such as Truphone, it can be used to make calls from, and receive calls, on either a fixed line, such as through a desktop computer, or a mobile. As such, a call to such a number can be a call to a mobile at one time, but a call to a fixed line at another.

- A4.129 However, all MCPs allow their subscribers to forward calls to their mobile numbers to fixed lines, and so this aspect is not unique to new operators' service offerings. In addition, many consumers use mobile devices while not actually mobile. According to research for the UK CMR 2008, 70% of users with both a landline and a mobile have used their mobile while at home.
- A4.130 Our current view is that, where an operator provides interconnection to a mobile number to other operators and could set a charge for this, it falls within the market definition of providing wholesale mobile voice call termination. Even where it chooses not to charge a termination rate, it still provides a termination service for voice calls and could, in principle, charge for this.

Broadening market definition beyond mobile voice call termination

A4.131 As mentioned previously, there has been, and continues to be, significant debate around whether the provision of termination services is a market in its own right, or whether it is part of a cluster of markets. Linked to this, it has been argued that the two-sided nature of the market means that the market definition of MCT should have regard to the provision of retail services as well. As discussed in paragraphs A4.20-A4.28, we do not consider that these arguments are compelling enough to suggest that MCT is not a separate market, albeit one with strong connections with other mobile services.

Geographic market definition

A4.132 Having defined the relevant wholesale product markets, the second part of a market definition exercise is the geographic scope of the relevant economic market. As set out in paragraph 56 of the SMP Guidelines:

"According to established case law, the relevant geographic market comprises an area in which the undertakings concerned are involved in the supply and demand of the relevant products or services, in which area the conditions of competition are similar or sufficiently homogeneous and which can be distinguished from neighbouring areas in which the prevailing conditions of competition are appreciably different..."

- A4.133 The narrowest possible geographic market is the area covered by the network assets (e.g. the RAN) owned and operated by the MCP capable of terminating a call. If the MCP were to rely entirely on its own network (i.e. it had no other formal or informal agreements to use the networks of other (mobile or fixed) communications providers) then this would be the only area where it could provide a voice call termination service. During all previous reviews of the market for mobile voice call termination, the MNOs that were being considered all had (or planned to develop) national networks, and so effectively their geographic market was the UK.
- A4.134 In this context, the competive conditions that an operator faces are not affected by the number of other operators in a particular area. As we set out in paragraph A4.118, we do not consider that voice call termination provided by one MCP can be

a substitute for termination provided by another. Even if there are more MCPs terminating calls in a particular location, these operators cannot offer MCT for calls to other operators' numbers.

- A4.135 Some MCPs have entered (or plan to enter) the market with network roll-out only in limited geographic locations. However, in some cases these MCPs supplement their own network assets by entering into formal agreements with other MCP(s) to use their networks to deliver services, including voice call termination i.e. a national or sub-national roaming agreement. As set out in annex 5, an originating operator would still need to interconnect with such a MCP, so this MCP will control the mobile termination rate on its number range even when the call terminates in an area outside of its own network coverage. Thus, the competitive conditions a MCP faces when terminating a call using another MCP's network are the same as those it faces when terminating a call using its own network. Therefore, it follows that the scope of its geographic market is the network over which it has control of the MTR.⁵⁴ In market definition terms, this geographic market is defined on the basis of there being homogeneity of competitive conditions as between its own physical network and the network (typically 2G/3G) on which its customers can roam.
- A4.136 There is a question over the geographic scope of MCT services provided over networks other than 'traditional' mobile networks e.g. using Wi-Fi to connect VoIP calls. The nature of this MCT service is such that MCPs do not need formal contractual arrangements in place in order to use other types of network assets to terminate voice calls on their mobile number range. Calls transferred as VoIP over data connections still require interconnection with the number range holder. Therefore the competitive conditions in these situations are exactly the same as where the MCP owns the network assets itself.
- A4.137 It is possible that the services provided to different numbers may have different geographic footprints. For example, one consumer may subscribe to use Wi-Fi hotspots that another consumer does not, and so the former will receive calls in areas where the latter will not. However, the competitive conditions in serving these customers are exactly the same in both cases. There is no strengthening or weakening of competitive pressure on the MCP as a result of the consumer choosing to widen the area over which he or she can receive calls. We therefore consider it appropriate to aggregate calls to individual mobile numbers to cover the entire geographic area over which the MCP provides calls to its number range for which it can determine the MTR.
- A4.138 As in the product market definition, we propose to find a number of different call types in each mobile call termination market. Different call 'types' are likely to have different geographic 'reach', and we need to consider the impact of this on the geographic market. For example, when a call is made to a consumer outside their coverage area, this call may be sent to voicemail. Therefore, the geographic market for calls which go to voicemail will cover a greater area than voice calls which the recipient answers. However, the conditions of competition in the provision of voicemail are exactly the same as the conditions of competition for 'normal' voice calls, regardless of the location where the call is received.
- A4.139 The only way to terminate a mobile voice call where the call recipient is currently located in the UK is by terminating that call on the UK network serving the recipient (i.e. it is not possible to terminate that call on a network located outside the UK).

⁵⁴ The approach we have taken here in defining the geographic scope to the market follows the framework that is set out in the Commissions SMP Guidelines in paragraph 56.

Accordingly, we do not consider that the relevant geographic market is wider than the UK.

A4.140 Thus, our view is that the geographic market for mobile voice call termination provided by a particular MCP should be the area of the UK within which that MCP provides and can set a charge for mobile voice call termination services.

Conclusions on market definition

A4.141 Our view is that it is appropriate to define 50 separate markets for wholesale mobile voice call termination services. Each of these individual proposed markets with respect to each mobile communications provider⁵⁵ comprises:

"termination services⁵⁶ that are provided by [named mobile communications provider] (MCP) to another communications provider, for the termination of voice calls to UK mobile numbers that MCP has been allocated by Ofcom⁵⁷ in the area served by MCP and for which MCP is able to set the termination rate".

⁵⁵ The definition of an MCP comprises those market participants offering wholesale mobile voice call termination services as a public electronic communications service (PECS), whether the entity is a public electronic communications network (PECN) or not. It therefore includes those mobile service providers (MSP), offering a publically available telephone service (PATS) based mobile telephony service (MTS) but is not limited to PSTN based calls.

⁵⁶ Call termination is the service necessary for an MCP to connect a caller with the intended recipient of the call originating from a caller on a different MCP's number range. If call termination was not available, an MCP could only terminate calls to other customers on own number range. This service is referred to as wholesale because it is sold and purchased by MCPs rather than retail customers.

⁵⁷ Applicable to those mobile number designations and allocations that are made by Ofcom in accordance with the UK's National Telephone Numbering Plan. Further details of our telephone number allocation procedures can be found at,

<u>http://www.ofcom.org.uk/telecoms/ioi/numbers/applying_num/</u>. For the purpose of market reviews 'within the UK' excludes of Jersey, Guernsey and the Isle of Man. Specifically, while Ofcom allocates mobile numbers to these UK protectorates, as a matter of administrative protocol, they operate under their own competition jurisdictions, separate to the UK and the EC.

Annex 5

Call types which require special consideration

A5.1 The purpose of this annex is to explain in more detail those types of calls that we consider are included (or not included) in the charge controls described in the main consultation.

Calls to ported numbers

- A5.2 Under General Condition 18, CPs (including MCPs) must provide number portability to their own customers on request, and 'portability' (that is, the network access necessary to enable subscribers to port their numbers) to any other CP. As a result, mobile numbers which were originally allocated to one MCP may be ported to another MCP at the subscriber's request.
- A5.3 The current portability arrangements mean that termination charges for a ported number are not set by the network to which the number has been ported (the recipient network) but by the network to which the number was initially allocated (the range holder). Therefore, since the recipient network does not set the charge for termination of calls to this number, calls to these numbers do not fall within the host network's market. Conversely, the range holder does set the MTR for calls to numbers which have been ported out, and this MTR is subject to the same common pricing constraint as MTRs for calls to numbers it still controls. Therefore calls to ported numbers fall into the market of the range holder.
- A5.4 Therefore the market for any given MCP extends to calls made to mobile numbers which have been ported out, but not to calls to mobile numbers which have been ported in.

Calls to voicemail

- A5.5 A call to a mobile number which the intended recipient does not answer is sometimes sent to voicemail, where the caller can leave a message for the recipient. It is therefore unlikely to be an indirect competitive constraint the call is made from and to the same number, and, generally, the caller does not choose to be given the option of leaving a voicemail message instead of a connected call. In addition, the MCP which decides whether the call is sent to voicemail is the same MCP which decides whether and how to connect the call when the recipient wants to answer.
- A5.6 We think that calls to voicemail should be included in the relevant market because of the close relationship between the way in which they are offered, and conventional voice calls.⁵⁸. Only the number range holder can determine how and whether to pass calls to voice, and exercises de facto control over voicemail messages left to its number range, in the same way it controls calls made to those numbers. It also faces the same incentives in setting the termination rate for voicemail as for calls to its numbers it is a wholesale charge, and so does not

⁵⁸ More formally, because of the homogenous competitive conditions between the two call types

directly influence what its own customers pay for leaving a voicemail message compared to making a call.

- A5.7 In addition, during the enforcement of our previous MCT charge control, several mobile network operators acknowledged that their systems did not allow them to differentiate between calls which ended on voicemail from other calls. This suggests that MCPs cannot set a different charge for terminating these calls and so they are subject to a common pricing constraint in relation to termination.⁵⁹
- A5.8 This suggests that off-net calls which end on voicemail should be *included* in the market.⁶⁰

National roaming

- A5.9 Some MCPs enter agreements with a national network to provide coverage over a greater area, or more effectively, than they would otherwise reach. The ability to roaming from one network in the UK to another is referred to as domestic or national roaming.
- A5.10 A user may receive a call to a number registered with MCP A, but the call would be received and terminated on MCP B's network. However, MCP A still controls the termination of the call and sets the termination rate. It is merely using MCP B's network as an input into its own termination service. Therefore, calls to an MCP's number range which are received while the user is roaming on another MCP's network should be treated in the same way as any other call to the first MCP's number range i.e. as if the user were not roaming. For example, a call from a H3G mobile number to a H3G number which is roaming on Orange's network should be treated as an on-net call and so would be excluded from the charge control. However, a call from a Cable & Wireless mobile number roaming on Orange's network to an Orange number would be treated like an off-net call to an Orange number and so would be included in Orange's market.

International roaming

A5.11 International roaming occurs might best be described as a service which allows mobile subscribers to use their mobile while abroad. The services available to subscribers, the price for using those services and whether a service can be obtained at all will be determined by a number of factors, including the subscriber's 'home' provider, their current tariff and the country on which they are roaming.

⁵⁹ A secondary factor is the degree of common pricing constraint at the retail level that is, in practice, often applied between voice calls that are connected, and those passed to voicemail platforms –

although some providers in some packages also offer free voicemail. ⁶⁰ On-net calls to voicemail should be excluded for the same reasons.

Figure 1: International roaming



Source: GSM Europe⁶¹

- A5.12 The way we treat international roaming calls, for the purposes of this review, depends on how the call is routed⁶². If the call is routed directly, then the call is treated like any other call originated on the UK network (i.e. an on-net call). However, in some cases the call may be 'tromboned' sent from the originator to the home network abroad, which then effectively terminates the call and sets up a separate call to the UK network on which the subscriber is roaming (i.e. off-net).
- A5.13 Below, we consider four examples, to illustrate how we believe we should consider international roaming calls, in the context of this review.

Example 1 – both the caller and recipient are roaming on the same UK network (e.g. user A with Meteor in Ireland roaming in the UK with T-Mobile calling user B with Meteor in Ireland also roaming with T-Mobile in the UK)

- A5.14 If the call were routed directly, this would be considered an on-net call. However, it is possible that the conditions of competition for these calls may not be the same as for normal on-net calls. The UK network still has the power to charge another network (the home network abroad) for termination. This is different to a normal on-net call, where the only MCP which would pay (if such a charge were actually levied) would be itself. Levying a charge in the case of a call to a number roaming internationally would actually allow the UK MCP to double-charge for termination, as termination costs are already paid by the originator through the inter-operator tariff (IOT)⁶³. This scenario assumes, of course, that the 'home' provider is able to match calls both made from and received on its own network. However, such behaviour could engender retaliation from the home network with respect to charges for UK mobile users roaming abroad, and so any benefit from double-charging may be outweighed by this potential risk.
- A5.15 If the call is tromboned, the second leg of the call (from the home network abroad back to the UK partner) would be considered an off-net call and so would be subject to the UK partner's MTR. However, such cases should be increasingly rare as more advanced network design and routing procedures make tromboning unnecessary in countries with more developed mobile telecommunications infrastructure.

⁶¹ www.roaming.gsmeurope.org

⁶² For the remainder of this section, we focus on calls made between numbers either roaming on or registered to the same UK network e.g. between a T-Mobile subscriber and a foreign subscriber whose network has a roaming agreement with T-Mobile.

⁶³ The IOT is a tariff agreed between operators and paid by the home network. It covers all of the costs of making a call, including origination, transit and termination.

A5.16 It is therefore our view at this stage that such calls should be *excluded from the market*, as i) with efficient routing, it would be an on-net call and ii) the UK partner already recoups the cost of termination through the IOT.

Example 2 – a call from a UK number to a roamer on the same network (e.g., a call from a T-Mobile user to a Meteor Ireland user who happens to be in the UK and roaming on T-Mobile's network)

- A5.17 In many such cases, we would expect that the UK MCP would know that the roamer was on its network and so would be able to route the call directly. Thus, it would be an on-net call and so should be excluded from the market as defined for this review.
- A5.18 If the call were tromboned, as described in paragraph 5.12, the second leg may be considered an off-net call and so would be subject to the UK MCP's MTR. It would thus fall within that MCP's market. However, as set out above, this should be becoming less common. This means these calls will be treated as on-net calls and excluded from the market.

Example 3 – a call from a roamer to a number which belongs to the same UK MCP (e.g., a call from a Meteor user roaming in the UK with T-Mobile to a UK T-Mobile user)

A5.19 This is the reverse of the situation in example 2. Here, the call will always be on-net, as the UK MCP would know the roamer (originating the call) and the call recipient (its subscriber) are both on its network. Wholesale payment for this call would be covered by the IOT. This call would therefore be treated like an on-net call and would be excluded from the market.

Example 4 – a call to a UK mobile number roaming abroad

A5.20 Unlike the previous three examples, the second leg of this call would terminate outside the UK, and so would be beyond the geographic bounds of the market. However, the call is initially sent to the UK network, which effectively terminates the call (and charges a mobile termination rate to the originator) before setting up the second leg. The first leg of the call, to a UK mobile number, is therefore terminated in the UK and so should be treated as though the call were received while the recipient is in the UK: if it is a call from a number on the same network it is an onnet call; if it is a call from a number on a different network it is an off-net call.

Other call types

A5.21 We are aware that there are other call types (e.g. test calls, calls to a MCP's customer service line) which are not typical calls between end-users and so which may not logically face the same competitive constraints or create the same incentives for MCPs. However, given that these calls represent only a very small proportion of total volumes, we do not feel it is proportionate to engage in a detailed analysis of these call types. For the avoidance of doubt, where these calls are made to a mobile number and face the same common pricing constraint as other calls to mobile numbers, we consider that these calls should fall within the market.

Annex 6

Regulatory framework

Introduction

- A6.1 This annex provides an overview of the market review process, to give some additional context and understanding of the matters discussed in the main body of this document and the legal instruments (statutory notifications) published at annex 7.
- A6.2 Market review regulation is technical and complex, including the legislation and the recommendations and guidelines that we need to consider as part of the process. There may be many relevant documents depending on the market and/or issues in question. This overview does not purport to give a full and exhaustive account of all such materials that we have considered in reaching our preliminary views on this market. Key aspects of materials relevant to this market review are, however, discussed in this document.

Market review concept

- A6.3 The concept of a market review refers to procedures under which we at regular intervals identify relevant markets appropriate to national circumstances, carry out analyses of these markets to determine whether they are effectively competitive and then decide on appropriate remedies (known as SMP obligations or conditions). We explain the concept of SMP (significant market power) below.
- A6.4 In carrying out this work, we act in our capacity as the sector-specific regulator for the UK communications industries, particularly relating to our role as the regulator for telecommunications. Our functions in this regard are to be found in Part 2 of the Communications Act 2003 (the Act). We exercise those functions within the framework harmonised across the European Union for the regulation of electronic communications by the Member States (known as the Common Regulatory Framework or the CRF), as transposed by the Act. The applicable rules⁶⁴ are contained in a package of five EC Directives, of which two Directives are immediately relevant for these purposes, namely:
 - Directive 2002/21/EC on a common regulatory framework for electronic communications networks and services (the Framework Directive); and
 - Directive 2002/19/EC on access to, and interconnection of, electronic communications networks and associated facilities (the Access Directive).
- A6.5 The Directives require that National Regulatory Authorities (NRAs) (such as Ofcom) carry out reviews of competition in communications markets to ensure that SMP regulation remains appropriate and proportionate in the light of changing market conditions.
- A6.6 Each market review normally has three stages, namely:

⁶⁴ The Directives have recently been reviewed and amendments were adopted on 19 December 2009. The amendments will need to be transposed into the national legislation by 25 May 2011, and then apply with effect from 26 May 2011.

- the procedure for the identification and definition of the relevant markets (the market definition procedure);
- the procedure for the assessment of competition in each market, in particular whether the relevant market is effectively competitive (the market analysis procedure); and
- the procedure for the assessment of appropriate regulatory obligations (the remedies procedure).
- A6.7 These stages are normally carried out together.

Market definition procedure

- A6.8 The Act provides that, before making a market power determination⁶⁵, we must identify the market, which is, in our opinion, the one which, in the circumstances of the UK, is the market in relation to which it is appropriate to consider making such a determination and to analyse that market.
- A6.9 The Framework Directive requires that NRAs shall, taking the utmost account of the 2007 Commission Recommendation on Relevant Product and Service Markets⁶⁶ and SMP Guidelines⁶⁷ published by the European Commission, define the relevant markets appropriate to national circumstances, in particular relevant geographic markets within their territory, in accordance with the principles of competition law.
- A6.10 The 2007 Commission Recommendation identifies a set of product and service markets within the electronic communications sector in which *ex ante* regulation may be warranted. Its purpose is twofold. First, seeking to achieve harmonisation across the single market by ensuring that the same markets will be subject to a market analysis in all Member States. Secondly, providing legal certainty by making market players aware in advance of the markets to be analysed. However, NRAs are able to regulate markets that differ from those identified in the 2007 Commission Recommendation where this is justified by national circumstances taking account of the three cumulative criteria referred to in the 2007 Commission Recommendation⁶⁸ (the three-criteria test) and where the European Commission does not raise any objections.
- A6.11 The fact that an NRA identifies the product and service markets listed in the 2007 Commission Recommendation or identifies other product and service markets that

⁶⁵ The market power determination concept is used in the Act to refer to a determination that a person has SMP in an identified services market.

⁶⁶ Commission Recommendation of 17 December 2007 on relevant product and service markets within the electronic communications sector susceptible to *ex ante* regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communication networks and services.

⁶⁷ Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services (2002/C 165/03).

⁶⁸ The Recommendation states that, "[w]hen identifying markets other than those set out in the Annex, national regulatory authorities should ensure that the following three criteria are cumulatively met: (a) the presence of high and non-transitory barriers to entry. These may be of a structural, legal or regulatory nature; (b) a market structure which does not tend towards effective competition within the relevant time horizon. The application of this criterion involves examining the state of competition behind the barriers to entry; (c) the insufficiency of competition law alone to adequately address the market failure(s) concerned."

meet the three-criteria test does not mean that regulation is warranted. Market definition is not an end in itself but is a means of assessing effective competition. The three-criteria test is also different from the SMP assessment because the test's focus is on the general structure and market characteristics.

- A6.12 The relationship between the market definition identified in this review and those listed in the 2007 Commission Recommendation is discussed in Section 3 of this document.
- A6.13 The SMP Guidelines make clear that market definition is not a mechanical or abstract process. It requires an analysis of any available evidence of past market behaviour and an overall understanding of the mechanics of a given sector. As market analyses have to be forward-looking, the Guidelines state that NRAs should determine whether the market is prospectively competitive, and thus whether any lack of effective competition is durable, by taking into account expected or foreseeable market developments over the course of a reasonable period. They clarify that NRAs enjoy discretionary powers that reflect the complexity of all the relevant factors that must be assessed (economic, factual and legal) when identifying the relevant market, and assessing whether an undertaking has SMP.
- A6.14 The SMP Guidelines also describe how competition law methodologies may be used by NRAs in their analyses. In particular, there are two dimensions to the definition of a relevant market: the relevant products to be included in the same market and the geographic extent of the market. Ofcom's approach to market definition follows that used by the UK competition authorities, which is in line with the approaches adopted by the European Commission.
- A6.15 While such methodologies are being used in identifying the *ex ante* markets, they will not necessarily be identical to markets defined in individual competition law cases. This may be the case, especially as the former is based on an overall forward-looking assessment of the structure and the functioning of the market under examination. Accordingly, the economic analysis carried out for the purpose of this review, including the identified markets, is without prejudice to any analysis that may be carried out in relation to any investigation pursuant to the Competition Act 1998 (relating to the application of the Chapter I or II prohibitions or Article 81 or 82 of the EC Treaty) or the Enterprise Act 2002.

Market analysis procedure

Effective competition

- A6.16 The Act requires that, at such intervals as we consider appropriate, we carry out market analyses of identified markets for the purpose of making or reviewing market power determinations. In any event, such analyses are to be carried out as soon as reasonably practicable after recommendations are made by the European Commission that affect matters that were taken into account, or could have been taken into account, in the case of our last analysis of that market.
- A6.17 In carrying out a market analysis, the key issue for an NRA is to determine whether the market in question is *effectively competitive*. The 27th recital to the Framework Directive clarifies the meaning of that concept. Namely, "[it] is essential that *ex ante* regulatory obligations should only be imposed where there is not effective competition, i.e. in markets where there are one or more undertakings with significant market power, and where national and Community competition law remedies are not sufficient to address the problem".

- A6.18 The definition of SMP is equivalent to the concept of dominance as defined in competition law. The Framework Directive requires, however, that NRAs must carry out market analysis taking the utmost account of the SMP Guidelines. The latter emphasise that NRAs should undertake a thorough and overall analysis of the economic characteristics of the relevant market before coming to a conclusion as to the existence of significant market power.
- A6.19 In that regard, the SMP Guidelines set out, additionally to market shares, a number of criteria that can be used by NRAs to measure the power of an undertaking to behave to an appreciable extent independently of its competitors, customers and consumers, including (a) overall size of the undertaking; (b) control of infrastructure not easily duplicated; (c) technological advantages or superiority; (d) absence of or low countervailing buying power; (e) easy or privileged access to capital markets/financial; (f) resources; (g) product/services diversification (e.g. bundled products or services); (h) economies of scale; (i) economies of scope; (j) vertical integration; (k highly developed distribution and sales network; (l) absence of potential competition; and (m) barriers to expansion. A dominant position can derive from a combination of these criteria, which taken separately may not necessarily be determinative.

Sufficiency of competition law

- A6.20 As part of our overall forward-looking analysis, we also assess whether competition law by itself (without *ex ante* regulation) is sufficient to address the competition problems identified. Aside from the need to address this issue as part of the three-criteria test, we normally also conclude on this matter in dealing with the appropriate remedies which, as explained below, are based on the nature of the specific competition problems we identify. We always consider the option of no *ex ante* regulation, while noting that the SMP Guidelines clarify that, if NRAs designate undertakings as having SMP, they must impose on them one or more regulatory obligations.
- A6.21 In considering this matter, we bear in mind the specific characteristics of communications markets. Generally, the case for *ex ante* regulation in communications markets is based on the existence of market failures, which, by themselves or in combination, mean that competition might not be able to become established, if the regulator relied solely on its *ex post* competition law powers that are established for dealing with more conventional sectors of the economy. Therefore, it is appropriate for *ex ante* regulation to be used to address these market failures and any entry barriers that might otherwise prevent effective competition from becoming established. By imposing *ex ante* regulation that promotes competition, it may be possible to reduce such regulation over time, as markets become more competitive, and instead place greater reliance on *ex post* competition law.
- A6.22 *Ex post* competition law is also unlikely in itself to bring about effective competition, as it prohibits the abuse of dominance rather than the holding of a dominant position. In contrast, *ex ante* regulation is normally needed to promote actively the development of competition. *Ex ante* regulation attempts to reduce the level of market power in a market, thereby encouraging effective competition to become established. This is particularly the case when addressing the effects of network externalities, because the network externality effect generally re-enforces a dominant position and, as noted above, under general competition law there is no prohibition on the holding of a position of dominance in itself. Therefore, it is more

appropriate to address the impact of network externality through *ex ante* obligations.

A6.23 Additionally, unless we consider otherwise in relation to a specific obligation in this review, we generally take the view that *ex ante* regulation is needed to create legal certainty for the market under review. Linked to that certainty is the fact that the SMP obligations we have proposed are necessary to enable us to intervene in a timely manner. For some other specific obligations, we generally consider that they are needed as competition law would not remedy the particular market failure, or we believe that specific clarity and detail of the obligation is required to achieve a particular result.

Remedies procedure

Powers and legal tests

- A6.24 The Framework Directive prescribes what regulatory action NRAs must take depending upon whether or not the market in question has been found effectively competitive. Where a market has been found effectively competitive, NRAs are not allowed to impose SMP obligations and must withdraw such obligations where they already exist. On the other hand, where the market is found not effectively competitive, the NRAs must identify the undertakings with SMP on that market and then impose appropriate obligations.
- A6.25 NRAs have a suite of regulatory tools at their disposal, as reflected in the Act. Specifically, the Access Directive specifies a number of SMP obligations, including transparency, non-discrimination, accounting separation, access to and use of specific network elements and facilities, price control and cost accounting. When imposing a specific obligation, the NRA will need to demonstrate that the obligation in question is based on the nature of the problem identified, proportionate and justified in the light of the policy objectives as set out in Article 8 of the Framework Directive, as implemented by national law.
- A6.26 Specifically, for each and every proposed SMP obligation we explain why it satisfies the test that the obligation is: (a) *objectively justifiable* in relation to the networks, services, facilities, apparatus or directories to which it relates; (b) *not such as to discriminate unduly* against particular persons or against a particular description of persons; (c) *proportionate* to what the condition or modification is intended to achieve; and (d) in relation to what it is intended to achieve, *transparent*.
- A6.27 Additional legal requirements may also need to be satisfied depending on the SMP obligation in question, for example, for price controls where the NRA's market analysis must indicate that the lack of effective competition means that the operator concerned might sustain prices at an excessively high level, or apply a price squeeze, to the detriment of end-users. In that instance, NRAs must take into account the investment made by the operator and allow him a reasonable rate of return on adequate capital employed, taking into account the risks involved, as well as ensure that any cost recovery mechanism or pricing methodology that is mandated serves to promote efficiency and sustainable competition and maximise consumer benefits. Where an obligation to provide third parties with network access is considered appropriate, NRAs must take into account factors including the feasibility of the proposed network access, the technical and economic viability of creating networks that would make the network access unnecessary and the investment of the network operator who is required to provide access.

A6.28 To the extent relevant to this review, we demonstrate the application of these requirements to the SMP obligations in question at Section 5 of this document. In doing so, we also set our assessment of how, in our opinion, the performance of our general duties under section 3 of the Act is secured or furthered by our regulatory intervention, and that it is in accordance with the six Community requirements in section 4 of the Act. This assessment is also rel*evant to our assessment* of the likely impact of implementing our proposals. A number of specific points should be noted in th*is regard.*

Ofcom's general duties - section 3 of the Act

- A6.29 Under the Act, our principal duty in carrying out functions is to further the interests of citizens in relation to communications matters and to further the interests of consumers in relevant markets, where appropriate by promoting competition.
- A6.30 In so doing, we are required to secure a number of specific objectives and to have regard to a number of matters set out in section 3 of the Act. As to the prescribed specific statutory objectives in section 3(2), we consider that the objective of securing the availability throughout the UK of a wide range of electronic communications services as particularly relevant to this review.
- A6.31 In performing our duties, we are also required to have regard to a range of other considerations, as appear to us to be relevant in the circumstances. In this context, we consider that a number of such considerations are relevant, namely:
 - the desirability of promoting competition in relevant markets;
 - the desirability of encouraging investment and innovation in relevant markets; and
 - the desirability of encouraging the availability and use of high speed data transfer services throughout the United Kingdom.
- A6.32 We have also had regard to the principles under which regulatory activities should be transparent, accountable, proportionate, consistent, and targeted only at cases in which action is needed, as well as the interest of consumers in respect of choice, price, quality of service and value for money.
- A6.33 Ofcom has, however, a wide measure of discretion in balancing its statutory duties and objectives. In so doing, we have taken account of all relevant considerations, including responses received during our consultation process, in reaching our conclusions.

European Community requirements for regulation – section 4 of the Act

- A6.34 As noted above, our functions exercised in this review fall under the CRF. As such, section 4 of the Act requires us to act in accordance with the six European Community requirements for regulation.
- A6.35 In summary, these six requirements are:
 - to promote competition in the provision of electronic communications networks and services, associated facilities and the supply of directories;
 - to contribute to the development of the European internal market;

- to promote the interests of all persons who are citizens of the European Union;
- to take account of the desirability of Ofcom's carrying out its functions in a manner which, so far as practicable, does not favour one form of or means of providing electronic communications networks, services or associated facilities over another, i.e. to be technologically neutral;
- to encourage, to such extent as Ofcom considers appropriate for certain prescribed purposes, the provision of network access and service interoperability, namely securing efficient and sustainable competition and the maximum benefit for customers of communications providers;
- to encourage compliance with certain standards in order to facilitate service interoperability and secure freedom of choice for the customers of communications providers.
- A6.36 We consider that the first, third, fourth and fifth of those requirements are of particular relevance to the matters under review and that no conflict arises in this regard with those specific objectives in section 3 that we consider are particularly relevant in this context.

Impact assessment – section 7 of the Act

- A6.37 The analysis presented in the whole of this document represents an impact assessment, as defined in section 7 of the Act.
- A6.38 Impact assessments provide a valuable way of assessing different options for regulation and showing why the preferred option was chosen. They form part of best practice policy-making. This is reflected in section 7 of the Act, which means that generally Ofcom has to carry out impact assessments where its proposals would be likely to have a significant effect on businesses or the general public, or when there is a major change in Ofcom's activities. However, as a matter of policy Ofcom is committed to carrying out and publishing impact assessments in relation to the great majority of its policy decisions. For further information about Ofcom's approach to impact assessment, which are on the Ofcom website: http://www.ofcom.org.uk/consult/policy_making/guidelines.pdf
- A6.39 Specifically, pursuant to section 7, an impact assessment must set out how, in our opinion, the performance of our general duties (within the meaning of section 3 of the Act) is secured or furthered by or in relation to what we propose.
- A6.40 Ofcom is separately required by statute to assess the potential impact of all our functions, policies, projects and practices on race, disability and gender equality. Equality impact assessments (EIAs) also assist us in making sure that we are meeting our principal duty of furthering the interests of citizens and consumers regardless of their background or identity. Unless we otherwise state in this document, it is not apparent to us that the outcome of our review is likely to have any particular impact on race, disability and gender equality. Specifically, we do not envisage the impact of any outcome to be to the detriment of any group of society.
- A6.41 Nor are we envisaging any need to carry out separate EIAs in relation to race or gender equality or equality schemes under the Northern Ireland and Disability Equality Schemes. This is because we anticipate that our regulatory intervention will

affect all industry stakeholders equally and therefore not have a differential impact in relation to people of different gender or ethnicity, on consumers in Northern Ireland or on disabled consumers compared to consumers in general. Similarly, we are not envisaging making a distinction between consumers in different parts of the UK or between consumers on low incomes. Again, we believe that our intervention will not have a particular effect on one group of consumers over another.

Regulated entity

- A6.42 The power in the Act to impose an SMP obligation by means of an SMP services condition provides that it is to be applied only to a 'person' whom we have determined to be a 'person' having SMP in a specific market for electronic communications networks, electronic communications services or associated facilities (i.e. the 'services market').
- A6.43 The Framework Directive requires that, where an NRA determines that a relevant market is not effectively competitive, it shall identify 'undertakings' with SMP on that market and impose appropriate specific regulatory obligations. For the purposes of EC competition law, 'undertaking' includes companies within the same corporate group (*Viho v Commission* Case C-73/95 P [1996] ECR I-5447), for example, where a company within that group is not independent in its decision making.
- A6.44 We consider it appropriate to prevent a dominant provider to whom a SMP service condition is applied, which is part of a group of companies, exploiting the principle of corporate separation. The dominant provider should not use another member of its group to carry out activities or to fail to comply with a condition, which would otherwise render the dominant provider in breach of its obligations.
- A6.45 Accordingly, we are seeking to apply the proposed SMP conditions as relevant to the MCPs listed in schedule 1 of annex 7 and any subsidiary or holding company, or any of its subsidiaries or holding companies, or any subsidiary of such holding companies, all as defined in section 1159 of the Companies Act 2006.

Annex 7

Notification under sections 48 (2) and 80 of the Communications Act 2003 and proposed SMP conditions

Proposals for the revocation of notifications, identification of markets, the making of market power determinations and the setting of SMP services conditions in relation to each of the named providers in Schedule 1 to this Notification

- 1. The Office of Communications ("**Ofcom**") in accordance with sections 48(2) and 80 of the Communications Act 2003 (the "**Act**") makes the following proposals for identifying markets, making market power determinations and the setting of SMP services conditions by reference to those determinations ("**SMP conditions**").
- 2. Ofcom are proposing to identify the market for *termination services that are provided* by each of those persons named in Column C of Schedule 1 ("**MCP**") to another communications provider, for the termination of voice calls to UK mobile numbers that that MCP has been allocated by Ofcom in the area served by that MCP (as identified in Column B of Schedule 1) and for which that MCP is able to set the termination rate, as applicable to each MCP for the purposes of making a market power determination (each a "**relevant market**").
- 3. Ofcom are proposing to make a market power determination that each of the persons set out in Column C of Schedule 1 has significant market power in relation to the relevant market in which that provider operates.
- Ofcom are proposing to set the SMP conditions on the persons referred in paragraph 3 above as set out in Schedule 2 to this Notification as set out in Column D of Schedule 1.
- 5. The Notification and related SMP conditions set out at annex 20 to the Mobile Call Termination statement, 27 March 2007, and any subsequent modifications to the SMP conditions set out at Mobile call termination, adoption of Revised SMP Services Conditions following the Competition Appeal Tribunal's Directions statement, are revoked by this Notification when it takes effect under sections 48(1) and 79(4) of the Act.
- 6. The effect of and Ofcom's reasons for making the proposals referred to in paragraphs 2 to 5 above are contained in the explanatory statement accompanying this Notification.
- 7. In making the proposals referred to above, Ofcom have taken due account of all applicable guidelines and recommendations which have been issued or made by the European Commission in pursuance of a Community instrument, and relate to market identification or analysis, or the determination of what constitutes significant market power, as required by section 79 of the Act.

- 8. In making the decisions referred to in paragraphs 1 to 5 above, Ofcom have considered and acted in accordance with the six Community requirements set out in section 4 of the Act and their duties in section 3 of the Act.
- 9. OFCOM consider that the SMP conditions referred to in paragraph 4 above comply with the requirements of sections 45 to 50 and sections 78 to 92 of the Act, as appropriate and relevant to each SMP condition.
- Representations may be made to Ofcom about the proposals set out in this Notification and the accompanying explanatory statement by 23 June 2010.
 Respondents are asked to provide representations in the manner set out in annex 1 of the explanatory statement.
- 11. Copies of this Notification and the accompanying explanatory statement have been sent to the Secretary of State in accordance with section 50(1)(a) and section 81(1) of the Act and to the European Commission in accordance with sections 50(3) and 81(3) of the Act.
- 12. Save for the purposes of paragraphs 1 and 2 of this Notification and except as otherwise defined in this Notification, words or expressions used shall have the same meaning as in the Act.

Signed

David Stewart Competition Policy Director

A person authorised by OFCOM under paragraph 18 of the Schedule to the Office of Communications Act 2002

1 April 2010

SCHEDULE 1

Column A lists the current number ranges allocated to each person identified in Column C (Identified market by service) ⁶⁹	Column B (Identified market by area)	Column C (persons with significant market power) ⁷⁰	Column D (remedies)
Termination of voice calls to Mobile Numbers in the ranges 07911 2, 07911 8, 07406 6, 07893 1	The area served by 24 Seven Communications Ltd within the UK	24 Seven Communications Ltd whose registered company number is 04468566 and registered address is Novis and Co Chartered Accounts, 1 Victoria Court, Bank Square, Morley Leeds, West Yorkshire, Leeds, LS27 9SE	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07537 5	The area served by Awayphone Ltd within the UK	Awayphone Ltd whose registered company number is 04609229 and registered address is The Old Post Office, 58 Winchester Road, Petersfield, Hants, GU32 3PL	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the ranges 07777 0-9	The area served by British Telecommunications plc, which is national in scope	British Telecommunications plc whose registered company number is 01800000 and registered address is 81 Newgate Street, London, EC1A 7AJ	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07822 8	The area served by Cable & Wireless plc, which is national in scope	Cable & Wireless plc whose registered company number is 0238525 and registered address is	SMP conditions M1 and M4

⁶⁹ For each of the mobile number ranges identified in Column A the table, the number range comprises those mobile numbers in the 07 range of 07XXX XXX XXX. For example, an allocation identified as 07XX1 0 comprises a block of 100,000 numbers: 07XX1 000 000 – 07XX1 999 999.
⁷⁰ For each of the persons identified in Colum C, the SMP designation holds with respect to the registered company identified and any subsidiary or holding company, or any of its subsidiaries or holding companies, or any subsidiary of such holding companies, all as defined in section 1159 of the Companies Act 2006.

		3 rd Floor, 26 Red Lion	
		Square, London, WC1R 4HQ	
Termination of voice calls to Mobile Numbers in the ranges 07874 5 and 07978 0	The area served by Callax Ltd within the UK	Callax Ltd whose registered company number is 04883104 and registered address is Level 7 Tower 42, 25 Old Broad Street, London, EC2N 1HN	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07537 7	The area served by CFL Communications Ltd within the UK	CFL Communications Ltd whose registered company number is 04419749 and registered address is Redhill Chambers, High Street, Redhill, Surrey, RH1 1RJ	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the ranges 07978 4, 07406 0-2 and 07822 7	The area served by Cheers International Ltd within the UK	Cheers International Sales Ltd whose registered company number is 06288825 and registered address is Britannia House, 1- 11 Glenthorne Road, London, W6 0LH	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07874 4	The area served by Citrus Telecommunications Ltd within the UK	Citrus Telecommunications Ltd whose registered company number is 03517870 and registered address is Second Floor, 99 Holdenhurst Road, Bournmouth, Dorset, BH8 8DY	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07520 7	The area served by Coralbridge Ltd within the UK	Coralbridge Ltd whose registered company number is 06345881 and registered address is 13-15 Hunslet Road, Leeds, West Yorkshire, LS10 1JQ	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the ranges 07520 4, 07744 2-9, 07755 2-5	The area served by Core Communication Services Ltd within the UK	Core Communication Services Ltd whose registered company number is 05467282 and registered address	SMP conditions M1 and M4

Termination of voice calls to Mobile Numbers in the range 07559 7	The area served by Core Telecom Ltd within the UK	is 31 Southampton Row, London, WC1B 5HJ Core Telecom Ltd whose registered company number is 05332008 and registered address is Titan House, Station Road, Horsforth, Station Road, Horsforth, Leeds, LS18 5PA	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07892 2	The area served by Edge Telecom Ltd within the UK	Edge Telecom Ltd whose registered company number is 03101247 and registered address is Global House, 2 Crofton Close, Lincoln, LN2 4NT	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the ranges 07822 0, 7892 5	The area served by FleXtel Ltd within the UK	FleXtel Ltd whose registered company number is 02772380 and registered address is Griffins Court, 24-32 London Road, Newbury, Berkshire, RG14 1JX	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the ranges 07400 0-9, 07401 0-9, 07402 0-9, 07403 0-9, 07533 0-9, 07575 0-9, 07576 0-9, 07577 0-9, 07578 0-9, 07578 0-9, 07723 0-9, 07727 0-9, 07728 0-9, 07735 0-9, 07737 0-9, 07782 0-9, 07828 0-9, 07838 0-9, 07853 0-9, 07848 0-9, 07861 0-9, 07862 0-9, 07863 0-9, 07865 0-9, 07868 0-9, 07865 0-9, 07868 0-9, 07878 0-9, 07882 0-9, 07883 0-9, 07886 0-9, 07888 0-9, 07886 0-9, 07888 0-9, 07897 0-9, 07898 0-9,	The area served by Hutchison 3G UK Ltd , which is national in scope	Hutchison 3G UK Ltd whose registered company number is 03885486 and registered address is Star House, 20 Grenfell Road, Maidenhead, Berkshire, SL6 1EH	SMP conditions M1, M2, M3 and M4

07915 0-9, 07916 0-9,			
07988 0-9			
Termination of voice calls to Mobile Numbers in the range 07520 9	The area served by Invomo Ltd within the UK	Invomo Ltd whose registered company number is 06267056 and registered address is 130 City Road, London, EC1V 2NW	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07978 9	The area served by IV Response Ltd within the UK	IV Response Ltd whose registered company number is 04318927 and registered address is 57-61 Mortimer Street, London, W1W 8HS	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07559 6	The area served by Lleida.net Serveis Telematics Ltd within the UK	Lleida.net Serveis Telematics Ltd whose registered company number is FC026372 and UK establishment branch address is 6 th Floor, 32 Ludgate Hill, London, EC4M 7DR	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the ranges 07404 0- 9, 07405 0-9	The area served by Lycamobile UK Ltd within the UK	Lycamobile UK Ltd whose registered company number is 05903820 and registered address is 3 rd Floor Walbrook Building, 195 Marsh Wall, London, E14 9SG	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07893 0	The area served by Magrathea Telecommunications Ltd within the UK	Magrathea Telecommunications Ltd whose registered company number is 04260485 and registered address is Albany House, 14 Shute End, Berkshire, RG40 1BJ	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07559 0	The area served by Mars Communications Ltd within the UK	Mars Communications Ltd whose registered company number is 06478834 and registered address is UK House, 315 Collier Row Lane, Romford, Essex, RM5 3ND	SMP conditions M1 and M4

Termination of voice calls to Mobile Numbers in the ranges 07520 2, 07589 4-7, 07892 1	The area served by Mundio Mobile Ltd within the UK	Mundio Mobile Ltd whose registered company number is 04553934 and registered address is 54 Marsh wall, London, E14 9TP	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07700 1	The area served by Nationwide Telephone Assistance Ltd within the UK	Nationwide Telephone Assistance Ltd whose registered company number is 04315226 and registered address is Ivy Lodge Farm, 179 Shepherds Hill, Harold Wood, Romford, Essex, RM3 0NR	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the ranges 07510 0- 9, 07511 0-9, 07512 0- 9, 07513 0-9, 07514 0- 9, 07515 0-9, 07516 0- 9, 07517 0-9, 07517 1- 9, 07518 0-9, 07518 0- 9, 07519 0-9, 07521 0- 9, 07522 0-9, 07523 0- 9, 07525 0-9, 07526 0- 9, 07540 0-9, 07541 0- 9, 07542 0-9, 07543 0- 9, 07544 0-9, 07545 0- 9, 07546 0-9, 07547 0- 9, 07560 0-9, 07561 0- 9, 07566 0-9, 07567 0- 9, 07566 0-9, 07565 0- 9, 07566 0-9, 07567 0- 9, 07590 0-9, 07591 0- 9, 07590 0-9, 07593 0- 9, 07594 0-9, 07593 0- 9, 07598 0-9, 07597 0- 9, 07598 0-9, 07597 0- 9, 07703 0-9, 07704 0- 9, 07703 0-9, 07706 0- 9, 07703 0-9, 07706 0- 9, 07703 0-9, 07706 0- 9, 07703 0-9, 07710 0- 9, 07713 0-9, 07714 0- 9, 07713 0-9, 07714 0- 9, 07715 0-9, 07716 0- 9, 07718 0-9, 07719 0-	The area served by O2 (UK) Ltd , which is national in scope	O2 (UK) Ltd whose registered company number is 02012647 and registered address is Wellington Street, Slough, Berkshire, SL1 1YP	SMP conditions M1, M2, M3 and M4

9, 07720 0-9, 07724 0- 9, 07725 0-9, 07729 0-			
9,077300-9,077310-			
9, 07736 0-9, 07738 0-			
9, 07739 0-9, 07740 0-			
9, 07742 0-9, 07743 0-			
9, 07745 0-9, 07746 0-			
9, 07749 0-9, 07750 0-			
9,07753,0-9,07754,0-			
9, 07756 0-9, 07759 0-			
9, 07761 0-9, 07762 0-			
9, 07763 0-9, 07764 0-			
9, 07783 0-9, 07784 0-			
9, 07793 0-9, 07801 0-			
9,078020-9,078030-			
9,078080-9,078090-			
9. 07821 0-9. 07834 0-			
9, 07835 0-9, 07840 0-			
9, 07841 0-9, 07842 0-			
9, 07843 0-9, 07844 0-			
9, 07845 0-9, 07849 0-			
9, 07850 0-9, 07851 0-			
9,07858,0-9,07860,0-			
9, 07860 0-9, 07864 0-			
9, 07871 0-9, 07872 0-			
9, 07873 0-9, 07874 0-			
3, 07874 6-9, 07885 0-			
9, 07889 0-9, 07892 3-			
4, 07892 6-9, 07893 2, 07893 4-7, 07894 0-9			
07895 0-9, 07902 0-9,			
07907 0-9, 07912 0-9,			
07921 0-9, 07922 0-9,			
7923 0-9, 07925 0-9,			
7926 0-9, 07927 0-9,			
07928 0-9, 07933 0-9,			
07936 0-9 07938 0-9			
07955 0-9, 07999 0-9.			
		OnePhone (UK) Ltd	
I ermination of voice	The area served by	whose registered	SMP conditions M1
in the range 07520 1	within the LIK	Company number is	and M4
In the range 07320 T		registered address is	
		11 Murray Street,	
		Camden, London, NW1	
		9RE	
		Onal Telecom I to	
Termination of voice	The area served by	whose registered	SMP conditions M1
calls to Mobile Numbers	Opal Telecom Ltd	company number is	and M4
in the range 07822 2	within the UK	03849133 and	
		registered address is	
		Stanford House,	

[]	[]	Garrett Field, Birchwood, Warrington, WA3 7BH [The successor entity to T-Mobile (UK) Ltd and Orange Personal Communications Services Ltd following their merger, approved by the European Commission on 10 March 2010]	[SMP conditions M1, M2, M3 and M4]
Termination of voice calls to Mobile Numbers in the ranges 07409 0- 9, 07416 0-9, 07419 0- 9, 07420 0-9, 07421 0- 9, 07422 0-9, 07527 0- 9, 07528 0-9, 07529 0- 9, 07530 0-9, 07531 0- 9, 07532 0-4, 07536 0- 9, 07556 0-9, 07579 0- 9, 07580 0-9, 07579 0- 9, 07580 0-9, 07583 0- 9, 07772 0-9, 07773 0- 9, 07779 0-9, 07790 0- 9, 07791 0-9, 07792 0- 9, 07791 0-9, 07792 0- 9, 07791 0-9, 077800 0- 9, 07805 0-9, 07807 0- 9, 07813 0-9, 07812 0- 9, 07813 0-9, 07816 0- 9, 07815 0-9, 07816 0- 9, 07854 0-9, 07855 0- 9, 07866 0-9, 07870 0- 9, 07855 0-9, 07866 0- 9, 07965 0-9, 07964 0- 9, 07965 0-9, 07966 0- 9, 07965 0-9, 07966 0- 9, 07967 0-9, 07968 0- 9, 07965 0-9, 07970 0- 9, 07965 0-9, 07970 0- 9, 7971 0-9, 07972 0-9, 07973 0-9, 07974 0-9, 07975 0-9, 07976 0-9, 07975 0-9, 07976 0-9, 07977 0-9, 7980 0-9, 07977 0-9, 7980 0-9, 07989 0-9	The area served by Orange Personal Communications Services Ltd, which is national in scope	Orange Personal Communications Services Ltd whose registered company number is 02178917 and registered address is St James Court, Great Park Road, Almondsbury Park, Bradley Stoke, Bristol, BS32 4QJ ⁷²	SMP conditions M1, M2, M3 and M4
Termination of voice calls to Mobile Numbers in the range 07520 8 ⁷¹	The area served by Orca Digital Ltd within the UK	Orca Digital Ltd registered company number 05836806 and registered address is	SMP conditions M1 and M4

⁷¹ Mobile Numbers have been allocated by Ofcom to D2See Ltd. D2See Ltd changed its registered name on 29 January 2010 to Orca Digital Ltd. Given the change to registered name, it is to Orca Digital Ltd that the SMP designation applies.

	ſ		
		The Barley Mow Centre, 10 Barley Mow Passage, Chiswick, London, W4 4PH	
Termination of voice calls to Mobile Numbers in the ranges 07589 1-3, 07822 9, 07978 6	The area served by Oxygen8 Communications UK Ltd within the UK	Oxygen8 Communications UK Ltd registered company number is 03383285 and registered address is 12 th Floor Lyndon House, 58-62 Hagley Road, Birmingham, B16 8PE	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07978 1	The area served by QX Telecom Ltd within the UK	QX Telecom Ltd registered company number is 03820728 and registered address is 2 Glenmore Close, Thatcham, Berkshire, RG19 3XR	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07559 9	The area served by Resilient Networks plc within the UK	Resilient Networks plc whose registered company number is 01403177 and registered address is 25/27 Shaftesbury Avenue, London, W1D 7EQ	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07872 7	The area served by Sky Telecom Ltd within the UK	Sky Telecom Ltd whose registered number is 06974505 and registered address is 1 st Floor Holborn Gate, 330 High Holborn, London, WC1V 7QT	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the ranges 07408 0, 07408 8, 07408 9, 07559 4, 07978 8	The area served by Software Cellular Network Ltd, which is national in scope	Software Cellular Network Ltd whose registered company number is 04187081 and registered address is 5 New Street Square, London, EC4A	SMP conditions M1 and M4

⁷² While the European Commission has approved the proposed merger between the UK subsidiaries of France Telecom and Deutsche Telecom, conditional on certain undertakings being met (<u>http://europa.eu/rapid/pressReleasesAction.do?reference=IP/10/208</u>), both the mobile number allocations made by Ofcom to these two entities and the Companies House registrations currently remain with the two separate subsidiaries. For this reason, the SMP designations apply to each of the two persons.

Termination of voice calls to Mobile Numbers in the range 07537 6	The area served by Sound Advertising Ltd within the UK	3TW Sound Advertising Ltd whose registered company number is 03218628 and registered address is Aston House, Cornwall Avenue, London, N3 1LF	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07537 1	The area served by Stour Marine Ltd within the UK	Stour Marine Ltd whose registered company number is 05914603 and registered address is 61 Station Road, Sudbury, Suffolk, CO10 2SP	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07520 3	The area served by Subhan Universal Ltd within the UK	Subhan Universal Ltd whose registered company number is 0564250 and registered address is 3 Weatheroak Close, Redditch, B97 5TF	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the ranges 07822 1, 07537 3	The area served by Swiftnet Ltd within the UK	Swiftnet Ltd whose registered company number is 02469394 and registered address is Britannia House, 958-964 High Road, London, N12 9RY	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07864 4	The area served by Switch Services Ltd within the UK	Switch Services Ltd whose registered company number is 04968578 and registered address is Switch House, 3 Berkeley Crescent, Clifton, Bristol, BS8 1HA	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07520 0	The area served by Teledesign plc within the UK	Teledesign plc whose registered company number is 03254784 and registered address is Keelings Broad House, The Broadway, Old Hatfiled, Hertfordshire, Al9 5BG	SMP conditions M1 and M4

Termination of voice calls to Mobile Numbers in the ranges 07893 8, 07822 4, 07822 6	The area served by Telephony Services Ltd within the UK	Telephony Services Ltd whose registered company number is 05134355 and registered address is 26 Cheltenham Street, Bath, Avon, BA2 3EX	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07978 7	The area served by TeleWare plc within the UK	TeleWare plc whose registered company number is 04756742 and registered address is Teleware House, York Road, Thirsk, North Yorkshire, Y07 3BX	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07559 8	The area served by Telswitch Ltd within the UK	Telswitch Ltd whose registered company number is 06127089 and registered address is 75 Springfield Road, Chelmsford, Essex, CM2 6JB	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07406 7	The area served by TG Support Ltd within the UK	TG Support Ltd whose registered company number is 05370731 and registered address is The Island House, The Island, Midsomer Norton, Radstock, BA3 2DZ	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the range 07520 6	The area served by Tismi BV within the UK	Tismi BV whose registered company number is 32081827 0000 and registered address is Catharijnesingel 51 A ⁷³	SMP conditions M1 and M4
Termination of voice calls to Mobile Numbers in the ranges 07504 0- 9, 07505 0-9, 07506 0- 9, 07507 0-9, 07508 0-	The area served by T- Mobile (UK) Ltd, which is national in scope	T-Mobile (UK) Ltd whose registered company number is 02382161 and registered address is Hatfield Business Park,	SMP conditions M1, M2, M3 and M4

⁷³ Tismi BV is registered with the Dutch Chambers of Commerce, Kamer Van Koophandel, which managed trade registrations in the Netherlands.

9, 07534 0-9, 07535 0-		Hattield, Hertfordshire	
9, 07538 0-9, 07539 0-		AL10 9BW	
9, 07550 0-9, 07572 0-			
9, 07573 0-9, 07574 0-			
9, 07722 0-9, 07726 0-			
9, 07757 0-9, 07758 0-			
9, 07804 0-9, 07806 0-			
9, 07847 0-9, 07852 0-			
9, 07903 0-9, 07904 0-			
9, 07905 0-9, 07906 0-			
9, 07908 0-9, 07910 0-			
9, 07913 0-9, 07914 0-			
9, 07930 0-9, 07931 0-			
9, 07932 0-9, 07939 0-			
9, 07940 0-9, 07941 0-			
9, 07942 0-9, 07943 0-			
9, 07944 0-9, 07945 0-			
9, 07946 0-9, 07947 0-			
9, 07948 0-9, 07949 0-			
9, 07950 0-9, 07951 0-			
9, 07952 0-9, 07953 0-			
9, 07954 0-9, 07956 0-			
9, 07957 0-9, 07958 0-			
9, 07959 0-9, 07960 0-			
9, 07961 0-9, 07962 0-			
9, 07963 0-9, 07981 0-			
9, 07982 0-9, 07983 0-			
9, 07984 0-9, 07985 0-			
9, 07986 0-9, 07987 0-9			
		Titanium Ltd whose	
Termination of voice	The area served by	registered company	SMP conditions M1
calls to Mobile Numbers	Titanium Ltd, within	number is 6952284	and M4
in the ranges 7406 4	the UK	and registered address	
		is Unit 4H,	
		Hinckley Business	
		Centre, Burbage Road,	
		Leicester	
		LE10 2TP	
		Vectone Network Ltd	
Termination of voice	The area served by	whose registered	SMP conditions M1
calls to Mobile Numbers	Vectone Network Ltd,	company number is	and M4
in the ranges 07822 5,	within the UK	05445235 and	
07978 5		registered address is	
		58 Marsh Wall,	
		London, E14 9TP	
		Vodafone Ltd whose	
Termination of voice	The area served by	registered company	SMP conditions M1,
calls to Mobile Numbers	Vodafone Ltd, which is	number is 01471587	M2, M3 and M4

⁷⁴ While the European Commission has approved the proposed merger between the UK subsidiaries of France Telecom and Deutsche Telecom, conditional on certain undertakings being met (<u>http://europa.eu/rapid/pressReleasesAction.do?reference=IP/10/208</u>), both the mobile number allocations made by Ofcom to these two entities and the Companies House registrations currently remain with the two separate subsidiaries. For this reason, the SMP designations apply to each of the two persons.

in the ranges 07407 0-	national in scope	and registered address	
9, 07423 0-9, 07500 0-		is Vodafone House,	
9, 07501 0-9, 07502 0-		The Connection,	
9, 07503 0-9, 07537 4,		Newbury, Berkshire,	
07551 0-9, 07552 0-9,		RG14 2FN	
07553 0-9, 07554 0-9,			
07555 0-9, 07557 0-9,			
07570 0-9, 07584 0-9,			
07585 0-9, 07586 0-9,			
07587 0-9, 07717 0-9,			
07721 0-9 07733 0-9			
07741 0-9 07747 0-9			
07748 0-9 07760 0-9			
07765 0-9 07766 0-9			
$07767 0_{-9} 07768 0_{-9}$			
077070-9, 077000-9, 0777000			
077090-9,077700-9,			
077710-9,07740-9,			
077750-9,077760-9,			
07778 0-9, 07780 0-9,			
07785 0-9, 07786 0-9,			
07787 0-9, 07788 0-9,			
07789 0-9, 07795 0-9,			
07796 0-9, 07798 0-9,			
07799 0-9, 07810 0-9,			
07818 0-9, 07823 0-9,			
07824 0-9, 07825 0-9,			
07826 0-9, 07827 0-9,			
07831 0-9, 07833 0-9,			
07836 0-9, 07867 0-9,			
07876 0-9, 07879 0-9,			
07880 0-9, 07881 0-9,			
07884 0-9, 07887 0-9,			
07899 0-9 07900 0-9			
7901 0-9 07909 0-9			
07917 0-9 07918 0-9			
07919 0-9 07920 0-9			
079790-9, 079200-9, 079700-9			
07979 0-9, 07990 0-9			
		Movement (LIK) Ltd	
Termination of voice	The erec conved by	whose registered	SMD conditions M1
calls to Mobile Numbers	vvavecrest (UK) Ltd	company number is	and M4
in the range 07537 0	within the UK	03042254 and	
		registered address is	
		87 Cheapside, London,	
		EC2V 6EB	
		Wire9 Telecom plc	
Termination of voice	The area served by	whose registered	SMP conditions M1
calls to Mobile Numbers	Wire9 Telecom plc	company number is	and M4
in the ranges	within the UK	04210403 and	
07872 2, 07924 5.		registered address is	
07978 2		Lacon House 84	
07978 3		Theobalds Road	
010100		London WC1X 8RW	
		Vim Siam Telecom I to	
Termination of voice	The area served by	whose registered	SMP conditions M1
	Vim Sigm Talagam Ltd		and M4
cans to woone numbers	TITI SIATT TELECOTT LTO	company number is	ai iu ivi4

in the range within the UK 07589 0, 07893 3	05668333 and registered address is Unit 5.3, the Old Fire Station, 140 Tabernacle Street, London, EC2A 4SD
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SCHEDULE 2

[DRAFT] The SMP services conditions imposed on each of the persons identified in Column C of Schedule 1 to this Notification under sections 45, 87 and 88 of the Act as a result of the analysis of the market set out in this Notification, ("SMP conditions")

Part 1: Application, definitions and interpretation of these conditions

- 1. The SMP conditions in Part 2 of this Schedule shall, except insofar as it is otherwise stated therein, apply to the markets set out in columns A and B of Schedule 1 of this Notification.
- 2. In this Schedule:

"Act" means the Communications Act 2003;

"**base year**" means for each relevant year, the period of 12 months ending on 31 March immediately preceding that relevant year;

"Call" means a voice call which originates on a public electronic communications network (whether fixed or mobile) and is terminated to a UK mobile number within a number range allocated to, or controlled by, the dominant provider, for which the dominant provider is able to set the termination charge;

"call termination charge" means either a fixed-to-mobile call termination charge or a mobile-to-mobile call termination charge.

"charge-setting date" means each of 1 April, 1 July, 1 October and 1 January of each relevant year;

"**Controlling Percentage**" means, in relation to each relevant year: (a) the amount of change in the Retail Prices Index in the period of 12 months ending on the 31 December immediately before the beginning of that Relevant Year, expressed as a percentage (rounded to one decimal place) of that Retail Prices Index as at the beginning of that period; reduced by:

- (a) see Figure 12 of the explanatory memorandum accompanying this Notification for the percentage on which Ofcom is consulting for O2, Vodafone, T-Mobile, Orange (the successor entity to T-Mobile and Orange following their merger)
- (b) see Figure 12 of the explanatory memorandum accompanying this Notification for the percentage on which Ofcom is consulting for H3G.

"**Charging Period**" means any of the current charging periods published by the dominant provider;

"**dominant provider**" means each of the persons listed in Column C of Schedule 1 to this Notification;

"**fixed-to-mobile call**" means a Call originating on a fixed public electronic communications network and where the dominant provider sets the charge;

"fixed-to-mobile call termination charge" means the charge made by the dominant provider to terminate a fixed-to-mobile call;

"**mobile number**" means a telephone number that is: (a) adopted or otherwise used to identify apparatus designed or adapted to be capable of being used while in motion; and, (b) designated under the National Telephone Numbering Plan ("NTNP") for use in connection with Mobile Services (as that term is defined in the NTNP);

"**mobile-to-mobile call**" means a Call originating on a mobile public electronic communications network of another mobile communications provider and where the dominant provider sets the charge;

"mobile-to-mobile call termination charge" means the charge made by the dominant provider to terminate a mobile-to-mobile Call;

"**network access**" means the provision of interconnection to the public electronic communications network provided by the dominant provider, together with any services, facilities or arrangements which are necessary for the provision of electronic communications services over that interconnection;

"Ofcom" means the Office of Communications;

"relevant year" means any of the following:

(i) the period of 12 months beginning on 1 April 2011 and ending on 31 March 2012 (the "First Relevant Year");

(ii) the period of 12 months beginning on 1 April 2012 and ending on 31 March 2013 (the "Second Relevant Year");

(iii) the period of 12 months beginning on 1 April 2013 and ending on 31 March 2014 (the "Third Relevant Year"); and,

(iv) the period of 12 months beginning on 1 April 2014 and ending on 31 March 2015 (the "Fourth Relevant Year");

"Retail Prices Index" means the index of retail prices compiled by an agency or a public body on behalf of Her Majesty's Government or a governmental department from time to time in respect of all items (which is the Office for National Statistics at the time of publication of this Notification); and,

"third party" means a person operating a public electronic communications network.

3. For the purpose of interpreting the SMP conditions in Part 2 of this Schedule:

(a) except insofar as the context otherwise requires, words or expressions shall have the meaning ascribed to them in paragraph 2 above and otherwise any word or expression shall have the same meaning as it has in the Act;

(b) the Interpretation Act 1978 shall apply as if each of the SMP conditions were an Act of Parliament; and,

(c) headings and titles shall be disregarded.

Part 2: The SMP conditions

Condition M1 – Requirement to provide network access on reasonable request

M1.1 Where a third party reasonably requests in writing network access, the dominant provider shall provide that network access. The dominant provider shall also provide such network access as Ofcom may from time to time direct.

M1.2 Subject to SMP condition M1.3, the provision of network access in accordance with paragraph SMP condition M1.1 shall occur as soon as reasonably practicable and shall be provided on fair and reasonable terms and conditions (including charges) and on such terms and conditions (including charges) as Ofcom may from time to time direct.

M1.3 The charges for Calls as covered by SMP condition M3 below shall be as set out in that condition for those defined dominant providers, but only for the duration of that condition.

M1.4 The dominant provider shall comply with any direction Ofcom may make from time to time under this SMP condition.

Condition M2 – Requirement not to unduly discriminate

M2 The dominant provider shall not unduly discriminate against particular persons or against a particular description of persons, in relation to matters connected with network access.

For the purposes of SMP condition M2:

"**dominant provider**" means H3G, 02, Vodafone, T-Mobile, Orange (and the successor entity to T-Mobile and Orange following their merger, approved by the European Commission on 1 March 2010).

Condition M3 – Control of termination charges

M3.1 Except as Ofcom may otherwise consent under SMP condition M3.8, the dominant provider shall ensure that, during any relevant year, the average call termination charge as calculated in each of SMP conditions M 3.2(a) and M 3.2(b) separately, and M3.3 does not exceed the maximum average charge.

M3.2 In this SMP condition, the average call termination charge is specified separately as follows:

(a) With respect to fixed-to-mobile calls, the average of the fixed-to-mobile call termination charges during the relevant year in question, weighted according to:

(i) the profile by Charging Period of the dominant provider's fixed-to-mobile call minutes; and,

(ii) the corresponding volumes by quarter of the dominant provider's fixed-tomobile call minutes,

in the base year.

(b) With respect to mobile-to-mobile calls, the average of the mobile-to-mobile call termination charges during the relevant year in question, weighted according to:

(i) the profile by Charging Period of the dominant provider's mobile-to-mobile call minutes; and,

(ii) the corresponding volumes by quarter of the dominant provider's mobileto-mobile call minutes,

in the base year.

(c) Where the dominant provider applies the same call termination charge for each of fixed-to-mobile and mobile-to-mobile calls, the calculations in SMP conditions M 3.2(a) and M 3.2(b) may be aggregated.

M3.3 For the purposes of calculating the average call termination charge separately for fixed-to-mobile calls and mobile-to-mobile calls where any call termination charges are in force during a part only of the relevant year (commencing or ending at a date in the course of the relevant year), the weighting shall be derived from:

(a) the profile by Charging Period of the dominant provider's separate fixed-to-mobile and mobile-to-mobile call minutes; and

(b) the corresponding volumes by quarter of the dominant provider's separate fixedto-mobile and mobile-to-mobile call minutes,

in the corresponding part of the base year.

Where the dominant provider applies the same call termination charge for both fixed-tomobile and mobile-to-mobile calls during a part only of the relevant year (commencing or ending at a date in the course of the relevant year), the above calculations may be aggregated.

M3.4 The dominant provider shall:

- (a) only make changes to its call termination charges on a charge-setting date in each relevant year;
- (b) only set one call termination charge rate for each of weekday daytime, weekday evening and weekend Charging Periods; and
- (c) ensure that except where a change is made on the 1 April each call termination charge (corresponding to a given Charging Period) is not increased by more than 20% on a charge-setting date.

M3.5 For the purposes of this SMP condition, the maximum average charge means:

(a) for the purpose of the First Relevant Year,

(i) [....] pence per minute (see Figure 12 of the explanatory memorandum accompanying this Notification for the maximum average charges on which Ofcom is consulting).

(b) for the purpose of the Second, Third and Fourth Relevant Years:

the maximum average charge in the base year multiplied by the sum of 100% and the Controlling Percentage for that relevant year, without rounding up or down.

M3.6 The dominant provider shall not make any call termination charge for:

(a) a Call which terminates on a recorded announcement provided by the dominant provider informing the caller of an inability to complete that Call so as to establish a two-way path where the mobile handset used by the called party is switched off, or rings and remains unanswered, or where coverage is not available from the dominant provider's public electronic communications network; and

(b) an unanswered Call which is diverted in respect of the period before that Call is answered.

M3.7 Notwithstanding SMP Condition M3.1 above:

(a) if the average call termination charge exceeds the maximum average charge for the First, Second or Third Relevant Year, the dominant provider shall make such adjustments to its termination charges and by such day in the following relevant year as Ofcom may direct for the purpose of remedying that excess. Such adjustments in the Second, Third or Fourth Relevant Year shall not be relevant for the purpose of establishing compliance with SMP condition M3.1 above in that relevant year; and,

(b) if it appears to Ofcom that the dominant provider is likely to fail to secure that the average call termination charge for the Fourth Relevant Year does not exceed the maximum average charge for that year, the dominant provider shall adjust its call termination charges by such day in that relevant year as Ofcom may direct for the purpose of avoiding that failure.

M3.8 Where the average call termination charge is less than the maximum average charge for the First, Second or Third Relevant Year, the dominant provider shall not adjust its termination charges in the following relevant year to recover the difference between the average call termination charge and the maximum average charge for the First, Second or Third Relevant Year, unless Ofcom have given their prior written consent to such adjustments. Such adjustments in the Second, Third or Fourth Relevant Year shall not be relevant for the purpose of establishing compliance with SMP condition M3.1 in that relevant year.

M3.9 Without prejudice to Ofcom's statutory information gathering powers, the dominant provider shall provide to Ofcom in writing the information necessary for the dominant provider to demonstrate compliance with this SMP condition, this includes:

(a) no later than three months after the start of each relevant year, the following information:

- I. the total volume of Call minutes to be used in the calculation of the average call termination charge in the relevant year in question broken down in accordance with SMP conditions M3.2 and M3.3;
- all data used to build the volume of Call minutes in SMP Condition M 3.9 (a) I. to ensure the correct call types (by type and amount) have been included in and excluded from the calculation of the average call termination charge;
- III. an explanation of how the volume data has been collected and prepared; and
- IV. any other information (including data) that the dominant provider has used to calculate the volume information provided.
- (b) no later than the day on which the dominant provider notifies Ofcom of its final rate change for each relevant year, the following information:
 - I. pursuant to SMP condition M3.5, the maximum average charge the dominant provider has applied for the relevant year in question;
 - II. the average call termination charge and the calculation of this charge for that relevant year;
 - III. the call termination charges made by the dominant provider in that year;
 - IV. any changes to the volume data provided under SMP condition M 3.9(a); and
 - V. any other information (including data) that the dominant provider has used to calculate the average call termination charge.

M3.10 The dominant provider shall comply with any direction Ofcom may make from time to time under this SMP condition.

For the purposes of SMP condition M3 only:

"dominant provider" means H3G, 02, Vodafone, T-Mobile, Orange (and the successor entity to T-Mobile and Orange following their merger, approved by the European Commission on 1 March 2010).

Condition M4 – Requirement to publish charges

M4.1 Except in so far as Ofcom may otherwise consent in writing, the dominant provider shall publish its charges for the provision of network access and act in the manner set out below.

M4.2 The dominant provider shall publish its call termination charges, separately from any of its other interconnection charges (including other termination charges).
M4.3 The dominant provider shall, on or before the earlier of: (a) the first charge-setting date in the First Relevant Year; or, (b) the date that this SMP condition comes into force, publish its charges on which it provides network access.

M4.4 The dominant provider shall provide any proposed amendment to the charges on which it provides network access or in relation to any charges for new network access (an "Access Charge Change Notice") to Ofcom five working days before providing them to the organisation that is notified first and it shall publish any amendment or new charge not less than 28 days before any such amendment or new charge comes into effect and consistent with SMP condition M3.1.

M4.5 Publication of the information in SMP conditions M4.3 and M4.4 above shall be effected by:

(a) sending a copy of such information or any appropriate parts of it to any person who may reasonably request such a copy; and

(b) placing a readily accessible copy of such information on any relevant website operated or controlled by the dominant provider.

M4.6 The dominant provider shall ensure that an Access Charge Change Notice includes:

- (a) a description of the proposed new charge for the network access in question;
- (b) where applicable, the current charge for the network access in question; and
- (c) the date on which or the period for which any amendments to charges will take effect (the "effective date").

M4.7 The dominant provider shall not apply any new charge identified in an Access Charge Change Notice before the effective date.

Annex 8

Network cost modelling

Introduction

- A8.1 Having considered different network technology scenarios, a network deploying 2G and 3G/HSPA was considered to be the preferred scenario for estimating a cost benchmark for mobile voice call termination. The rationale for this decision is discussed in Section 9. After finalising the model requirements, Ofcom concluded that the model developed in 2007 for the previous charge control period⁷⁵ (hereafter referred to as the 2007 mode"), had the majority of the required functionality and so would be a suitable starting point for the development of a new model.
- A8.2 In August 2009, Ofcom commissioned Analysys Mason to assist in updating the model. The process of updating the model required all existing parameters to be reviewed and certain additional functionality to be added in order to meet the requirement of estimating a cost benchmark (discussed below). The main areas of change are listed below:
 - The inclusion of the ability to calculate costs based on a pure LRIC cost standard.
 - Updates to the traffic demand forecasts.
 - Updates to reflect price trends in network equipment.
 - Updates to reflect recent network developments, such as the deployment of HSPA (high speed packet access) and up-to-date network equipment prices.
- A8.3 During the development of the new model we have, on two occasions, collected data from the four national MCPs using our powers under Section 135 of the Communications Act 2003. Through this process we have collected a large amount of detailed information in the areas of:
 - Historical demand for network services.
 - Historical number of assets deployed and their unit costs.
 - Historical information on network costs by type.
 - Forecasts for traffic growth.
 - Information about planned changes to network architectures.
- A8.4 In addition to these two Section 135 data requests, we also held a modelling workshop on 26 October 2009⁷⁶ to engage informally with stakeholders on the development of a new model. This workshop included discussion of demand forecasts, current and future network architectures and the treatment of spectrum costs.

⁷⁶ More information about the workshop can be found at

⁷⁵ http://www.ofcom.org.uk/static/LRIC_files/

http://www.ofcom.org.uk/consult/condocs/mobilecallterm/workshop/

- A8.5 This annex outlines the functionality of the new model, with a particular focus upon where the assumptions have changed since the development of the 2007 model. This annex should be viewed as a companion to the actual model that is also being released. The annex is structured as follows:
 - Summary of major changes to the model.
 - Model overview.
 - Detailed discussion of each of the five modules of the model and the changes since the 2007 model.

Summary of major changes to the model

A8.6 The changes to the model have all been made based upon a combination of information from the mobile operators and input from Analysys Mason. The resulting model has been calibrated against top-down cost information from the mobile operators, as discussed in annex 10.

Inclusion of ability to calculate costs based on a pure LRIC cost standard

A8.7 The model has been developed to include the ability to calculate outputs using a pure LRIC cost standard, in addition to the existing ability to calculate LRIC+ costs. In a *LRIC*+ approach we calculate the incremental costs of traffic using a large increment approach (i.e. all voice and data traffic). Common costs are allocated across all services using service specific routing factors. In contrast, when using a *pure LRIC* approach incoming voice traffic is considered as a 'final increment' with *no* common costs being allocated to the service (which also includes the common costs of a 'coverage network'). The incremental costs associated with incoming voice traffic are calculated by separately calculating the model outputs (cashflows, service demand, asset volumes for each network element) with incoming voice traffic and without incoming voice traffic. The calculation flow used to determine pure LRIC values in the model is shown in Figure 2 below.



Figure 2: How pure LRIC values are determined

A8.8 The incremental cashflows, service demand and asset volumes for each network element are then used as inputs to the economic depreciation (ED) algorithm. The output of this algorithm is the pure LRIC unit cost of incoming voice. The same ED algorithm is used for both LRIC+ and pure LRIC, albeit with different asset volumes, outputs and cash flows.

Updates to demand forecasts

- A8.9 There have been many changes in the mobile market since the 2007 model was developed. The use and uptake of all services has differed from the forecasts in the 2007 model, and to take these developments into account, all demand forecasts have been updated to reflect current usage patterns. The updated demand forecasts are based upon detailed historical data on subscriber numbers, voice traffic, messaging traffic and data traffic from all five mobile operators for the period from Q2 2005 until Q3 2009. Forecasts have also been provided by the national MCPs until 2011. Feedback provided by Ofcom and other stakeholders at the modelling workshop on 26 October 2009 was also taken into account. The main forecasts that have been updated include:
 - Subscriber numbers for both handsets and datacards.
 - Incoming, outgoing and on-net voice call volumes.
 - SMS and MMS volumes.
 - Usage of data services on mobile handsets.
 - Usage of data services on datacards (also known as dongles).
- A8.10 These forecasts are inputs to the model, and are used to dimension the network. As the growth in subscribers and the use of data services (both on handsets and datacards) has been higher than was assumed in the 2007 model, the new model has significantly higher demand forecasts. Further details of the updated forecasts are given in the description of the traffic module later in this annex (see paragraph A8.31).

Updates to reflect recent network developments

Deployment of HSPA

A8.11 When the 2007 model was constructed, 3G networks were still relatively new. As these networks have matured, there have been changes to their capabilities in a number of areas, and the model has been updated to reflect these changes. For example, HSPA technologies (which are now widely deployed to support the majority of mobile data demand) are now included in the model. HSPA is a mobile telephony protocol that extends and improves the existing WCDMA protocols, allowing more efficient transfer of data. The model has been modified to allow both HSPA and Release 99 traffic to be carried on a shared carrier.

Sharing of network elements between operators

A8.12 Mobile operators may share the *passive* elements on sites, or the *active* components of the network such as radio equipment and backhaul.

- A8.13 Passive network elements include items such as the physical space, power supplies and any masts. All of the mobile operators in the UK currently use passive site sharing to some extent (known as 'site sharing' in the remainder of the report), and Ofcom believes that an efficient operator would continue to extend the amount of site sharing in its network. Functionality has therefore been added to the model to assess the effects of a move by operators to increase the amount of site sharing. This action leads to a reduction in operating costs, though it is also accompanied by the additional one-off costs of moving from dedicated sites to shared sites. These costs cover decommissioning old sites, moving equipment and any necessary upgrades to the shared sites.
- A8.14 Mobile operators are also able to share *active* network elements. This is commonly referred to as active RAN sharing, and has the potential ability to deliver greater cost savings than site sharing. However, there are significant technical and operational challenges with active RAN sharing, and only one pair of UK mobile operators (T-Mobile and Hutchison 3G) are currently deploying active RAN sharing. This will be extended to Orange's 3G network once the Orange-T-mobile joint venture agreement is signed at the end of April 2010. Because of this, Ofcom is of the view that an average efficient operator should *not include* any cost savings from active RAN sharing.

Updates to network element unit costs and capacities

- A8.15 Unit cost information provided by the national MCPs indicates that the costs of 2G and 3G base station equipment have both declined significantly since 2007. The rate of decline in unit costs has been much greater than previously forecast, leading to a unit cost in 2009/10 which is approximately 65% of the previous estimate.
- A8.16 The unit costs and capacities of other network elements have also been changed to better reflect the currently deployed network equipment. However, these are relatively minor changes and have not had a significant impact upon network costs.

Model overview

- A8.17 Ofcom has created a bottom-up LRIC model to derive the cost to a hypothetical efficient network operator of providing voice termination services. The primary objective of the model is to assess the network costs to a single hypothetical efficient network operator of delivering voice services over 2G and 3G mobile networks. However, there are significant economies of scope in the provision of voice and data services, particularly on 3G networks, and therefore data services have also been included in the model in order to provide a more accurate view of the costs of voice services, and of voice termination in particular.
- A8.18 The model is based on the use of technologies and spectrum bands that have been, or are currently being, deployed in the UK. Specifically it includes:
 - 2G in the 1800 MHz band
 - 3G (including HSPA) in the 2.1 GHz band.
- A8.19 The model explicitly calculates the capital and operating costs associated with network equipment, from the radio network to the core network, up to and including the gateway switches and interconnect ports:
 - Radio network (including base station sites and equipment).

- Backhaul (i.e. links from the base stations to the core network).
- Backbone network.
- Core network switching equipment and other assets.
- A8.20 The model is driven by three key cost drivers: (a) the number of subscribers, (b) coverage requirements and (c) the total traffic that subscribers consume. The number of subscribers drives a relatively small number of assets e.g. HLRs, whereas coverage requirements and service demand (traffic) drive the majority of costs.
- A8.21 Service demand from all traffic services is combined to form aggregated cost drivers. Since certain traffic services use different network resources more or less intensively than others, specific aggregation factors are applied in order to capture these effects. These cost drivers are used to calculate the required deployment of 2G, 3G and HSPA networks (where appropriate) in order to meet the demands for capacity and coverage. This is in line with the approach taken in the previous market review.
- A8.22 Service costs are arrived at by allocating all the costs identified to different services according to service routing factors. Within the LRIC+ model, to the extent that common costs exist, these are allocated to service increments according to routing factors. The LRIC+ model does not explicitly identify or estimate the level of common costs. The outputs of the LRIC+ model are unit costs that include all network costs. Therefore the model output, for a LRIC+ cost benchmark, is an incremental cost plus and an implicit mark-up for a contribution to common costs. This is a particular form of network common cost allocation.
- A8.23 In the pure LRIC version of the model, no common costs are added to voice termination services: voice termination is considered as the 'final increment'. The only costs allocated to voice termination are the incremental costs of providing voice termination on a hypothetical network built to provide all services *except* voice termination.
- A8.24 The model explicitly calculates the network costs for the period 1990/91 to 2039/40 with a perpetuity-based terminal value thereafter, although all inputs are constrained to be constant from 2020/21 onwards.
- A8.25 The model recovers the capital and operating costs over time using a methodology known as original economic depreciation (original ED). This approach was used in the 2007 model and the choice of using original ED was validated by the Competition Commission determination (2009)⁷⁷.

Model structure

A8.26 The mobile cost model comprises five distinct modules, as shown in Figure 3. These modules are summarised below and described in more detail in the following subsections.

 ⁷⁷ See Competition Commission, Mobile call termination: reference to the CC made by the CAT on 18 March 2008 in the consolidated appeals Hutchison 3G UK Limited v Office of Communications (1083/3/3/07) and British Telecommunications plc v Office of Communications (1085/3/3/07), Section 7 at http://www.competition-commission.org.uk/appeals/communications act/mobile phones determination.pdf



Figure 3: Overall model structure

- The scenario control module is used to set the chosen parameters that are used to define the different scenarios and sensitivity analyses that have been considered. It also contains a summary of the key results.
- The traffic module contains the demand forecasts and network coverage assumptions.
- The network module forecasts the 2G and 3G network deployment required to support the input level of demand and network coverage over time.
- The cost module produces the network costs, based on asset costs (both capital and operating) and projected network deployment.
- The economic depreciation module calculates service costs from the forecast network costs, based on a form of economic depreciation.
- The **HCA CCA module** calculates gross book value (GBV) and net book value (NBV) for each asset. These metrics have been used only for the purpose of model calibration.⁷⁸

Model outputs

A8.27 The outputs of the model are unit costs in each year for voice call termination. These service unit costs can be calculated on either a LRIC+ or a pure LRIC basis. The entire model works in real 2008/09 terms and all outputs are stated on this basis.

Scenario control module

A8.28 The scenario control module contains the main parameters that affect the cost of termination, which then feed through to all the other relevant modules.

⁷⁸ The HCA CCA module was designed in previous reviews to be able to calculate the results based upon Historical Cost Accounting (HCA) or Current Cost Accounting (CCA). These two cost recovery methods have not been considered in this review.

- A8.29 The scenario worksheet contains the parameters which are most important to the output of the model. The sheet is constructed to allow the user to quickly swap between different scenarios, with a macro enabling the calculation of either LRIC+ or pure LRIC results for these scenarios.
- A8.30 The *Outputs* worksheet contains the most important results from the model. These include the cost of termination for each technology over time, the blended cost of termination over time and the number of sites constructed over time.

Traffic module

A8.31 This module converts demand and coverage assumptions into resultant traffic levels, which can then be used to dimension the 2G and 3G (including HSPA) networks. This subsection describes in detail the demand forecasts that are used to develop the network traffic forecasts. These traffic forecasts are used in the rest of the model. Figure 4 shows the overall logical flow for forecasts of subscribers and service demand on the 2G and 3G/HSPA networks:



Figure 4: Calculation flow in the traffic module

A8.32 Traffic is modelled based on a forecast of subscribers, plus a forecast for the demand per subscriber. Demand for each service is based on historical data

combined with forecasts for future periods. The forecasts in the model were generated with reference to forecasts from the national MCPs, as well as Analysys Mason mobile market research. "High", "Medium" and "Low" forecasts have been generated for each of the services below:

- 2G incoming, outgoing and on-net voice calls.
- 2G SMS and MMS.
- 2G packet data.
- 3G incoming, outgoing and on-net voice calls.
- 3G SMS and MMS.
- 3G handset packet data.
- 3G datacard packet data.
- A8.33 In the updated model, 3G/HSPA datacard and handset packet data services have been treated as two separate services. This is because we believe these services have different drivers for usage, and because national MCP data shows that there has been significant growth in data services from mobile broadband datacards.
- A8.34 Data from national MCPs have shown that there is very low usage of video calling demand for this service is falling (in both absolute and relative terms) and it represents less than 0.1% of all calls. For this reason video calls have been excluded from our modelling.

Subscribers for handset-based services

- A8.35 The number of subscribers for the hypothetically efficient operator is calculated according to the total number of mobile subscribers in the market. The forecast for the total number of subscribers assumes that mobile penetration will saturate at 1.27 SIMs per person.⁷⁹ We have assumed that the population will grow at 0.4% per annum⁸⁰. The number of subscribers for each network is then calculated using an assumed market share profile over time.
- A8.36 The penetration of mobile services assumed in the model is higher than in the 2007 model (shown in Figure 5). This change is justified by noting that the number of mobile subscribers using mobile handsets (excluding datacards⁸¹) has grown more than was forecast in the 2007 model: there were a total of 73 million subscribers at the end of Q1 2009/10 compared to a previous forecast of 66.4 million. The updated forecast is that this will reach 83.8 million by the end of 2020/21.

⁷⁹ Assumption guided by advice from Analysys Mason Research.

⁸⁰ Based on data from the Economist Intelligence Unit, August 2009.

⁸¹ The take-up of mobile broadband datacards is discussed later.



Figure 5: Mobile subscriber penetration

Source: Analysys Mason

- A8.37 Two alternative market share profiles are used: one for a 2G/3G operator and another for a 3G-only operator. These profiles are consistent with the principle of competitive neutrality, with four players taking equal shares of the market by the end of the model period. This approach is in line with that taken in the previous market review, and is also consistent with the EC Recommendation.
- A8.38 The market share profile is based on that used in the 2007 model. Between 2003/04 and Q2 2010/11 market share declines from 25% prior to the entry of the 3G-only operator to 20%. Due to the planned merger (via a joint venture) between Orange and T-Mobile we considered it more appropriate to move towards a 25% market share (corresponding to four players). Accordingly, from Q3 2010/11 onwards market share increases towards 25%. This market share profile is shown in Figure 6 below.





Source: Analysys Mason

- A8.39 The rate of migration from 2G-only to 3G-enabled handsets is based on an assumption that the proportion of new handsets that are 3G-enabled will reach 80% by 2020/21, up from 54% in Q4 2009/10. The calculation of the number of new handsets requires an assumption on the market (average) rate of subscriber churn: this remains unchanged from the 2007 model at 10% per quarter.
- A8.40 This forecast migration from 2G to 3G services is much slower than the 2007 model, which forecast that 3G subscribers would represent 99.6% of total subscribers by 2020/21. The updated model now assumes this figure to be 80% (see Figure 7 below). This slower rate of migration is supported by data which show that 31% of handsets were 3G-capable in Q1 2009/10 compared to a forecast of 44% in the 2007 model. The national MCPs have all indicated that they currently have no plans to switch off their 2G networks, which provides further support for our slower 3G migration assumption.



Figure 7: Forecast migration to 3G-capable handsets

Source: Analysys Mason⁸² Handset usage forecasts

Voice services

- A8.41 The 2007 model assumed that subscribers with 3G-capable handsets have a higher usage of voice services per subscriber than subscribers with only 2G-capable handsets. However, the data provided by the national MCPs for this review was not sufficient to determine reliably whether there is in fact any significant uplift in voice usage by 3G subscribers. Ofcom has therefore decided to use the same values for average per-subscriber voice usage for both 2G and 3G subscribers.
- A8.42 It is our understanding that even though a subscriber may use a 3G-capable handset, a significant proportion of that user's voice traffic is still routed via the 2G network. This situation could be caused by a lack of 3G coverage in the area concerned, the operator choosing to route voice traffic over the 2G network, or the user disabling the 3G functionality of their handset. To allow for this possibility in our model, we assume that 40% of all voice traffic originated and terminated by a 3G handset user is routed over the 2G network.

However, the modelling in these two projects is seeking to answer very different questions and is based on different assumptions. The MTR model seeks to model a hypothetical efficient operator given currently available technology. The 2G liberalisation project considers changes in the types of technology used to deliver mobile services. For instance, the 2G liberalisation project is explicitly looking at the migration of 3G from 2.1GHz spectrum to "fast 900MHz", however, the MTR model is only considering an operator using 2.1GHz and 1800MHz spectrum. As such, we believe that any differences are simply a result of the differing objectives of these two projects.

⁸² We are aware that the migration to 3G in this chart differs slightly from the migration path assumed in Ofcom's 2G liberalisation Consultation (2009) Annex 9 Figure 10. http://www.ofcom.org.uk/consult/condocs/spectrumlib/annex9.pdf

A8.43 Based on actual figures for the period 2005/6 to Q3 2009/10, we have revised the forecasts for minutes of use per subscriber, as shown in Figure 8 below.



Figure 8: Forecasts for monthly outgoing MOU per subscriber

- A8.44 It can be seen that the updated Low forecast reaches 145 outgoing minutes per subscriber per month by 2013/14, after which time it remains constant. The Medium demand forecast reaches 165 minutes per month by 2013/14 and 178 minutes by the end of 2020/21. We have also constructed a High demand forecast. The final minutes of use per subscriber in the High demand forecast are similar to the 2007 model's High demand forecast.
- A8.45 To ensure that the proportion of incoming calls from fixed lines is consistent with historical data, we have adjusted a single parameter which affects all years of the model. This parameter determines the number of incoming calls from fixed lines based on the number of outgoing calls to fixed lines. The parameter has been reduced from 0.75 to 0.50, essentially meaning that there are relatively fewer incoming calls from fixed lines.

Messaging services

A8.46 The growth in messaging services since the end of 2004/5 has been significantly greater than was previously forecast, reaching almost 100 messages per subscriber per month by 2009/10, compared to a previous forecast of around 66 messages per month in the previous High demand forecast. Our updated demand forecasts reflect the continued strong growth in messaging (see Figure 9 below). The updated Low forecast assumes that messaging usage will plateau at around 110 messages per subscriber per month, the Medium forecast approaches 140 messages per month

Source: Analysys Mason

by 2020/21, and the High demand forecast exceeds 270 messages per month in 2020/21.



Figure 9: Forecasts for monthly outgoing messages per subscriber

A8.47 The 2007 model forecasts the expected proportion of total messages that are MMS to increase to 5.1% for 2G and 6.1% for 3G by 2020/21. However, historical data from the MCPs shows that by Q1 2009/10 the proportion of MMS had fallen from a peak in early 2006/7 of 0.84% for 2G and 1.76% for 3G, to 0.52% for 2G and 0.78% for 3G. Taking this into account, we have assumed that the proportion of messages which are MMS will remain at 0.5% for 2G, and for 3G will drop from 0.8% to 0.5% by 2020/21. The average sizes of SMS and MMS messages are unchanged in the model at 0.15kbytes per SMS and 50kbytes per MMS.

Handset-based data services

A8.48 The Section 135 responses from the national MCPs were not able accurately to report the historical split of handset-based data traffic carried over either 2G or 3G handsets. However, reliable national MCP information is available on the amount of data usage by technology (across all devices), and the proportion of total data produced by datacards. By combining all this information we have estimated the amount of data traffic carried over 2G handsets and 3G handsets. Our revised forecasts for handset-based 2G data usage are shown in Figure 10 below, while those for 3G are shown in Figure 11.

Source: Analysys Mason



Figure 10: Forecasts for monthly 2G handset data usage per subscriber

Source: Analysys Mason



Figure 11: Forecasts for monthly 3G handset data usage per subscriber

Source: Analysys Mason

- A8.49 In recent years we have observed strong growth in 2G handset data usage, and by the end of 2009 average usage was just over 1Mbyte per month. Our Medium and High forecasts assume that this growth will continue, in varying degrees, so that by 2020/21 average usage per subscriber per month reaches 2.4, 3.4 and 5.8 Mbytes respectively. The Low forecast assumes that growth levels off as subscribers interested in data services migrate to 3G. It is worth noting that the 2007 model assumed that a proportion of 2G users were 'active data users'.⁸³ To simplify the forecasting process, we now assume that all handsets are data users.
- A8.50 Regarding 3G data usage, there was relatively little consumer demand for 3G data services on handsets until the recent emergence of devices such as the iPhone which make data services both easy to use and attractive. Such devices are likely to lead to increasing demand for data services on handsets in the future, and we have revised the model assumptions to take this into account (Figure 11 above).
- A8.51 There is some evidence from T-Mobile in Germany that iPhone users currently generate over 100Mbytes per month of data per subscriber.⁸⁴ Orange has also stated that, in countries where its customers have access to an iPhone, average iPhone usage is around 200Mbytes per month⁸⁵. It is not completely clear whether this usage is all over the mobile network, or over a combination of mobile and WiFi networks but either way it is clear that a substantial amount is carried over the mobile network. Our High demand forecast reaches 100Mbytes per month for 3G handsets during 2018/19. This forecast therefore appears to be consistent with a scenario where, within 10 years, the average 3G subscriber consumes a similar amount of data to a heavy user today. This shows that data usage on 3G handsets is much higher than data usage on 2G handsets.

Datacard take-up and usage

- A8.52 Mobile broadband datacards have emerged as a significant driver of network traffic; by the end of Q1 2009/10 there were almost 2.9 million mobile broadband datacards in the UK, from a base of just 208 000 at the end of 2006/7.⁸⁶ Despite initial optimism about the potential of mobile broadband to offer a competitive proposition to fixed broadband, many recent surveys have highlighted the relatively slow speeds delivered (compared to fixed broadband) and a generally low level of user satisfaction⁸⁷. It is therefore not clear if mobile broadband will continue its very fast growth and become ubiquitous, or reach a plateau at a lower level of take-up. At present, mobile broadband is largely used as a *complement* to fixed broadband, and only to a limited extent as a *substitute*. We anticipate that this situation will remain unchanged, and have assumed that under all demand forecasts, mobile broadband will largely remain a complement to fixed broadband.
- A8.53 Nevertheless, we expect mobile broadband to continue growing: a report by Analysys Mason Research in February 2009⁸⁸ forecast that mobile broadband will reach a penetration of around 27% of the UK population by the end of 2014. However, historical growth appears to be a little below the forecasts in that report. For example, at the end of 2008 the report forecast a penetration of 4.3% whereas actual penetration was around 3.6% (noting that the forecast did not have access to

⁸³ Users which produce a non-zero amount of data traffic

⁸⁴ See http://www.unstrung.com/document.asp?doc_id=144563&f_src=unstrung_gnews

⁸⁵ See <u>http://www.macworld.co.uk/ipod-itunes/news/index.cfm?newsid=27643</u>

⁸⁶ Source: Operator data from Section 135 data requests.

⁸⁷ See <u>http://www.broadbandgenie.co.uk/articles/the-british-public-love-hate-broadband</u>

⁸⁸ <u>http://www.analysysmason.com/Research/Content/Reports/RDMM0-Mobile-broadband-Europe-2009-2014-</u> Feb2009/

actual subscriber numbers for the end of 2008). Taking these figures into account we have developed a Medium demand forecast for this study that is more conservative than the Analysys Mason study. Our forecasts reach 18% at the end of 2014, and 27% by the end of 2020/21 (see Figure 12 below). The Low demand forecast reaches 18% by 20/21, and the most aggressive High forecast reaches 50% by the end of 2020/21.



Figure 12: Forecasts for datacard take-up

Source: Analysys Mason

A8.54 Information from the Section 135 data requests suggests that prior to the rapid growth in mobile broadband (which also occurred at a similar point in time to the deployment of HSPA), usage per datacard was lower than at present, at around 100Mbytes per month. However, with the rapid growth in subscribers, lower pricing, and the availability of HSPA, the usage per datacard rapidly rose to around 900Mbytes per month. Usage per datacard per month appears to have been relatively steady for the last 18 months. Based on this recent data, we have revised the forecasts in the model (see Figure 13 below). Our Medium demand scenario assumes that usage per device will remain constant at 900Mbytes per month over the model period. However, the mobile broadband market is still in its early stages and historical trends may not be a good predictor for the future: we have therefore also included two other forecasts is to capture a scenario where new users have lower levels of usage, which dilutes the average usage.



Figure 13: Forecasts for monthly 3G data usage per datacard

Source: Analysys Mason

Technology mix for 3G services

- A8.55 We have also assumed that mobile technologies (i.e. 2G and 3G) rather than wireless technologies such as WiFi will be the primary means of accessing mobile data services when on the move. Services can also be accessed via WiFi, but the success of commercial WiFi outside the home has been relatively limited, compared to 3G-based services.
- A8.56 The cost model needs to estimate the split of data usage on 3G networks between Release 99 and HSPA services. It is therefore necessary to forecast the proportion of 3G data services that will be carried over the HSPA network. Our forecast (Figure 14, below) has been designed to be in line with the HSPA deployment by the national MCPs. The inter-relationship between 3G, Release 99 and HSPA is explained in the section on the network module (paragraph A8.61).
- A8.57 Datacards and newer 3G handsets are generally enabled with HSPA functionality, but there is still a base of 3G handsets that cannot utilise the HSPA network. As a result, separate assumptions for the proportion of traffic carried over the HSPA network are used for 3G handsets and datacards.



Figure 14: Proportion of 3G data traffic carried across the HSPA network

Geotypes and network coverage

- A8.58 'Geotypes' are a means of mapping different geographical segments of the UK according to the likely density of traffic and building clutter that is experienced in those segments.⁸⁹ These factors have a direct influence on the number of sites that are required to provide: (a) network coverage and (b) sufficient network capacity to carry all of the traffic in the busy hour. The geotype definitions used within the model are an attempt to capture these geographical factors, and are defined on the basis of population density (as a proxy for variations in traffic density and building clutter). The model includes a total of nine geotypes, which have not changed since the 2007 model.
- A8.59 The proportion of the UK within each geotype has been estimated using geographical analysis of the postal sector areas in the UK. Demand is then distributed by geotype. As shown in Table 3 below, the distribution is identical to that used in the 2007 model.

Source: Analysys Mason

⁸⁹ For example, city centres with high traffic density and high building clutter versus rural areas with low traffic density and low building clutter.

Geotype	Minimum population density (people per km ²)	Percentage of population in geotype	Percentage of area in geotype	Percentage of traffic in geotype
Urban	7959	6.0%	0.1%	12.8%
Suburban 1	3119	30.0%	1.5%	56.2%
Suburban 2	782	32.8%	4.6%	16.0%
Rural 1	112	21.2%	18.4%	6.1%
Rural 2	47	7.0%	22.1%	2.0%
Rural 3	25	2.0%	13.0%	0.6%
Rural 4	0	1.0%	35.1%	0.3%
Highways	N/A	0.0%	4.4%	3.5%
Railways	N/A	0.0%	0.8%	3.3%

Table 3: Distribution of population, area and traffic by geotype

Source: Analysys Mason

A8.60 For a 2G/3G operator we believe that long-term 2G coverage of 99% and 3G coverage of 92% is appropriate for a hypothetical efficient operator. The 2G coverage is consistent with the assumptions made in the 2007 model, while the 3G coverage has been increased slightly. This is due to assumed implementation of site sharing, which should make coverage viable in some previously uneconomic areas. For sensitivities involving a 3G-only operator 99% coverage levels are assumed.⁹⁰ The population coverage in 2020/21 by geotype for our base-case scenario is given in Table 4 below.

⁹⁰ Further information on these changes is given in the subsection on network dimensioning below.

Geotype	2G population coverage for an average efficient operator	3G population coverage for an average efficient operator
Urban	100.0%	100.0%
Suburban 1	99.0%	99.3%
Suburban 2	99.0%	99.3%
Rural 1	99.0%	92.5%
Rural 2	99.0%	57.1%
Rural 3	99.0%	20.0%
Rural 4	93.0%	5.0%
Highways	100.0%	92.5%
Railways	100.0%	92.5%
Overall	99.0%	92.4%

Table 4: Population	coverage assumptions	in the Base Case
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Source: Analysys Mason

Network module

Overview

A8.61 The network module calculates the deployment of each type of 2G and 3G network asset which is required to meet the input levels of service demand and coverage in each year. The flow of calculation in this module is illustrated below:



Figure 15: Calculation flow of the network module

* The detailed calculation flows in the Network workbook are too numerous and complex to show in diagram

- Non-scenario dependent input
- Intermediate calculation
- Output or Input
- A8.62 The purpose of the cost model is to provide relevant benchmarks to inform the appropriate levels for charge controls on MCT. The network module has therefore been designed to model (a) an operator with both a 2G and a 3G/HSPA network

and (b) an operator with a 3G/HSPA network only. The network design algorithms used to determine the deployments of these two types of operator are consistent (although different dimensioning rules exist for 2G-, 3G- and HSPA-specific equipment). However, for an operator with both 2G and 3G/HSPA networks, certain assets (e.g. radio sites) may be shared between the 2G and 3G/HSPA networks. HSPA technology has been modelled as an additional feature on the 3G network with HSPA traffic sharing a 3G carrier with Release 99 traffic.

A8.63 As previously stated, traffic generated by 2G and 3G subscribers has been adjusted to take into account the proportion of 3G voice traffic that will be carried on the 2G network due to limitations in 3G coverage. During this process, an on-net call between a subscriber on the 2G network and one on the 3G network is converted into an outgoing call on one network and an incoming call on another. For a 2G/3G operator, this assumes that the cost of an on-net call between the operator's 2G and 3G network is equal to the cost of an outgoing call on one network and an incoming call on the other. In the case of the 3G-only operator, it has been assumed that the own-network cost of an on-net call is that of an outgoing call if the receiving party is outside 3G coverage, or that of an incoming call if the calling party is outside 3G coverage.

Cost drivers

A8.64 In order to dimension 2G and 3G/HSPA networks on the basis of cost causation relationships, the network model first converts the demand for each service under the selected input scenario into a number of specific cost drivers, each of which drives the deployment of certain network assets. A common measure of traffic output is required so that demand from multiple services can be aggregated appropriately. Traffic for each service is therefore converted into voice-equivalent busy-hour Mbit/s. A matrix of routing factors is then applied in order to map the services onto a full set of network cost drivers. This approach is shown in Figure 16.

Figure 16: Cost driver calculation flow



A8.65 A key issue in terms of the conversion of services into cost drivers is the relative efficiency with which circuit-switched (i.e. voice) and packet-switched (i.e. data) services are carried on the 3G radio network. The previous market review concluded that packet-switched traffic is transmitted on average three times as efficiently as the transmission of circuit-switched voice traffic over 3G (Release 99) networks. We have reviewed this assumption and believe that it is still valid. The resulting voice-equivalent capacity of a 3G carrier is therefore 0.36Mbit/s for voice services and 1.07Mbit/s for Release 99 data services. Assuming an average bit rate of 12.2kbit/s for voice services, this equates to a maximum of 29 erlangs per carrier.

A8.66 The 2007 model did not explicitly take into account calls to voicemail. The updated model assumes that 4% of total voice traffic terminates at a Voice Mail Server (VMS).

Network dimensioning

- A8.67 A number of technical parameters are required in order to establish quantifiable relationships between cost drivers and network deployment. The two key parameters which affect the dimensioning of 2G and 3G/HSPA networks in the model are (a) the cell radii, (b) traffic demand per cell, and (c) equipment capacities (including the radio, backhaul, backbone and core networks).
- A8.68 In order to derive a realistic assessment of cost structures for our hypothetically efficient mobile operator, Ofcom has developed a bottom-up approach that calculates the quantities of each type of network asset required. These assets are dimensioned in the model according to the cost drivers discussed previously, either directly or indirectly (in the case of assets which are dimensioned on the basis of other asset quantities). The approach that has been taken for dimensioning 2G and 3G/HSPA networks is the same as in the 2007 model. Under this approach the radio network is dimensioned for whichever is the greater of coverage and capacity requirements within each geotype.
- A8.69 The proportion of traffic in the busy hour is a key metric, which directly impacts the size of network needed to meet capacity requirements. In the 2007 model we assumed 10% for all traffic types from 2000/01 onwards. After reviewing MCP data submissions, we have decided to revise these figures downwards:
 - 9% for all non-data services in 2004/05 and 2005/06.
 - 8.5% for all data services in 2004/05 and 2005/06.
 - 8% for all non-data services from 2006/07 onwards.
 - 7.5% for all data services from 2006/07 onwards.
- A8.70 The model takes account of the opportunity that the 2G/3G MCPs have to share costs between their existing 2G networks and their new 3G networks. In particular, many sites used for 2G transmitters are likely to be used for 3G transmitters as well.
- A8.71 There have been two changes to the structure of the network dimensioning. The first change is that the impact of site sharing can be assessed, for both 2G and 3G networks.
- A8.72 Numerous operators have entered into site-sharing agreements. These agreements enable both operators to reduce their cost base by sharing physical site locations. Only macro cell sites can be shared. As the operators involved would need to move equipment from one site to another and possibly upgrade the infrastructure at the shared site, we have allowed for two types of transformation costs: sharing costs and decommissioning costs. Sharing costs are the expenditure required, on average, to upgrade the infrastructure of a site to house two operators. Decommissioning costs are the costs required to dismantle and remove a site so that the equipment can be moved to a shareable site. It is assumed that 50% of the hypothetical efficient operator's sites are upgraded for sharing and 50% are decommissioned. The following costs have been assumed following guidance from national MCPs:
 - cost of sharing a site: £17,000

- cost of decommissioning a site: £20,000.
- A8.73 We assume in the model that site sharing begins in Q1 2007/08, and that all macrocell sites are shared by the end of Q1 2014/15. Sites existing before the start of the agreement are upgraded for sharing or are decommissioned evenly over this period. All shared sites have an opex which is 50% of that of a non-shared site. The investment costs of sites constructed after the agreement begins are also reduced by 50%.
- A8.74 As previously discussed, when site sharing is implemented we have assumed an increase in 3G coverage. This is to take into account the fact that some previously uneconomic areas become viable when site-sharing agreements are in place. Table 5 below shows how 3G coverage for a 2G/3G operator increases when site sharing agreements are implemented.

Geotype	3G coverage for hypothetical efficient 2G/3G operator	3G coverage for hypothetical efficient 2G/3G operator – site sharing
Urban	100.0%	100.0%
Suburban 1	99.0%	99.3%
Suburban 2	99.0%	99.3%
Rural 1	90.0%	92.5%
Rural 2	39.2%	57.1%
Rural 3	0.0%	20.0%
Rural 4	0.0%	5.0%
Highways	90.0%	92.5%
Railways	90.0%	92.5%
Overall	90.0%	92.4%

Table 5: 3G coverage increases under site sharing

Source: Analysys Mason

2G-specific network dimensioning

A8.75 A series of network design algorithms are applied to create asset requirement projections for the 2G network. The 2G algorithms are identical to those implemented in the 2007 model, though a few changes have been made to some of the parameters which drive these algorithms. These changes have all been influenced by the data submitted by the national MCPs, advice from Analysys Mason, or as part of the calibration process. These changes are listed in Table 6 below.

Parameter changed	Details of and reason for alteration
Number of 2G sites deployed	When our demand forecasts were fed into the 2G network dimensioning worksheet we found that 2G site numbers started to decrease from 2008/09 and then increase again in later years of the model. To solve this problem a look ahead has been added to the model.
	added again in later years.
Proportion of data traffic in the downlink	This parameter has been reduced from 80% to 75%.
Proportion of traffic carried over macro, micro and pico cells	Proportions are kept constant at 2000/01 values. Previously, between 2000/01 and 2004/05 an increasing proportion of traffic was assumed to be carried by micro and pico sites.
BSC unit capacity	The number of TRXs that can be supported by a BSC has been reduced from 512 to 300.
MSC capacity	The CPU capacity of a 2G MSC has been increased from 10 million to 30 million busy-hour minutes.
SMSC unit capex and unit capacities	Unit investment costs have been reduced by 20% per annum between 2010/11 and 2013/14. Previously these figures were -3% then -2% for the remaining years.
Average 2G cell radii for 1800MHz spectrum in different geotypes	Urban: reduced from 1.1km to 1.0km Suburban 1: reduced from 2.1km to 1.85km Suburban 2: reduced from 2.1km to 1.95km Rural 1: reduced from 4.0km to 3.5km.
	In addition there is a 1% decrease in cell radii in each geotype between 2007/08 and 2010/11. This has been added as part of the calibration process.

Table 6: Changes to 2G network dimensioning parameters

3G-specific network dimensioning

- A8.76 As with 2G network dimensioning, a series of design algorithms are applied to create asset requirement projections for the 3G/HSPA network. Although many of these algorithms are identical to those implemented in the 2007 model, a number of important changes have been made, which are discussed below.
- A8.77 We have made a change to the capacity of UMTS base stations. When we reviewed the capacity of base stations (Node Bs) that are used for 3G services,⁹¹ we found that modern Node Bs have increased processing power due to technological progress, and are able to accommodate more capacity than was

⁹¹ Node Bs are used to deliver voice, Release 99 (UMTS) data, and HSPA services.

assumed in the 2007 model.⁹² In that model it was assumed that a single carrier in each sector has a capacity of 0.27Mbit/s for Release 99 voice services. Following a detailed review of different releases of UMTS, we now believe that for 3G voice it is appropriate to revise the maximum capacity per carrier per site to 0.36Mbit/s. For Release 99 data services, the relative capacity is three times higher. Relative efficiency is discussed further below. For clarity, Table 7 below shows the differences between the 2007 and updated models in terms of the voice-equivalent capacities for a single carrier.

	Updated model	2007 model
Voice (Mbit/s)	0.36	0.27
Voice (Erlangs)	29	21
Release 99 data (Mbit/s)	1.07	0.80
HSPA data (Mbit/s)	2.14	N/A

Source: Analysys Mason

- A8.78 HSPA has historically been deployed in a number of stages, with the maximum download speed achievable increasing with each upgrade. We have assumed that HSPA is deployed in three phases as summarised below:
 - HSPA 3.6Mbit/s deployed to all sites evenly between 2006/07 and 2007/08
 - HSPA 7.2Mbit/s deployed to all sites evenly between 2007/08 and 2008/09
 - HSPA 14.4Mbit/s deployed to all sites evenly between 2009/10 and 2011/12.
- A8.79 HSPA technologies use the radio network even more efficiently than Release 99 data services. Submissions from the national MCPs suggest that HSPA increases the efficiency compared to R99 by a factor of two (i.e. a factor of six compared to voice services). We have assumed the following efficiency factors for each evolution of HSPA:
 - HSPA 3.6Mbit/s: 4.50 times the voice efficiency (leading to a carrier capacity of 1.62Mbit/s across a site)
 - HSPA 7.2Mbit/s: 5.25 times the voice efficiency (leading to a capacity of 1.89Mbit/s across a site)
 - **HSPA 14.4Mbit/s:** 6.00 times the voice efficiency (leading to a capacity of 2.14Mbit/s across a site).
- A8.80 A unit investment cost of £4000 per site is assumed for the first HSPA upgrade. Subsequent upgrades cost £2500 per site. No additional operating costs are assumed for HSPA upgrades; these are assumed to be absorbed into 3G cell equipment opex.

⁹² The increase in capacity is due to Node Bs now supporting more channel elements within a single cabinet.

- A8.81 We assume that HSPA is delivered via a *shared* carrier with Release 99 services. Under this type of deployment the Mbit/s of HSPA traffic is divided by the relative efficiency factor to calculate the voice-equivalent Mbit/s. This traffic is then added to the voice traffic and Release 99 data traffic before the resulting numbers of network assets are calculated.
- A8.82 Demand for mobile services is not constant across all sites within a geotype. This non-homogeneity of demand within a geotype needs to be captured within the network dimensioning. The 2007 model used a complicated methodology for 3G that was different to that used by the 2G network dimensioning. In the updated model, the impact of the non-homogeneity of demand has been modified so that it is now handled in the same way as 2G networks. Our revised approach is simpler and relies upon the parameters for carrier, sector and site utilisation. The resulting average utilisation has been calibrated to match operator data.
- A8.83 In addition we have made a number of minor changes to the 3G dimensioning parameters. These changes have all been influenced by the national MCPs' data submissions, our own expertise, or to aid the calibration process. The changes are listed in Table 8.

Alteration	Details of and reason for alteration
Maximum sectors per site	The maximum number of sectors per macro site has been reduced from four to three.
Proportion of data traffic in the downlink	This parameter has been reduced from 80% to 75%.
RNC unit capacity	Unit capacity has increased. Voice Erlang capacity has increased from 6100 voice Erlangs to 15000. Mbit/s capacity has increased from 200 Mbit/s to 500 Mbit/s.
Changes to 3G average cell radii for 2100MHz spectrum in different geotypes	Suburban 1: increased from 0.85km to 1.05km Suburban 2: increased from 1.4km to 1.7km Rural 2: increased from 3.94km to 4.2km

Table 8: Changes to 3G network dimensioning parameters

3G/2G shared network dimensioning

A8.84 This allows for 2G/3G operators to deploy assets that are common to both their 2G and their 3G networks. The 2G and 3G network dimensioning algorithms separately calculate the site requirements for each network. These requirements are then passed to a site-sharing algorithm which establishes how many of these sites can be shared rather than purchased as standalone sites. The proportion of incremental 3G sites (additional 3G sites for that year) which will be shared with 2G sites is assumed as an input to this calculation, and is allowed to vary over time. This leads to sites being classified as either standalone 2G, standalone 3G or shared. The proportion of 3G sites built in each year which are shared with existing 2G sites is given in Table 9. This is a key metric in the calibration process.

	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09 onwards
2007 model	100%	85%	80%	80%	75%	70%	65%	65%
Updated model	100%	95%	92%	87%	77%	72%	67%	67%

Table 9: Proportion of incremental 3G sites shared with 2G

Source: Analysys Mason

- A8.85 In order to model the effects of backhaul sharing, we calculate the total backhaul capacity that would be required in a geotype for both the 2G and 3G network cell sites. Backhaul is then deployed to accommodate the implied average traffic per site. Two types of backhaul are provisioned: microwave and Ethernet. By default microwave backhaul is deployed, and this is replaced by Ethernet links when more than four 2Mbit/s microwave links would be required. However, no Ethernet links are deployed before 2009/10 regardless of capacity needs.
- A8.86 The modelled microwave backhaul network has a tree-and-branch configuration, as illustrated in Figure 17 below. This structure is deployed multiple times such that all sites are served by backhaul. The impact of this approach is that transmission links from sites, other than from those at the lowest levels in the tree, will carry traffic from several sites and therefore use higher bandwidth backhaul links, resulting in economies of scale. This approach is in line with that of the 2007 model.
- A8.87 Ethernet backhaul is not deployed in a tree-and-branch structure. A maximum of one link per site is deployed.



Figure 17: Example backhaul tree-and-branch structure

Cost module

A8.88 In order to determine the appropriate level of the charge controls on voice call termination, the model estimates the costs that would be incurred by a hypothetical efficient mobile network operator operating different combinations of 2G and 3G/HSPA network technologies. The cost module forecasts the total cash flows (i.e. investment and operational expenses) that would be incurred in each year to purchase, renew and maintain the required level of deployment of each type of network asset, as calculated by the network module. An overview of the calculation flow of the cost module is given in Figure 18 below.



Figure 18: Calculation flow of the cost module

A8.89 We have based these calculations on a Modern Equivalent Asset (MEA) approach, which takes into account changes in the investment and maintenance costs associated with each asset type, as well as technological developments that improve asset productivity. For example, an asset which is expected to halve in price and double its effective capacity over a given period of time would have an MEA investment price at the end of that period equal to a quarter of the original price. This approach has not changed since the previous version of the model.

Investment costs

A8.90 The investment costs calculated in each year take into account increases in the required quantity of each network asset, and the replacement of assets that have reached the end of their economic life, as well as MEA investment costs per unit for each asset type. The number of assets purchased is calculated as the number of incremental assets required in that year, plus the number of assets whose economic lifetime has expired and therefore need replacement. Incremental asset deployment in the cost module is smoothed, to avoid artificial behaviour and overpurchasing in relation to equipment which declines in quantity but then recovers in later years in response to changes in demand. Typically the required level of deployment of an asset climbs to a peak before declining over its lifetime. A smoothing algorithm ensures that up until the lifetime peak requirement is reached, the required deployment of that asset can only increase or remain constant in any year, while after the peak requirement has been reached, the required deployment must always decrease or remain constant. This smoothing is intended to reflect the fact that in reality it would be inefficient for an operator to remove a network asset in response to a transitory fall in demand for that asset.

- A8.91 The cost model does not assume any payment for assets in advance of deployment – this is consistent with information supplied by the national MCPs. MEA unit investment costs are calculated on the basis of input absolute values, which are extrapolated from historical and forecast MEA trends for 2G and 3G networks. Parameters have been built into the model so that unit investments are adjusted to take into account the extent of site sharing.
- A8.92 3G licences were purchased in the 2000/01 financial year. However, the new cost model does not deploy a 3G spectrum asset until the first year of demand on the 3G network. This value includes a two-year holding (or gestation period) and is in line with the Competition Commission's conclusion on the use of gestation periods. A 3G spectrum value of £0.5 billion for 2x10MHz (in real 2008/09 prices) is assumed. Spectrum valuation is discussed in more detail in annex 9.
- A8.93 We have reviewed all the asset unit investment costs. This review took into account advice from Analysys Mason, the opinion of the national MCPs, and the model calibration process. All changes are listed in Table 10.

Alteration	Details of and reason for alteration
Increase in macro, micro and pico cell unit	We have inputted the following 2009/10 unit prices (in 2008/09 terms) into the model:
investment costs	Macro cell sites: £91089 Micro cell sites: £65000 Micro cell sites: £45000
	Unit investment costs are kept constant until the end of 2008/09. An investment trend of 1% is assumed from 2009/10 onwards.
	In the 2007 model the following 2009/10 unit prices were assumed (in 2008/09 terms):
	Macro cell sites: £85600 Micro cell sites: £54572 Micro cell sites: £34108
Reduction in 2G macro and pico cell equipment unit investment costs	Data submissions showed that equipment prices had dropped significantly in recent years. The unit investment trends between 2005/06 and 2007/08 has been set to -35% per annum. Previously the figure was -5%.
	Unit investment trend in all other years is consistent with the 2007 model.
Reduction in 2G micro cell and all other 2G cell equipment unit investment costs	An investment trend of -35% per annum in the investment cost of micro cells was considered too large. Instead between 2005/06 and 2007/08 a trend of -30% per annum has been assumed. The unit investment trends in all other years are consistent with the 2007 model.
Reduction in 3G micro cell equipment unit	The unit investment trend between 2005/06 and 2007/08 has been set to -40% per annum. Previously the figure was -5%.

Table 10: Alterations to unit investment costs

investment costs	
BSC unit costs	The input unit investment cost has been multiplied by (300/512) in order to normalise the unit cost for the capacity adjustment. Unit investment trends have also been altered: the previous value of - 4% per annum for 2004/05 to 2007/08 has been changed to -30%.
SMSC unit investment costs	We have adjusted unit investment trends to -20% per annum for each year between 2010/11 and 2013/14. Previously the trend was -3% in 2010/11and -2% from 2011/12 until 2013/14.
RNC unit investment costs	We have adjusted unit cost trends to -30% in the years 2005/06 to 2008/09. Previously a trend of -5% was assumed for these years.
Microwave backhaul	Microwave backhaul costs were found to be too low historically. Accordingly, between 1996/97 and 2006/07 the cost trend has been increased from -10% per annum to -2%. Likewise, between 2007/08 and 2009/10 the cost trend has been increased from -5% to -2%.
	We have inputted the following 2009/10 unit prices (in 2008/09 terms) into the model:
	8Mbit/s backhaul links: £3000 16Mbit/s backhaul links: £3500 32Mbit/s backhaul links: £4000.
HSPA upgrades	New Asset. We have set the unit cost in 2009/10 (in 2008/09 prices) for each upgrade as follows:
	HSPA 3.6Mbit/s: £4000 per site HSPA 7.2Mbit/s: £2500 per site HSPA 14.4Mbit/s: £2500 per site
	The unit investment cost is trended at -5% per annum thereafter. This trend is in line with the majority of electronic equipment.
Ethernet backhaul	New asset.
	The price in 2009/10 (in 2008/09 terms) is set to £12000 per link. The unit investment cost is trended at -2% per annum thereafter.
Shared site	New asset.
	The price in 2009/10 (in 2008/09 terms) is set to £17000 per site upgrade. The unit investment cost is trended at 1% per annum thereafter. This trend is in line with other civil work events.
Site transformation	New asset.
	The price in 2009/10 (in 2008/09 terms) is set to £20000 per site upgrade. The unit investment cost is trended at 1% per annum thereafter. This trend is in line with other civil work events.

Operating costs

- A8.94 We model operating costs for each type of network asset included in the model. We take into account the costs that would be incurred in maintaining the deployed 2G and 3G network assets. These are calculated based on the deployment of each network asset multiplied by an MEA operating cost per unit specific to that asset. In years where asset deployment is decreasing (due to decommissioning), the model assumes that there will be a lag between the point when the asset is no longer required in the network and the point when it will no longer incur operating expenses. This is the same approach as adopted in the 2007 model.
- A8.95 The approach that has been taken on MEA operating cost trends over time is similar to that described above for capital costs. However, for asset types where less information is available on levels of operating costs, greater reliance has been placed on the calibration process.
- A8.96 We have built parameters into the model so that unit investments are adjusted to take into account the extent of site sharing.
- A8.97 All asset unit operating costs have been reviewed. This review took into account advice from Analysys Mason, the opinion of the national MCPs, and the model calibration process. All changes are listed in Table 11 below.

Table 11: Alterations to unit operating costs		
Alteration	Details of and reason for alteration	
3G site upgrade opex	The purpose of the 3G site upgrade asset is to allow for the reduced cost of maintaining 2G and 3G equipment on a shared site. Previously the trend of this negative cost matched that of site acquisition – but this led to too much cost being offset in later years. This asset is now set to be 20% of the 3G cell equipment opex.	
Reduction in 3G microcell equipment unit opex costs	We have set the unit operating trends between 2005/06 and 2007/08 to -25%, -30% and -30% per annum. Previously the figures were -15%, -8% and -4% respectively for these three years.	
BSC unit costs	We have set the unit operating cost trends to be consistent with that of unit investment trends for all years except 2004/05 to 2007/08.	
Microwave backhaul	We found that microwave backhaul costs were too low historically. Accordingly, between 2000/01 and 2009/10 the cost trend has been increased to -2% per annum (previously annual trends ranged from -15% to -3% over this period).	
	The following 2009/10 unit prices have been inputted into the model:	

	8Mbit/s backhaul links: £700 16Mbit/s backhaul links: £750 32Mbit/s backhaul links: £800.
HSPA upgrades	New Asset.
	HSPA is a software upgrade and therefore any operating cost is taken into account in the 3G cell equipment costs.
Ethernet backhaul	New asset.
	The price in 2009/10 is set to £5000 per link. The unit operating cost is trended at -2% per annum thereafter.
Shared site and site transformation	New asset.
	These assets are one-off events and therefore have no operating cost.

Asset lifetimes

We have reviewed all existing asset lifetimes. This review took into account A8.98 Analysys Mason's industry experience, the opinion of the national MCPs, and the model calibration process. All changes to asset lifetimes are shown in Table 12 below.

Table 12: Changes to asset lifetimes

Asset	Previous lifetime	Updated lifetime
Site acquisition and preparation and lease	20	18
Cell equipment	10	8
BSC equipment	10	9
RNC equipment	10	8

Source: Analysys Mason

A8.99 Due to the introduction of site sharing and HSPA functionality there are a number of additional assets requiring lifetimes to be set. Table 13 shows the rationale for our decisions.

Table 13: Lifetimes of new assets

Asset	Lifetime	Rationale
Site sharing: transformation sites	Indefinite ⁹³	A "transformation site" is essentially a site decommission. It is a one-off event and therefore has a lifetime longer than that of the model.
Site sharing: shared sites	Indefinite	A "shared site" is a site adapted to host a second MCP. It is also a one-off event and therefore has a lifetime longer than that of the model.
HSPA upgrades (3.6 Mbit/s, 7.2 Mbit/s, 14.4 Mbit/s)	8	The lifetime is consistent with that of other active cell site equipment.
Ethernet link	8	The lifetime is consistent with that of other backhaul products.

Cost of capital for the efficient MCP

A8.100 One of the inputs to our model is an estimated cost of capital for a UK MCP. For the purpose of this exercise we use the Capital Asset Pricing Model (CAPM) to determine the WACC. The WACC is given by:

WACC = (Cost of equity x (1 – Gearing)) + (Cost of debt x Gearing)

A8.101 Within the CAPM, the cost of equity is given by:

Cost of equity = risk-free rate + (equity beta x equity risk premium).

A8.102 The risk-free rate is the expected rate of return on a risk-free investment; the equity risk premium is the expected return on equities over and above the risk free rate;

⁹³ Indefinite lifetimes are set to be 100 to avoid asset replacement.
and the equity beta reflects the variability of returns of the equity of the company in question compared with the variability of returns on the equity market.

A8.103 The cost of debt is given by:

Cost of debt = risk-free rate + debt premium.

The debt premium is the expected additional return demanded by a company's debt owners over and above the risk-free rate.

- A8.104 Our proposed approach in this consultation is the same as that set out in annex 18 of our March 2007 mobile call termination statement. That approach is to continue to use the CAPM, and to apply a single estimate of the WACC to all companies and activities within the sector.
- A8.105 We are estimating the cost of capital for a notional efficient mobile operator. We note that the level of volatility and uncertainty in financial markets has been very high for at least the last 18 months. When considering empirical evidence from time periods that include this period of volatility, care needs to be taken in separating short-term and long-term effects.
- A8.106 In this consultation, we propose an estimated range for the pre-tax real WACC of 6.5% 8.8% (versus our 2007 final estimate of 11.5%). The mid-point of this range forms our base case value of 7.6%.
- A8.107 Our calculations are based on the following parameter ranges:

Parameter	Value
Equity Risk Premium (ERP)	5%
Equity Beta	0.7 – 1.0
Real risk-free rate	2.0%
Gearing	25% - 35%
Debt premium	1 - 2%
Pre-tax real WACC	6.5% - 8.8%

Table 14: Efficient mobile operator WACC parameters

Source: Ofcom estimate

A8.108 The bases for the ERP and the real risk-free rate are similar to the bases provided as part of recent Ofcom decisions (particularly our May 2009 statement entitled "A new pricing framework for Openreach"⁹⁴, annex 8). We have reviewed recent market data in both areas and are content that the estimates from May 2009 remain appropriate for this consultation.

Equity beta for a notional operator

A8.109 Estimating the equity beta for a notional MCP is particularly difficult since there are no separately-listed UK MCPs⁹⁵.

⁹⁴ http://www.ofcom.org.uk/consult/condocs/openreachframework/statement/annexes.pdf

⁹⁵ While the UK MCPs' parent companies are all listed on stock exchanges, the UK operators themselves are not separately listed.

- A8.110 However, since all four of the incumbent UK MCPs are owned by listed multinational telecom operators, we can use these companies' betas as an input to our estimates of UK betas.⁹⁶
- A8.111 The parent companies of the incumbent MCPs are Vodafone Group (Vodafone), Grupo Telefonica (Telefonica), Deutsche Telekom (DT) and France Telecom (FT). These groups own more than just their UK mobile businesses, and share a number of common characteristics – they are all telecoms operators, they generate a significant proportion of their revenue, profitability and value in Europe, and (apart from Vodafone) they have a mix of fixed and mobile businesses.
- A8.112 However, since Vodafone's assets are substantially all mobile businesses (apart from a relatively small fixed line broadband business), we believe it offers the best proxy for a UK MCP. Therefore, we place relatively more weight on Vodafone's equity beta and gearing levels than on those of the other three parent companies.

How have observed betas moved over recent years?

- A8.113 In our 2007 statement we estimated the equity beta for an efficient mobile operator to be in the range 1.0 to 1.6. This was predominantly based on observed market data for Vodafone and mmO2 (now called O2, and part of the Telefonica Group).
- A8.114 We have commissioned a report from the Brattle Group into an appropriate estimate of the equity beta for UK mobile operators. This report can be found at annex 15.
- A8.115 Brattle's report suggests that observed equity betas for the parent companies of UK MCPs have fallen in recent years. Brattle offers a number of possible explanations why this might have occurred:

a) Changing investor perceptions about the risk attached to mobile telecoms stocks. Investors may have been concerned that mobile stocks would promise much and deliver little, but several years of solid performance have proved the resilience of these operators.

b) The increasing maturity of mobile networks now that 3G networks have been built out and nearly 100% coverage has been achieved. Mobile operators are now perceived as offering stable and positive free cash flows. This may be a temporary, cyclical state of affairs, since 4G network rollout is likely to begin in the coming years.

- A8.116 Brattle concluded that the best range of current estimates would be 0.46 0.79. However, this range is not weighted towards Vodafone, and is based on betas against the FTSE All-World index, rather than the FTSE All-Share. Vodafone's 2 year beta against the FTSE All-Share was 0.84, and this is the value on which we would place most weight.
- A8.117 Brattle's analysis also suggests that a 25% 35% gearing level looks a reasonable range of the gearing of the companies in question, particularly Vodafone, which has

⁹⁶ Since H3G's parent company, Hutchison Whampoa, is a diversified conglomerate, with a relatively low share of its value being in telecoms businesses, we do not believe that it's observed equity beta would be instructive for our purposes.

had gearing levels in this range for the last four years. Since gearing levels have been relatively stable for the last few years, the observed equity betas can be said to be broadly consistent with such a gearing level, and it is not necessary to 'relever' the estimates.

A8.118 Accordingly, we propose to lower our equity beta estimates for an efficient MCP, and propose a range, of 0.7 to 1.0 for the equity beta (the range in 2007 was 1.0 to 1.6 in 2007.

Debt premium

- A8.119 The past few years have been a period of volatility and uncertainty in credit markets, and this uncertainty is reflected in corporate bond yields, which have remained relatively high over the last 18 months.
- A8.120 Debt yields for the parent companies of all the four incumbent MCPs currently sit in a range of 1 2% above risk-free rates.
- A8.121 The Bank of England's Quarterly Bulletin in November 2009⁹⁷ suggested that investment-grade non-financial corporate bond spreads have fallen from highs seen in Autumn 2008. The Bank notes that

"Conditions in credit markets also continued to ease for non-financial companies. Spreads on sterling-denominated corporate bonds narrowed, especially for non-investment grade bonds. Indeed, the sharp widening in spreads in Autumn 2008, when the turmoil in financial markets intensified, has been largely unwound, although spreads remained above their average levels over the past decade."

- A8.122 Now that credit markets appear to have stabilised somewhat, the current observed market levels of debt premiums appear to provide a reasonable long-term estimate.
- A8.123 We propose to use a range of 1% 2%, the same as in 2007, and in line with both current market rates and longer term market estimates.

Gearing⁹⁸

- A8.124 In 2007 we used a figure of 10% gearing for an efficient UK MCP. This level was based on previous data for O2 and Vodafone, which we have now updated.
- A8.125 Note that this is an optimal gearing level. The optimal capital structure of a notional efficient MCP necessarily difficult to estimate, since company-specific circumstances impact the optimal structure, and therefore there are practical difficulties with estimating an industry-standard gearing level.
- A8.126 The concept of an optimal gearing level recognises that debt, which has an inherent tax shield, is a cheaper form of finance than equity, but that there are also costs associated with very high levels of gearing (such as default risk).
- A8.127 Real-life observations of the gearing levels of the UK MCPs' parent companies are the main source of evidence on which we base our estimated gearing level. The

⁹⁷ http://www.bankofengland.co.uk/publications/guarterlybulletin/mo09nov.pdf

⁹⁸ For the purposes of CAPM estimation, gearing is calculated as follows:

Gearing = net debt / (net debt + market capitalisation).

data provided by the Brattle Group gives gearing levels since 2006 in the following ranges for the parent companies of the UK MCPs:

FT and DT	45% – 60%
Telefonica	35% – 50%
Vodafone	25% – 35%

- A8.128 As noted above, gearing levels tend to reflect company-specific circumstances as well as industry-generic considerations. For example, the large, domestic fixed-line businesses of FT, DT and Telefonica, which generate relatively stable and predictable cashflows, exhibit some characteristics of utilities. This allows these groups to gear up their balance sheets in the expectation of stable returns.
- A8.129 Vodafone has no such fixed-line business to fall back on, and could be argued to provide a better benchmark of optimal gearing for a MCP. We therefore afford more weight to Vodafone's gearing levels than to those of the other parent companies.
- A8.130 For comparison, in our recent charge controls involving BT, we estimated an optimal gearing level of 35% for the BT Group, based on observed gearing levels of 30% 40% for the period from 2001 until the start of the credit crunch in 2008.

How have our WACC estimates changed since 2007?

A8.131 The table below shows how our estimates of the CAPM parameters have changed since we last estimated the cost of capital for the purposes of setting mobile termination rates. We consider a pre-tax real range from 6.5% to 8.8% to be appropriate for a hypothetical efficient MCP, with a central estimate of 7.6%.

Table 15:Pre-tax real WACC

WACC component	March 07	March 10
Real risk-free rate	2.2%	2.0%
Inflation assumption	2.8%	2.5%
Equity risk premium	4.5%	5%
Equity beta	1.0 – 1.6	0.7 – 1.0
Gearing	10%	25% - 35%
Cost of equity (post tax nominal)	9.5 – 12.2%	8.0 – 9.5%
Debt premium	1 – 2%	1 – 2%
Corporate tax rate	30%	28%
Cost of debt (post tax nominal)	4.2 – 4.9%	4.0 – 4.7%
WACC (pre-tax real)	9.7 – 13.2%	6.5 - 8.8%
Average pre-tax real	11.5%	7.6%

Source: Ofcom estimate

Economic module

Overview

A8.132 The Economic module implements original economic depreciation to calculate a cost per unit of output in each year for every asset in the model. These costs per unit of output for each asset are used to estimate the unit service cost for each service modelled, using service routeing factors. The algorithm is conceptually identical to that in the 2007 model. The main calculation flow in the module is shown in Figure 19.



Figure 19: Calculation flow of the economic module

- A8.133 We have adapted the economic module in order to determine the unit costs using a pure LRIC methodology. We have added three new worksheets: (a) Active inputs, (b) Inputs with incoming, and (c) Inputs no incoming. These worksheets all contain network cost information (from the cost module), network element count, network element output and service demand (all from the network module). Two of the worksheets have their values determined by the pure LRIC macro.
 - The active inputs worksheet contains the information required to determine unit costs in the live version.
 - The *inputs with incoming* worksheet contains the information required to determine unit costs when incoming traffic is included (for the parameters active when the *pure LRIC macro* was last run).
 - The *inputs no incoming* worksheet contains the information required to determine unit costs when no incoming traffic is included (for the parameters active when the *pure LRIC macro* was last run).
- A8.134 Figures in the *inputs no incoming* worksheet are subtracted from values in the *Inputs with incoming* worksheet. This equation produces the hypothetical cost and number of network elements needed to build a network to transport incoming traffic. This information is then fed through the economic depreciation algorithm to produce a cost recovery profile for these costs.

Administration Costs

- A8.135 Non-network costs are costs of all activities that are not directly associated with the network operation enabling calls to be made. These can be grouped into three categories:
 - Customer acquisition, retention and service costs (CARS) comprising advertising and marketing, handset costs, discounts and incentives, customer care, billing and bad debts;
 - Administration costs general overheads; and
 - Other costs costs not relating to the running of the UK network nor either of the above two categories (e.g. payments to other operators such as roaming charges).
- A8.136 The figure below summarises the MCPs' non-network costs in the three categories above, based on the MCPs' average accounting costs as submitted to Ofcom from the MCPs.

	Average costs (£ million)
CARS costs	1,827
Administration costs	383
Other	1,207
Total	3,417

Table 16: Average non-network costs (calander year 2008)

Source: Ofcom based upon information from MCPs

- A8.137 Of the non-network costs above, we would only propose a contribution to administration costs under LRIC+. This would be consistent with the 2007 MCT Statement (see Annex A15 thereof) and the CC's determination (see Section 3 and Section 8 thereof). Administration costs include the overheads for non-network depreciation (IT, furniture and office equipment), property costs, human resources, finance and legal costs and IT overheads. Since these costs are common across all a MCP's activities, under LRIC+ they should therefore be recovered across all the areas of a MCP's business that they help to support. Because these are common costs, they are not included under pure LRIC.
- A8.138 Table 17 below sets out our approach to estimating the share of total administration costs that are allocated to network activities. This table has been created using accounting information for 2008, which is the latest available.

Table 17: Allocation of administration costs to network activities (calander year 2008)

Category	Calculation	Average costs (£ million)
Network depreciation	Α	331
3G licence amortisation	В	219
Network opex	С	376
NBV of network assets	D	1,520
NBV of 3G licence	E	2,821

Cost of capital ⁹⁹	F	10.3%
Cost of capital on network assets	FxD	157
Cost of capital of 3G licences	FxE	291
Cost of capital on network assets and 3G licences	G=(E+D) xF	447
Total annual network costs	H=A+B+C+G	1,373
Annual operating cost of retail activities (CARS)	1	1,827
Annual operating costs of "Other" activities	J	1,207
Annual operating costs of Admin activities	К	383
NBV of non-network assets	L	531
Cost of capital on non-network assets	M=LxF	55
Cost of capital of non-network assets attributable to CARS (Retail)	N=MxI/(I+J+K)	29
Total CARS (Retail) costs	O=I+N	1,856
Cost of capital non network costs attributable to Admin	P=MxK/(I+J+K)	6
Total Admin costs	Q=K+P	390
Total Network and Retail costs	R=H+O	3,229
% Network costs	S=H/R	43%
Share of administration costs allocated to network activities (2008) terms	T=SxQ	166

Source: Ofcom based upon infromation from MCPs

- A8.139 Ofcom estimates that £166m in calnder year 2008 prices (£170m in 2008/09 prices) should be allocated to network activities as a share of administration costs for the average efficient operator.
- A8.140 The total administration cost allocated to network activities e.g. icoming calls, outgoing calls and data, is allocated to network services in proportion to their respective shares of network traffic costs. The ppm mark-up for administration costs on termination in 2014/15 is estimated by dividing termination's share of this total costs by the number of minutes terminating in that year.

 $[\]overline{}^{99}$ Pre tax nominal assuming 2.5% inflation.

Annex 9

Spectrum value

The valuation of spectrum for charge control purposes

- A9.1 In specifying efficient unit costs for MCT that are used as the target for efficient charges, our cost model requires an appropriate valuation of spectrum assets.
- A9.2 We first set out below a summary of estimated spectrum valuation options. We then provide a more complete discussion by providing further background on past assessment of the value of spectrum, including the findings of the CC in its determination for the last appeal of MCT. The rest of this section sets out detailed reasoning on valuing the spectrum frequencies used in our cost model. For the avoidance of doubt, the analysis of spectrum values in this market review is solely for the purposes of the possible regulation of mobile termination rates. It is not intended to pre-judge or influence any possible future review of spectrum pricing by Ofcom in different contexts (i.e. the review of administered incentive pricing).
- A9.3 As shown in annex 8 and later in this section, changes in the spectrum value would have no impact on the pure LRIC charge in 2014/15 and a limited effect on the charge for 2014/15 when using LRIC+. The issue of spectrum valuation is therefore considerably less relevant to this market review than it was during the previous market review (and the subsequent appeal process).¹⁰⁰ It is also obviously significantly less relevant than for regulatory decisions (e.g. the design of spectrum auctions) that are primarily about spectrum allocation (or valuation).

Background

- A9.4 As well as modelling the network costs associated with the provision of voice call termination, we need to capture the cost of holding and making use of radio spectrum assets. Mobile operators hold spectrum licences at various frequency bands, with the main four operators predominantly holding spectrum licences in three frequency bands: 900 MHz and 1800 MHz, which are currently used for 2G services, and 2.1 GHz, used for 3G services.
- A9.5 As with the other aspects of the charge control modelling process, we are seeking to determine the forward-looking costs for a hypothetical efficient operator providing voice call termination. Any value of spectrum we use for such purposes must be seen in that light i.e. we are not seeking to value spectrum holdings *per se*, but wish to identify what contribution voice call termination should make to the recovery of spectrum costs.

¹⁰⁰ Under pure LRIC, there is no allocation of spectrum to voice call termination in our cost model. In principle, if termination traffic were entirely removed then this might entail an MCP avoiding having to purchase some spectrum. Hence, it is possible in theory for pure LRIC to include some contribution to spectrum costs. However, there is a particular trade-off between the amount of spectrum used and network costs. For a given amount of spectrum, more capacity can be provided by increasing the size of the network (i.e. increasing the number of base stations and/or traffic-handling capacity at base stations). Or for a given size of network, more capacity can be provided if more spectrum is deployed. At the margin the willingness to pay for the additional spectrum required would be no more than the network costs avoided, so in principle the pure LRIC of termination should be the same under either approach. As shown in Table 20 of this Annex, the different options for valuing spectrum do not result in different unit costs under the pure LRIC cost standard.

- A9.6 Consistent with the assumptions in the MCT cost model, our benchmark hypothetical efficient costs are generated by a network cost model built around 2x30 MHz of 1800 MHz spectrum and 2x10 MHz of 2.1 GHz spectrum.
- A9.7 In determining the value of spectrum, our objective is to provide appropriate price signals to consumers for the efficient consumption of services using mobile termination. This is in line with the approach adopted under the current control and was endorsed by the CC, stating, at paragraph 2.3.71 of its Determination that Ofcom was correct, "… in focusing on providing appropriate price signals for efficient consumption as the main pricing objective in relation to 3G spectrum for the purposes of setting regulated MCT charges."¹⁰¹
- A9.8 The implication of this is that we should be concerned with the forward-looking opportunity cost of spectrum. Opportunity cost is the measure of the resource cost to society of (in this case) scarce spectrum. If prices reflect opportunity costs, consumers face efficient price signals about the resource costs of different services. If historic rather than forward-looking valuations of spectrum were used, this would be unlikely to provide correct signals over the duration of the charge control period if there had been significant changes in market circumstances.
- A9.9 In considering options for the valuation of spectrum at different frequencies for this market review, we have taken into account the impact of the forthcoming liberalisation and trading of mobile spectrum. Our assumption is that liberalisation of 900 MHz and 1800 MHz spectrum will have happened by 2014/15 (and most likely much sooner).¹⁰² Liberalisation provides more choice of spectrum frequencies at which a particular technology such as UMTS can be deployed (and for a given stock of spectrum this would increase its value). At the same time there may be more spectrum available with the release of digital dividend spectrum (at 800 MHz) and spectrum at 2.6 GHz, which, other things being equal, would lower the value of spectrum.

Past consideration of spectrum valuation

A9.10 Our previous charge control cost models for MCT have included an assessment of spectrum costs. Indeed, in the appeal of the current charge control, this aspect was widely debated, particularly as it was a significant component of the MCT costs.¹⁰³ In the CC's determination, in ppm terms it accounted for 0.96 ppm or 26% of 3G unit costs. The equivalent allowance for 2G spectrum costs was 0.16 ppm (equivalent to 4% of 2G unit costs).¹⁰⁴ Therefore, in order to inform our options for

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:274:0025:0027:EN:PDF. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:274:0032:0035:EN:PDF

¹⁰¹ For a more complete discussion of price signals as the appropriate regulatory objective and the application of forward-looking opportunity cost of spectrum see paragraphs 9.44 to 9.47 of the MCT Statement and paragraphs 2.3.1 to 2.3.70 of the CC's determination.

¹⁰² Directive 2009/114/EC, which amends Directive 87/372/EEC on the frequency bands to be reserved for the coordinated introduction of public pan-European cellular digital land-based mobile communications, requires Member States to make the 900MHz frequency band available for UMTS use as well as for GSM use. Similarly, Commission Decision 2009/766/EC requires Member States to make the 1 800 MHz frequency band available for UMTS use as well as for GSM use. The full text of the Directive and Commission Decision are available at:

¹⁰³ For the CC's determination on the value of spectrum under the charge control see Section 2 of its Determination: http://www.competition-

commission.org.uk/appeals/communications_act/mobile_phones_determination.pdf

¹⁰⁴ This value is taken from Table 2.10 (page 75) of the CC's Determination. 3G unit costs consisted of 3G incoming voice call network costs plus 3G spectrum allowances.

the valuation of spectrum, we have looked at the main conclusions arising from the Determination.

The CC's final determination: the 2G cap approach

- A9.11 The CC determined the value of 2×10 MHz of 2.1 GHz spectrum to be £2.67bn (2006/07 prices) based on the assumption that the spectrum is put into use as soon as it is purchased. However, the CC accepted that it is reasonable to assume that there will be a period of time between the purchase of spectrum and the time that the spectrum is put into productive use (i.e. a gestation period). In its 2009 determination, the CC found that it was appropriate to allow for an adjustment to spectrum value to reflect the costs associated with gestation. It concluded that a period of two years was appropriate for 2.1 GHz spectrum (i.e. the difference between the expected time of the purchase of spectrum and when it would be put into use was two years). After these adjustments are allowed for, the implied value of 2.1 GHz spectrum determined by the CC is £2.5bn (2008/09 prices) when treated as if it were a one-off licence payment in an auction.¹⁰⁵
- A9.12 This £2.5bn figure (2008/09 prices) was not a direct estimate of the value of 3G spectrum. But it was a value implied by adopting the "2G cap" approach. In its Determination, the CC accepted arguments first put forward by BT that the value of 3G spectrum could be determined by looking at the network costs of voice termination over the 2G network (at 1800 MHz) plus the value of 2G spectrum established by 2G AIP.¹⁰⁶
- A9.13 AIP is intended to reflect an intentionally conservative estimate of the (nonliberalised) opportunity cost of 1800 MHz spectrum. This is based on the trade-off at the margin between the amount of spectrum used and network costs. For a given amount of spectrum, more capacity can be provided by increasing the size of the network i.e. increasing the number of base stations and/or the traffic-handling capacity at the base stations. Or for a given network cost, more capacity can be provided if more spectrum is deployed.
- A9.14 The CC's rationale underlying the 2G cap principle at the time was that this cap would set an upper limit on the amount that an operator delivering voice termination on its 3G network could charge in a competitive market. In particular, at paragraph 2.9.10 to 2.9.11 of its determination, the CC highlighted that the principle underpinning this approach was that for a service supplied in a competitive market, the introduction of a new and more efficient technology (e.g. 3G) delivering existing services should not cause prices for an existing service to rise. Under this approach, the value of 3G spectrum would be the difference between the sum of 2G network unit costs and spectrum unit costs (i.e. including a contribution to AIP for 1800 MHz spectrum) and the unit network costs associated with voice termination delivered on the 3G network only (i.e. excluding any contribution to spectrum assets). This implied (3G) spectrum valuation calculation is shown (in pence per minute terms) in Figure 20 below.

¹⁰⁵ We apply two conversions to the CC's £2.7bn value of 2.1 GHz spectrum to produce the £2.5bn value. The first conversion removes two years of gestation cost from the spectrum value. This is done by multiplying the spectrum value by $1/(1+WACC)^2$. This value is then converted to 2008/09 prices to give a value of £2.5bn. ¹⁰⁶ 2G AIP fees are paid by spectrum licence holders for their use of that spectrum. These are

¹⁰⁶ 2G AIP fees are paid by spectrum licence holders for their use of that spectrum. These are calculated based on the MCPs' costs of gaining or losing a carrier (2*200 kHz) of 2G spectrum.



Figure 20: Derivation of the implied value of 3G spectrum in 2010/11 (2006/07 prices)

Source: Ofcom based on Table 2.10, CC, January 2009¹⁰⁷

- A9.15 In Figure 20 above, the 0.96 ppm value (in 2006/07 prices) is the implied spectrum value that equalises the modelled unit cost of 2G and 3G termination for a 1800 MHz-only 2G/3G MCP in 2010/11.
- A9.16 In the CC's final determination, the CC considered that the benefit of the 2G cap was that "...*it generates an upper bound for the 3G spectrum allowance within the MCT charge controls that can be derived from a coherent methodology.*" (paragraph 2.9.148). However, while the CC made use of the 2G cap approach, it accepted that the 2G cap was not ideal in certain respects, but in the absence of better data or alternative approaches, considered it appropriate in the circumstances. For example, at paragraph 2.9.149 it noted that "...*relying on 2G costs is unlikely to be a long-term regulatory possibility. However, we are concerned primarily with sending efficient price signals for this price control period.*"

Ofcom's concerns during the appeal regarding the particular application of the 2G cap

- A9.17 In response to the CC's draft determination, we thought that there was an important distinction between:
 - The "True 2G Cap": the principle or concept underlying the approach of the 2G cap. In particular, the cost of termination on a 2G network, taking into account the full opportunity cost of 2G spectrum, including under liberalisation; and

¹⁰⁷ <u>http://www.competition-</u>

commission.org.uk/appeals/communications act/mobile phones determination.pdf

- The "BT 2G Cap": the particular implementation of the principle proposed by BT at the time. BT assumed that the cost of 2G spectrum was determined by current AIP fees. BT also assumed that the amount of traffic on 2G networks reflected Ofcom's medium traffic scenario and medium subscriber migration scenario.
- A9.18 We accepted the principle of the True 2G cap, but we expressed certain concerns regarding its implementation. In particular, given the uncertainty at the time of our decision over the growth of 3G data services and mobile broadband, we did not consider it appropriate to accept the BT proposed implementation of the 2G cap (based on a single traffic scenario) as the uniquely correct answer to the implementation of the True 2G cap.
- A9.19 In addition, we expressed concerns over other aspects of the proposed implementation of the 2G cap:
 - 9.19.1 **Use of the AIP values:** we considered that it was not appropriate to use *only* the current level of 2G AIP fees when determining the level of the True 2G Cap as the opportunity cost of 2G spectrum may be greater than current AIP fees. We identified three reasons why current AIP fees may understate the opportunity cost of 2G spectrum:
 - Ofcom's conservative policy towards setting AIP fees;¹⁰⁸
 - The AIP fees only considered the value of unliberalised spectrum (i.e. 1800 MHz only used for 2G voice and data services). Following liberalisation existing services could be displacing higher value services that could only be provided using 3G technology; and
 - Following liberalisation, the value of 1800 MHz spectrum would be expected to increase somewhat to reflect any network cost savings from using 3G spectrum, rather than 2G technology at lower frequencies.
 - 9.19.2 **Implementation of the 2G cap:** in implementing the 2G cap approach and comparing network unit costs between the 2G and 3G networks, for various reasons,¹⁰⁹ the CC decided not to base its estimates on a 2G only model. Instead, the CC based its calculation of 2G network costs using a 2G/3G network cost model i.e. with a proportion of traffic also being carried on the 3G network. Therefore, we also highlighted that the relevant unit network costs of 2G and 3G termination will be a function of the degree of migration anticipated in the year in which the comparison is made (i.e. 2010/11).
- A9.20 Notwithstanding our concerns as discussed above, the CC's final determination settled on a value of MCT for the final year of 2010/11, which under the 2G cap as implemented by the CC implied a gestation-adjusted value for 2x10 MHz at 2.1 GHz of £2.5bn (2008/09 prices).

¹⁰⁸ For example, at paragraph 4.25 we referenced the 2004 consultation on setting AIP fees for *inter alia* 900 MHz and 1800 MHz spectrum. This consultation referred to "the policy to set AIP conservatively so as not to create disincentives for trading" and stated that "Ofcom intends initially to set AIP fees towards the bottom end of the range."

¹⁰⁹ Paragraph 2.9.129 *et seq.* of the CC's determination, sets out that a "2G only" world was not necessary or relevant given that the appropriate objective was sending efficient price signals. In its view, the counterfactual to a 3G only world would be one where the incumbents use 2G networks but other operators could enter using the 3G technologies. In such a world, in the CC's view, the scenario whereby all traffic had to be carried on 2G networks would not have arisen.

Options for forward-looking spectrum valuation

- A9.21 As explained in paragraphs A9.4-A9.9 above, under our base line assumptions for the MCT model, we are seeking to determine the appropriate values of spectrum at 1800 MHz and 2.1 GHz. This is because the network cost model uses a "blended" 2G/3G approach – modelling the network costs of a hypothetical efficient network operating 2G at 1800 MHz and 3G at 2.1 GHz to derive relevant pence per minute unit cost. These frequency and technology mixes were used in the previous charge control, and in the CC's cost modelling, and have been discussed in annex 8 of this document.
- A9.22 Looking ahead to the period covered by this market review (i.e. to 2014/15) there is significant uncertainty over valuing spectrum due to recent market and regulatory developments.
- A9.23 In the remainder of this annex, we discuss our options for valuing spectrum at 1800 MHz and 2.1 GHz. To value spectrum at 2.1 GHz, the natural starting point would seem to be the use of the previously determined value of 3G spectrum. This would take as our starting point the £2.5bn (gestation adjusted) value (2008/09 prices for two 2x5 MHz carriers) which follows from the CC's use of the 2G cap (and 2G AIP value for 1800 MHz).

2.1 GHz valuation: Use of the previously determined value of 3G spectrum

- A9.24 One basis for using the £2.5bn value (2008/09 prices) for 3G spectrum is that it is the value determined following a lengthy appeal in which spectrum costs to be recovered from voice call termination were explored in depth.
- A9.25 However, the problem with this approach is that it does not take into account new information that has come to light since the last review. There are two main reasons why we consider that value to be no longer representative of the forward-looking opportunity cost of spectrum:
 - our updated network modelling suggests that there are likely to have been significant changes in network unit costs. This suggests, at a minimum, updating the 2G cap analysis.
 - the reasoning underpinning the 2G cap i.e. that network unit cost differences at different frequencies are quite large – may not be an appropriate representation given our updated views on technological developments.
- A9.26 This is confirmed, as discussed below, when we see that the CC's £2.5bn value (or the estimate implied by re-running the 2G cap analysis) is unlikely to remain appropriate when compared to external benchmarks that might provide better information on the forward-looking value of 2.1 GHz spectrum.

Re-assessing the 2G cap

A9.27 In the light of the above, one option is to re-calculate values using the 2G cap method with more up-to-date information from our network cost model. This is to assess whether we can simply update the analysis while retaining the underlying 2G cap rationale. This re-calculated 2G cap uses as an exogenous value (or anchor point) the value of 1800 MHz spectrum based on 2G AIP but with revised estimates of network unit costs in 2014/15. Table 18 below shows the results of the 2G cap analysis using the CC's original 2G cap calculations (updated to 2008/09 prices) and also re-running the 2G cap using values from our network cost model.

Method	2x30 MHz at 1800MHz spectrum value (£bn 2008/9 prices)	2x10MHz at 2.1GHz spectrum value (£bn 2008/09 prices)	LRIC+ unit cost benchmark for 2014/15* (ppm in 2008/09 prices)	Pure LRIC unit cost benchmark for 2014/15* (ppm in 2008/09 prices)	Percentage contribution of spectrum under LRIC+	Percentage contribution of spectrum under pure LRIC
Original 2G cap based values for spectrum	£0.2bn	£2.5bn	1.0	0.5	14%	0%
updated 2G cap - equalised 2014/5 unit costs	£0.2bn	£3.6bn	1.0	0.5	17%	0%

Table 18: Comparison of valuations of spectrum under the 2G cap approaches¹¹⁰

Source: Ofcom calculations, 2010

*Unit cost benchmarks are presented with all other model inputs held at their base values. Admin costs not included in ppm values.

- A9.28 Table 18 shows the values implied by the CC's original 2G cap with a value of £2.5bn for 2x10 MHz at 2.1 GHz spectrum (when updated to 2008/09 prices) and a value of £0.2bn for 2x30 MHz at 1800 MHz (2008/09) based on 2G AIP fees.¹¹¹ Rerunning the 2G cap with annual 2G AIP fees unchanged but with the network unit costs comparison instead based on those prevailing at the end of this charge control period (i.e. 2014/15) suggests a value for 2.1 GHz of £3.6bn.
- A9.29 Re-running the 2G cap under the current network cost model therefore suggests lower 3G unit costs (assumed to be deployed at 2.1 GHz). This yields a much higher implied spectrum value than for the CC's modelling (i.e. £3.6bn rather than £2.5bn). In practice, when we take into account spectrum liberalisation (which entails greater flexibility of use) and greater availability of spectrum, we do not think that a widening of the difference in the value of 1800 MHz and 2.1 GHz seems correct. This view is supported by engineering-based analysis discussed in paragraphs A9.31-A9.38 below, which looks at the likely cost savings of operating mobile services at different frequencies.
- A9.30 Furthermore, if 3G is now an established technology and anticipating the prospect of entrants wishing to deploy the least-cost technology going forward, it may be that a method anchored around the 2G cap is in any case not the most satisfactory way to identify the spectrum costs for a hypothetical efficient mobile operator. The implied spectrum valuations generated by re-running the 2G cap may simply be an artefact of the network cost model based on what will be outdated scenarios in 2014/15. We therefore believe the 2G cap methodology is no longer appropriate to determine the spectrum values for this market review.

¹¹⁰ Both of the 2G cap methods present a LRIC+ unit costs benchmark of 1.0 ppm (excluding admin costs). As shown in column 6, there is a difference in the percentage contribution of spectrum to the unit cost benchmark under each method. However, as the difference in the percentage contribution of spectrum under each method is not that large, then once the final ppm unit cost benchmarks are rounded to the nearest decimal place, they both yield the same ppm value.

¹¹¹ In our cost model 2G AIP fees are included as the cost of 2x30 MHz holding of 1800 MHz spectrum. We have capitalised these payments so that we can compare the value of a 2x10 MHz holding of spectrum over the life of the network (i.e. until 2039/40) with our alternative benchmark values.

Spectrum liberalisation and the modelling of network cost differences

Value of liberalised spectrum at 1800MHz and 2.1 GHz is very similar

- A9.31 In the long run, the relative value between two frequency bands used to deliver the same services in competitive markets would be expected to be driven by the network cost differences between supplying those same services at the different frequencies.¹¹² We discuss below why network cost differences associated with the use of 1800 MHz and 2.1 GHz spectrum are unlikely to be significant in practice.
- A9.32 In the context of our work looking at the impact of the liberalisation of spectrum previously reserved for GSM mobile, we found that the likely network cost savings of 3G services operating at 1800 MHz instead of 2.1 GHz were not significant.¹¹³ In early 2009, we consulted on how we should implement the (then) proposed European Directive and a draft *Radio Spectrum Decision* that would require the 900 MHz and 1800 MHz bands to be made available for UMTS (3G) as well as GSM (2G) technologies and additional mobile spectrum by May 2010.
- A9.33 As part of the impact assessment of the possible benefits of 2G liberalisation, in annex 13 and 14 of that consultation, Ofcom developed a detailed engineering-based model of the possible network cost savings of deploying UMTS over different spectrum frequencies (i.e. 900 MHz versus 1800 MHz and 2.1 GHz).¹¹⁴ The modelling of network cost differences at different bands was first set out in our 2007 consultation, where we sought to quantify the impact of the use of different frequency bands on the provision of high quality mobile broadband services. We did so because the impact (if any) of the uneven distribution of the 900 MHz and 1800 MHz spectrum between MCPs depends (among other things) on the extent of these differences.
- A9.34 Our analysis in early 2009, shown in Table 19 below, indicates that in densely populated areas,¹¹⁵ having access to 1800 MHz spectrum rather than 2.1 GHz spectrum would not in practice make a significant difference to the cost of network deployment (based on the number of cell sites that would be required at different frequencies to meet a given demand).

¹¹² In principle, if a specific frequency provides an unmatchable advantage over another frequency for particular services or applications, then this is also relevant to the relative value of those bands. However, in the case of mobile voice calls, we do not consider that there would be a discernible difference, for example, in relation to quality in operation at the two frequency bands. However, there may be relative advantages of particular frequencies for different services. ¹¹³ See the initial consultation published in September 2007

http://www.ofcom.org.uk/consult/condocs/liberalisation/ and the further consultation published in February 2009

http://www.ofcom.org.uk/consult/condocs/spectrumlib/

¹¹⁴ See: <u>http://www.ofcom.org.uk/consult/condocs/spectrumlib/annex13.pdf</u> and

http://www.ofcom.org.uk/consult/condocs/spectrumlib/annex14.pdf

¹¹⁵ This area would correspond to 80% population coverage.

Demand	Number of sites required at 1800 MHz with 2 carrier spectrum	Number of sites required at 2100 MHz with 2 carrier spectrum	Difference
1 MB / user / day	12,818	12,776	0.3%
10 MB / user /	13,490	13,448	0.3%
30 MB / user /	18,911	18,914	0.02%

Table 19 : Site count differences implied by operating mobile services at different frequencies in densely populated areas

Source: Ofcom, February 2009¹¹⁶

- A9.35 The results in Table 17 suggest that the number of sites required to deliver different demand scenarios (ranging from 1 MB to 30 MB per user per day) would be nearly identical at the two frequencies in densely populated areas. On this basis there would not seem to be a significant difference in network costs.
- A9.36 In less densely populated areas, the modelling results suggested a more significant difference than in the densely populated areas. Our base case indicates that using 1800 MHz would require 2,074 sites and using 2.1 GHz would require 2,568 sites. The sensitivity analysis conducted in the consultation also suggested that there was a relatively small difference in sites required between 1800 MHz and 2.1 GHz under alternative assumptions.
- A9.37 Applying the site count differences implied by the 2G liberalisation consultation in dense and less densely populated areas to our network cost model does not suggest large network costs differences. To assess this we used the implied cell site savings discussed above of operating UMTS services at different frequencies in densely populated and less densely populated areas.¹¹⁷ This resulted in an implied unit cost difference at 1800 MHz and 2.1 GHz of significantly less than 0.1 ppm in 2014/15 (2008/09 prices).
- A9.38 On the basis of the above it appears that there is almost no difference in unit costs for a national deployment of 3G services using either 1800 MHz or 2.1 GHz frequencies. This confirms that, after spectrum is liberalised, in 2014/15 the 2G cap methodology is no longer appropriate. The methodology artificially generates a very large difference between the value of spectrum currently used for 2G services at 1800 MHz and the spectrum currently used for 3G services at 2.1 GHz.

Benchmarks for 2.1 GHz spectrum valuations from market developments

A9.39 As noted above, after spectrum liberalisation, setting 3G spectrum values based on the 2G cap may not be appropriate, particularly when compared to external

¹¹⁶ See Annex 13: <u>http://www.ofcom.org.uk/consult/condocs/spectrumlib/annex13.pdf</u>

¹¹⁷ Specifically, we assessed the network cost differences of operating 3G services at 2.1GHz and 1800 MHz. As the variation in cell sites was observed in less densely populated areas, we analysed the impact of extending coverage to these areas (interpreted in our model as the geo-types other than Urban, SU1 and SU2) and covering an area of 91856 sq.Km (this latter assumption was used to match the area modelled in the 2G-liberalisation analysis). To be able to calibrate our model so that it matched the difference in site counts for services operating at 2.1 GHz and 1800 MHz in the 2G liberalisation analysis, we varied the cell radii assumptions for cells in less densely populated areas. Therefore, with 2100 cell radii maintained at current levels, the 1800 cell radii were adjusted for 'less densely populated areas' to achieve a site count ratio between 2100 and 1800 in the less dense geotypes (=91, 856 sq.Km) of approximately 1.24 to 1 (i.e. a ratio of 2,568 cell sites at 2.1 GHz to 2,074 at 1800 MHz).

benchmarks. It is likely that these benchmarks yield better information on the forward-looking value of spectrum.

- A9.40 In principle a number of recent benchmarks for assessing the forward-looking value of liberalised 2.1 GHz spectrum can be identified, including:
 - Spectrum awards;
 - The implied value from recent bids for T-Mobile in the UK.

Spectrum awards

- A9.41 Licence auction payments are useful, in that they provide information on what MCPs were actually willing to pay for spectrum in a competitive bidding process and the amounts paid are in the public domain. However, the payments from the UK 3G licence awards in 2000 cannot now be taken as an appropriate forward-looking opportunity cost benchmark for 2.1 GHz spectrum. From the evidence shown below, it appears that market conditions have changed significantly since 2000. Therefore, we cannot simply accept the historical valuation of approximately £3.7bn (in 2000/01 prices) per 2x10 MHz of 2.1 GHz spectrum, which corresponds to £4.8bn (in 2008/09 prices).
- A9.42 In principle, if we had information on MCPs' valuations and bidding strategies at the time this information could be used to assess how changing expectations of service growth and revenues may feed into a forward-looking spectrum valuation. However, as part of our information requests for the current charge control, there was not sufficient contemporaneous information from MCPs prior to the 2000 auctions for this purpose. Moreover, ten years have now passed and many competitive parameters have changed in what is a dynamic industry.
- A9.43 In any case, given the rejection by the CC and CAT of scenarios for spectrum values at 2.1GHz based on the 3G licence auctions, we do not propose to consider scenarios in which the historic payments made are used as inputs to our forward looking model of voice call termination costs.
- A9.44 Nevertheless, further benchmarks for the value of spectrum can be obtained by considering not just UK spectrum awards since the 3G licence auctions in 2000 but also more recent auctions from other countries. We set out in Table 20 below the results from a selection of auctions.

Date	Country	Use	Band	GBP/MHz/pop	GBP/MHZ/pop (2008/09 prices)	Adjusted values for two 2 ⁵ 5MHz and UK population (£ million) (2008/09 prices)
2000	UK	UMTS	2100	6.24	7.92	4,754
2000	Austria	UMTS 2 GHz	2100	0.85	1.08	648
2000	Germany	3G	2100	6.30	7.99	4,795
2000	Italy	3G	2100	2.30	2.92	1,752
2000	Netherlands	3G	2100	1.80	2.28	1,369
2000	Switzerland	3G spectrum	2100	0.18	0.23	139
2001	US	Mobile	1900	5.20	6.44	3,867
2001	Austria	GSM - 1800	1800	0.25	0.31	186
2001	Belgium	3G	2100	0.61	0.76	457
2001	Denmark	3G	2100	0.96	1.20	717
2001	Greece	3G	2100	0.61	0.75	452
2001	Greece	2G and 3G	1800	0.26	0.33	195
2001	Norway	900 Mhz	900	0.19	0.24	143
2001	Norway	GSM 1800 MHz	1800	0.16	0.20	121
2002	Austria	GSM	1800	0.06	0.07	44
2003	UK	Wireless broadband	3400	0.01	0.01	4
2003	Norway	3G Licence 2	2100	0.29	0.34	206
2004	Austria	GSM 2004	1800	0.01	0.01	5
2004	Norway	450 MHz auction	450	0.18	0.21	125
2005	UK	Mobile	1781	0.02	0.02	13
2005	Denmark	UMTS	2100	0.60	0.68	409
2005	US	Mobile	1900	3.00	3.38	2,029
2005	US	Various	1900	1.72	1.94	1,163
2005	US	Mobile	1900	1.00	1.13	676
2005	Ireland	450 MHz	450	0.01	0.01	7
2005	Sweden	450 MHz	450	0.40	0.45	271
2006	UK	PAMR	412	0.01	0.01	8
2006	US	AWS	1900	0.54	0.59	353
2006	Austria	450 MHz	450	0.11	0.12	73
2007	NI + ROI	Wireless broadband	1785	0.01	0.01	5
2008	UK	Various	1450	0.01	0.01	4
2008	UK	Various	10000	0.00	0.00	0
2008	UK	Various	28000	0.00	0.00	0
2008	UK	Various	32000	0.00	0.00	0
2008	Norway	3G	2600	0.04	0.04	26
2008	Sweden	3G	2600	0.26	0.27	159
2008	US	Mobile	700	1.39	1.43	856
2008	Austria	900 MHz	900	0.06	0.06	37
2009	Finland	Mobile broadband	2600	0.01	0.01	3

Table 20: Benchmarking of fees paid in international spectrum awards

Source: Ofcom calculations, 2010 based on award data from regulators' websites

A9.45 In Table 20 above we have converted the amounts paid in local currencies into a £/MHz/pop value.¹¹⁸ In addition, in the last column we calculate the implied licence value associated with a 2x10 MHz holding scaled for the UK population (in 2008/09 prices). Table 20 suggests a wide variation in the implied value of spectrum, but the results are significantly below those seen in 2000 and 2001 in the UK and US. The highest value award in the last couple of years was in the US for 700 MHZ which was equivalent to £0.9bn for 2x10 MHz. Since 2001, only two awards have

¹¹⁸ In calculating per MHz values, we have based this on a paired spectrum holding (i.e. per MHz of paired spectrum). For example 2 x 10 MHz we would divide the amount paid in the spectrum award by 10 (rather than 2 x 10) in order to calculate the value per MHz of paired spectrum. In relation to unpaired spectrum, in some international awards the licence included a bundle of paired and unpaired spectrum. In our per MHz valuations we have not included the unpaired spectrum. This approach is likely to yield slightly higher values per MHz of paired spectrum but is intended to reflect the situation in the UK where unpaired spectrum remains largely unused and therefore is only likely to have contributed minimally to the overall spectrum value.

generated values in excess of \pounds 1bn (when converted to UK pop/ 2x10 MHz and 2008/09 prices). Table 21 below presents averages based on the above results.

Table 21: Average of fees paid in international spectrum awards

International benchmarks considered	GBP/MHz/pop (2008/09 prices)	Mean of adjusted values for two 2*5MHz and UK population (£ million) (2008/09 prices)	Median of adjusted values for two 2*5MHz and UK population (£ million) (2008/09 prices)
Total average (incl. 2000/01)	1.11	669	159
UK average (incl. 2000/01)	1.00	598	4
Awards within 2GHz (+/- 1GHz) (incl. 2000/01)	1.52	909	353
All awards post 2001	0.43	259	37
Post 2001 awards within 2GHz (+/- 1GHz)	0.61	364	102

Source: Ofcom calculations, 2010

- A9.46 Table 21 above suggests that the overall average paid was £0.7bn (adjusted to UK 'equivalent' values). This overall average incorporates the US and UK awards in 2000/01 that now look in excess of the market value revealed by more recent awards in the UK and other developed countries.
- A9.47 However, in comparing the results of auctions in different countries, for a given spectrum frequency, we think that it is important to highlight the difficulties in obtaining a like-for-like comparison between different auction results. This is because there are a multiple factors that might explain variations between auctions. For example, among other things, auction awards will be affected by:
 - the fact that the expected average revenue per user (ARPU) may vary by country;
 - the degree of competition in downstream mobile markets;
 - whether the frequencies are standardised and harmonised for mobile use (meaning that a range of equipment will be available in sufficient volumes and that roaming is possible);
 - the conditions or restrictions attached to the use of spectrum licences (including geographic restrictions or population coverage requirements);
 - the format and design of the auction;
 - the length of the licence (or the expected security of tenure of the licence);
 - the number of bidders for spectrum within that auction;
 - the availability of alternative spectrum frequencies (in particular with liberalised use for mobile) and the prospect of future spectrum auctions or awards; and
 - even with the same population levels (which we adjust for), the density of population (i.e. population per km²) may also be relevant.
- A9.48 Notwithstanding these factors, the results from the most recent international spectrum awards do not suggest a value of spectrum close to either the historic UK

3G licence payments or the value used under the 2G cap from the CC's determination of £2.5bn or the re-run 2G cap of £3.6bn (2008/09 prices). Indeed, the highest value spectrum award since 2001 was in the US in 2005 when the 1900 MHz award suggested a value for 2 x 10 MHz of around £2bn (in 2008/09 prices) if applied to the UK population. Since then no award has come close, with the US award of 700 MHz spectrum yielding a "UK-equivalent" value of around £0.9bn (in 2008/09 prices). Due to the potential network cost savings associated with lower frequencies, if anything, 2x10 MHz at 700 MHz may be of considerably more value than 2x10 MHz at 2.1 GHz. If we considered a simple average of post-2001 auctions for spectrum close to 2 GHz (i.e. +/- 1GHz) then this would suggest a value closer to £0.4bn.

- Recently external analysts have made some predictions of the potential valuations A9.49 of spectrum in different countries including the UK. For example, Barclays Capital estimated a €/MHz/pop valuation of €0.5 for 800 MHz and €0.2 for 1800 MHz/2.1 GHz (in "UK equivalent terms" for a 2 x 10 MHz paired holding this would equate to £0.5bn and £0.2bn (£/MHz/pop) respectively).¹¹⁹ While Barclays Capital does not necessarily claim that these are precise calculations of spectrum valuation, its appraisal of spectrum values is clearly more consistent with the evidence we have gathered from recent international benchmarks rather than the 2G cap derived values.
- Other industry analysts such as Fitch Ratings¹²⁰, Price Waterhouse Coopers¹²¹ and A9.50 UBS¹²² have also sought to value spectrum based on more recent international awards. These commentators considered that the results of the Swedish award in 2008 provided (at that time) a useful benchmark of likely amounts to be paid for spectrum in forthcoming awards.¹²³ PWC estimated that the total value of forthcoming spectrum across major European countries would be €40bn (this estimate is based on recent Swedish auctions controlling for revenue per user, market concentration and penetration of different services). UBS suggested a valuation of spectrum of €7.2bn for released spectrum across major European countries over a shorter time frame of 2009/10. Fitch Ratings estimated that the Sweden auction could translate into a value of spectrum in the UK of €2.8bn (£2.5bn) for the forthcoming awards. For this latter estimate for the UK, with a total of 100 MHz of additional paired spectrum potentially on offer over the next few years,¹²⁴ this could equate to a value of £0.3bn for 2x10 MHz.
- Assessing the above international benchmarks in the round and taking a A9.51 conservative view, suggests a possible low valuation of around £0.3bn and an upper estimate of around £1bn for 2x10MHz (2008/09 prices). More recent awards suggest that this upper bound is more likely for lower frequency spectrum bands than those used in our cost model. For awards after 2001, at frequencies close to

¹¹⁹ "Spectrum: Quality versus Quantity – risk of new entrants", Barclays Capital, 14 January 2010 ¹²⁰ Telecommunications EMEA Special Report, "European Telecoms – Spectrum Issues to the Fore", Fitch Ratings, 17 November 2009 ¹²¹ See: <u>http://www.pwc.com/en_GX/gx/communications/pdf/spectrum_releasing_value.pdf</u>

¹²² UBS Investment Research "Calling Fundamentals – The UBS Wireless Quarterly", 2 April 2009 ¹²³ In these reports there is a degree of variation in the estimates of between 0.13 to 0.16 €/MHz/pop (possibly reflecting differences in exchange rate, and population assumptions and in particular the total usable MHz (i.e. whether to include the results of TDD (unpaired) licence allocations). The assumption over usable MHz is likely to explain the differences with Ofcom's own calculations of £/MHz/pop of paired spectrum in the Swedish 2.6 GHz award.

¹²⁴ See for example pp17-18 of the BIS consultation on a Direction to Ofcom to Implement the Wireless Radio Spectrum Modernisation Programme, October 2009. http://www.berr.gov.uk/files/file53061.pdf

those used in our cost model, the 2 x 10 MHz "equivalent" values are clustered towards the bottom of the range (\pounds 0.3bn to \pounds 1bn). In the light of this, we consider that, an appropriate base case estimate of the forward looking value of 2 x 10 MHz spectrum to be used as an input into our cost model (under the alternative LRIC+ scenario) would be \pounds 0.5bn based on international benchmarks. Slightly higher or lower values would also be reasonable, but as explained above different values have no impact on the charge under our preferred approach (pure LRIC) and only a limited effect under the alternative cost modelling approach (LRIC+).

Value implied by the T-Mobile/Orange merger

- A9.52 There is anecdotal information on bids apparently made for T-Mobile (prior to its merger with Orange) of £3.5bn.¹²⁵ This information potentially provides a market-based view of the value of using (amongst other things) the spectrum assets of the firm.
- A9.53 We do not think great weight can be placed on this information, which is only anecdotal (and as the offer was not, in any case, accepted, it does not follow that these bids represented a fair-value). Even if the £3.5bn were indicative of the overall value of T-Mobile, we would need a way to separate out the value of the spectrum holdings from the other factors affecting the total valuation of T-Mobile. Such factors might include outstanding debt levels and synergies associated with the take-over.
- A9.54 In terms of the Orange/T-Mobile merger itself, we consider that it would be difficult to produce a spectrum value. As T-Mobile and Orange have formed a joint venture, we would in principle only have the relative value of the two firms.
- A9.55 Outside the joint venture itself, we consider that in so far as any credence can be put on the reported £3.5bn valuation of the T-Mobile business, this would place an upper bound on the value of the spectrum assets used in the UK (indeed not just the value of 2.1 GHz spectrum holdings but all spectrum holdings).

Comparison of 2G cap approach to external benchmarks

- A9.56 The above comparison of external benchmarks suggests that the £2.5bn valuation (2008/09 prices) used by the CC is no longer credible as a valuation of 2x10 MHz of 2.1 GHz spectrum. To put the £2.5bn into context, this valuation of spectrum would represent over 70% of the total amount that Vodafone and O2 were apparently willing to pay for the total T-Mobile UK business. Furthermore, this value of spectrum for 2x10 MHz of spectrum in the UK would represent between 6-7% of the total market capitalisation of T-Mobile or France Telecom businesses (which cover significantly more than just the UK and more than just mobile operations).¹²⁶ For the same reasons, the re-run 2G cap, which yielded a value of £3.6bn looks even further out of line with reasonable benchmark values.
- A9.57 Given the overall uncertainty in valuing spectrum, a more pragmatic modelling approach might be to set the same value of spectrum at 1800 MHz and 2.1 GHz. As argued in A9.31 onwards, we consider that this is justified on the grounds that any difference in network costs of operating UMTS at 1800 MHz and 2.1 GHz is negligible. However, this still requires us to select an appropriate value of spectrum

¹²⁵ http://business.timesonline.co.uk/tol/business/industry_sectors/telecoms/article6823290.ece

¹²⁶ This estimate is based on market capitalisations of £38 billion for T-Mobile and £39 billion for

France Telecom expressed in 2008/09 prices based on Bloomberg data as at 20 January 2010.

that we could then apply both to 1800 MHz and 2.1 GHz. We have two options remaining – make use of the 1800 MHz AIP values or rely on international benchmarks.

Use of 2G AIP or international benchmarks

- A9.58 Arguably, the use of 2G AIP would be consistent with the CC's past determination as it accepted this as an appropriate value of spectrum at 1800 MHz. Based on using equal values for 1800 MHz and 2.1 GHz, then we would simply have to adjust our model so that 2G AIP fees for 2 x 30 MHz at 1800 MHz would also include 2 x 10 MHz for the 2.1 GHz holding.
- A9.59 However, as discussed in paragraph A9.19.1, due to the way in which 2G AIP was determined, we view 2G AIP as an unduly conservative estimate of the value of spectrum for the purpose of determining efficient unit costs in 2014/15. The extent to which the value of spectrum at 1800 MHz is underestimated when using 2G AIP depends on the interplay between mobile spectrum demand and supply (recognising the potentially off-setting effects of, on the one-hand liberalisation increasing value, but on the other, increased supply from other substitute bands reducing spectrum value, other things equal).
- A9.60 To compare the 2G AIP values with international benchmarks, we have included below a comparison of the value of spectrum implied by 2G AIP by capitalising the assumed flow of AIP fees in our cost model. In our model, operators would pay £17.7m per annum for 2 x 30 MHz at 1800 MHz (equivalent to £5.9m per annum for 2 x 10 MHz), which is then capitalised from 2004/05 to the end of the lifetime of the network using the central estimate of the weighted average cost of capital as a discount rate).
- A9.61 This means that the capitalised value based on 2G AIP fees is less than £0.1bn in 2008/09 prices for 2 x 10 MHz. Comparing this to the value of spectrum from international benchmarks suggests that 2G AIP on a like-for-like basis is likely to be an unduly conservative estimate of the value of 2 x 10 MHz of spectrum. For the international awards considered, the results shown in Figure 21 suggest that capitalised 2G AIP is likely to understate the forward-looking value of liberalised 2.1 GHz spectrum.



Figure 21: Comparison of international awards with capitalised 2G AIP fees for 2x10 MHz of spectrum

Source: Ofcom, 2010

- A9.62 We consider that evidence from past and recent international spectrum auctions provides the best available evidence of spectrum value on a forward-looking basis, despite the significant difficulties in drawing clear conclusions from international benchmarks alone (due to the complications in ensuring a true like-for-like comparison). While some awards are below those implied by the 2G AIP, we have to consider the context in which some of those auctions were conducted.¹²⁷
- A9.63 Assessing the above evidence in the round and taking a cautious view, suggests a possible low valuation of £0.3bn and an upper estimate of no more than £1bn for 2x10 MHz (2008/09 prices). We have assessed these possible high and low values and consider that a value nearer the bottom of the range is more likely than towards the upper end (given the clustering of international benchmarks). The base case we have used in our LRIC+ estimates is a value of £0.5bn for 2 x 10 MHz (in 2008/09 prices) which is towards the lower end of the range and is close to the post 2001 average for awards around 2 GHz.

¹²⁷ See A9.47 above. For a specific example, see: <u>http://www.analysysmason.com/Consulting/Services/Strategy-consulting/Spectrum-management/Articles-on-spectrum/Rock-bottom-prices-paid-for-Finlands-26GHz-spectrum/</u>

Summary and conclusions

A9.64 Table 22 below shows the pence per minute impacts of results based on the two 2G cap approaches previously discussed in paragraphs A9.27-A9.30 and the valuations derived from international benchmarks.

Method	2x30 MHz at 1800MHz spectrum value (£bn 2008/9 prices)	2x10MHz at 2.1GHz spectrum value (£bn 2008/09 prices)	LRIC+ unit cost benchmark for 2014/15* (ppm in 2008/09 prices)	Pure LRIC unit cost benchmark for 2014/15* (ppm in 2008/09 prices)	Percentage contribution of spectrum under LRIC+	Percentage contribution of spectrum under pure LRIC
Original 2G cap based values for spectrum	£0.2bn	£2.5bn	1.0	0.5	14%	0%
updated 2G cap - equalised 2014/5 unit costs	£0.2bn	£3.6bn	1.0	0.5	17%	0%
International benchmarks - lower case (£0.3 billion)	£0.9bn	£0.3bn	1.2	0.5	27%	0%
international benchmarks - Base Case (£0.5 billion)	£1.5bn	£0.5bn	1.4	0.5	39%	0%
International benchmark - mid case (£0.7 billion)	£2.1bn	£0.7bn	1.6	0.5	48%	0%
International benchmark - highcase (£1 billion)	£3bn	£1bn	2.0	0.5	57%	0%

Table 22: Pence per minute impact of different spectrum valuation options*

Source: Ofcom calculations, 2010

* In inputting these values into our cost models we need to take into account gestation costs.128 **Unit cost benchmarks are presented with all other model inputs held at their base values

A9.65 In all cases the ppm contribution for pure LRIC is unchanged when looking at ppm impacts under the different options for valuing spectrum. For LRIC+, the results vary more. Taking the CC's value of spectrum would result in 1.0 ppm unit cost benchmark (excluding admin costs) for LRIC + compared to a unit cost benchmark of between 1.2 ppm to 2.0 ppm using international benchmarks.¹²⁹

¹²⁸ The way we have inserted spectrum values into our model is based on the assumption that the spectrum is put into productive use as soon as it is purchased. Since international spectrum awards reflect licence payments in auctions they will be likely to reflect operators' expectations that spectrum will come into use with some delay. Therefore, to be consistent with Ofcom's modelling approach, we must uplift the values implied by international benchmarks to reflect the fact that the amounts paid will have incorporated an expectation of delay in bringing that spectrum into use. As is consistent with the CC determination, Ofcom believes that it is appropriate to increase the international benchmark values for 2 years worth of gestation costs.

¹²⁹ Both of the 2G cap methods present LRIC+ unit costs benchmarks of 1.0 ppm (excluding admin costs). As shown in column 6, there is a difference in the percentage contribution of spectrum to the unit cost benchmark under each method. However, as the difference in the percentage contribution of

- A9.66 From the evidence above, we have suggested a plausible range for estimated spectrum values from international awards of between £0.3bn to £1bn (as if expressed as a licence payment for 2 x 10 MHz in 2008/09 prices). However, we highlighted that a value towards the bottom of this range might be more plausible. So we take as a base case a value of £0.5bn as the estimate of the forward-looking opportunity cost of 2.1 GHz and 1800 MHz spectrum (as if expessed as a licence payment for 2 x 10 MHz in 2008/09 prices). Doing so yields a LRIC+ unit cost in 2014/15 around 0.4 ppm higher than using the 2G cap based spectrum values from the CC, or where the CC's 2G cap were updated and re-run. However, we consider that both of these 2G cap approaches are anchored on a value of 1800 MHz which is unduly conservative in a world of liberalised 1800 MHz spectrum.
- We note that the above considerations of spectrum value (for the purpose of the A9.67 MCT charge control) have been made on the basis of available information on current AIP fees and from the results of spectrum awards to date. However, in the timeframe to the publication of the MCT Statement there is the possibility that AIP fees may be updated in particular in the light of auctions for 800 MHz and 2.6 GHz spectrum. Indeed, the Department for Business Innovation and Skills issued a consultation in October 2009¹³⁰ on a direction to Ofcom to implement spectrum a modernisation programme. Among the consultation proposals is for Ofcom to determine to revised annual licence fees to reflect "the full economic value of this spectrum" following a combined auction of 800 MHz and 2.6 GHz. In parallel, we have issued this week a consultation: Strategic Review of Spectrum Pricing that considers spectrum pricing more generally. Therefore, pending spectrum awards may provide important information for spectrum pricing (which in any case may be updated) and hence might be factors for us to consider further in valuing spectrum for the purpose of the charge control. However, as stressed at the start of this annex, the analysis of spectrum values in this review is solely for the purposes of possible regulation of mobile termination rates and is not intended to pre-judge or influence any possible future review of AIP by Ofcom.

spectrum under each method is not that large, then once the final ppm unit cost benchmarks are rounded to the nearest decimal place, they both yield the same ppm value. ¹³⁰ http://www.berr.gov.uk/files/file53061.pdf

Annex 10

Calibration of the cost model

Overview

- A10.1 Cost models can be constructed in both 'top-down' and 'bottom-up' forms. In a top-down approach, relationships between outputs and costs are estimated from historical accounting information, and costs are projected forward on the basis of output forecasts. In a bottom-up approach, the components of cost are identified at a more granular level. Cost causation relationships are then defined to link the quantity of each of these cost components with output and other cost drivers, based on practical and theoretical evidence.
- A10.2 In this market review, as in previous market reviews, we are using a hybrid approach, with the intention of capturing the strengths of both top-down and bottomup approaches. The model has been developed as a bottom-up cost model, but it has also been calibrated by adjusting the unit cost levels and cost causality relationships of different cost components, so as to ensure the model is reasonably in line with the five national MCPs' actual costs in historical years. The purpose of this annex is to describe the methodology which has been applied to calibrate the model to accounting data, and to summarise the results of the calibration (to the extent that confidentiality of national MCP data allows this information to be disclosed).
- A10.3 All the results presented in annex 11 and the changes to the model structure described in annex 8 take into account this calibration of the model to an average efficient 2G/3G operator.

Calibration benchmarks

- A10.4 The new model has been calibrated according to two different types of high-level benchmarks obtained from the national MCPs: counts of different types of network equipment (e.g. cell sites, MSCs) and accounting costs based on data from the operators' management accounts. Ofcom requested actual and forecast equipment inventories from operators for the period 2000/01 to 2014/15. These counts related to equipment at all levels of the 2G and 3G networks, ranging from 2G and 3G cell sites through backhaul and BSCs and RNCs to equipment in the core network. Although none of the national MCPs were able to provide complete responses to this detailed request, Ofcom regards the information it received as sufficiently comprehensive for calibrating the bottom-up cost model. Cell site counts are of particular significance, because the deployment of many other network components is driven (directly or indirectly) by the number of cell sites. All five operators provided useful information on these assets.
- A10.5 Ofcom has also obtained updated figures from each of the national MCPs for network gross book value (GBV), network net book value (NBV) and network operating costs. The information provided by the national MCPs enabled an accurate calibration to be made for the years 2006, 2007 and 2008. Ofcom considers that GBV is a more appropriate calibration benchmark than actual in-year capital investment: GBV provides a snapshot of the total value of assets for a national MCP, and is therefore less sensitive to year-on-year fluctuations in investment. Network operating costs, on the other hand, are likely to fluctuate less

than capital costs on a year-to-year basis since these represent ongoing network maintenance and overhead costs. Hence network operating costs have been used directly as a calibration benchmark. However, Ofcom notes that there are still likely to be year-to-year fluctuations in these cost benchmarks which are not explainable solely in terms of factors included within the new model. NBV acts as a useful cross-check during the calibration process. When combined with an accurate calibration of GBV, an NBV calibration provides additional information on the accuracy of asset lifetimes in the model.

A10.6 Accounting data was requested from the national MCPs in the most granular form available. Given the variation in the granularity between submissions, and the scope for inconsistent cost definitions, comparisons have been made only at a high level. A detailed calibration has been made based on overall totals, and a further, more approximate, calibration has been conducted to ensure that the relative spend on access, backhaul and core is correct.

Model inputs

- A10.7 The objective of the cost modelling exercise is to establish the unit cost benchmarks for voice termination of an efficient average operator, rather than operator-specific unit cost benchmarks. The asset count and cost benchmarks (network GBV and network operating costs) discussed previously for each of the national MCPs have therefore informed the values of the input parameters for the efficient operator, and the network dimensioning rules. Ofcom believes these factors to be similar across the industry and reasonable for an average efficient operator (e.g. design utilisation). Calibration of these key inputs has resulted in a configuration of the new cost model such that high-level asset count and cost outputs (specifically GBV, NBV and opex) for the modelled efficient average operator are in line with typical observed industry values.
- A10.8 This process can be summarised in terms of adjusting a number of non-operatorspecific inputs in order to produce the closest calibration of the model to that of an average efficient operator. These inputs are as follows:
 - 1800MHz GSM cell radii by geotype;
 - 2.1GHz UMTS cell radii by geotype;
 - distribution of traffic by cell type (e.g. macro, micro, pico cells);
 - the proportion of cell sites which are shared between 2G and 3G networks;
 - MEA investment costs per unit over time;
 - MEA operating costs per unit over time;
 - unit capacities of network elements; and
 - percentage of traffic in the busy hour.
- A10.9 While the input parameters from the 2007 model formed the starting point for the inputs to the new model, some of these parameters have subsequently been adjusted during the calibration process. Ofcom and Analysys Mason have made these adjustments after taking into account more detailed and up-to-date data in relation to the benchmarks described above, as well as other technical and unit cost data received from the national MCPs.

Asset count calibration

- A10.10 The aim of the asset count calibration exercise has been to ensure that the highlevel asset counts produced by the model are consistent with average operator data. The general principle is that the count of the most important assets (e.g. macro sites) should be close to the average of the 2G/3G MCPs, and as a minimum always in between the minimum and maximum values seen across all of the operators. Ofcom has adopted a broadly similar approach as in the previous review by calibrating the overall levels in the model to average operator data for all 2G/3G MCPs, since the averaged data is more likely to give reliable estimates of overall industry figures rather than those which reflect specific operator strategies.
- A10.11 In assessing the deployment of 2G-specific and shared 2G/3G network equipment, Ofcom has taken account of the modelled and actual equipment levels of the four 2G network operators. For 3G-specific equipment, information from all five operators has been considered. The asset count calibration focussed on adjusting the cell radii, traffic in the busy hour, cell type distributions and element unit capacities. The four figures on the following pages (Figure 22 to Figure 25) show the counts of sites in the model compared to the operator benchmarks after complete calibration of the new model. This is shown on an average basis for the four 2G/3G MCPs.



Figure 22: Comparison of total 2G sites between model output and 2G/3G MCP data

Source: Analysis Mason





Source: Analysys Mason







Source: Analysys Mason



Figure 25: Comparison of total macro, micro and pico sites between model output and 2G/3G MCP data

Source: Analysys Mason

A10.12 Similar calibration exercises have been carried out on other network elements. However, reliably comparing asset counts of HLRs, RNCs and other network elements is more difficult than comparing sites. For example, there are numerous different types of RNC, each with a different maximum throughput, and MCPs tend to purchase a mix of different sizes of RNCs according to their specific needs. This makes it difficult to make a reliable comparison between the number of assets owned by each operator. Our chosen approach has been to ensure that the highlevel average cost per unit of capacity is consistent between the model and the actual MCP data.

Cost calibration

A10.13 Similarly to the calibration of asset counts, the aim of the cost calibration exercise has been to adjust model inputs so that the levels of GBV, NBV and operating costs produced by the model are broadly consistent with average operator data. The model was calibrated so that the GBV, NBV and operating expense outputs for 2006, 2007 and 2008 should be close to the average of the 2G/3G MCPs, but as a minimum always in between the minimum and maximum values seen across all of the operators. The cost benchmarks obtained from the national MCPs could not be split consistently between 2G-specific, 3G-specific and shared costs, so total network costs for each operator have been considered for the purpose of calibration. The cost calibration has focussed on adjusting MEA levels for investment and operating unit costs over time.

- A10.14 The three figures below (Figure 26, Figure 27 and Figure 28) show the levels of GBV, NBV and operating costs from the model in each relevant year compared to the operator benchmarks, after calibration of the model.
- A10.15 It might be misleading to compare the modelled capital and operating costs to the average capital and operating costs of national MCPs in isolation, without considering the total annualised costs. Modelled investment costs in some years are slightly lower than those of the average national MCP benchmarks; however, capital and operating costs may be partly substitutable depending on an operator's commercial strategy, and the lower capital costs in each case are approximately offset by the higher mobile call termination operating costs in the same year. On balance, and within the context of the accuracy of the accounting information available, we consider that our approach is reasonable in terms of any potential impact on the level of unit costs for voice termination arising from the small differences between the accounting benchmarks and modelled costs.
- A10.16 Although the model slightly underestimates GBV, the value calculated by the model is comfortably within the range supplied by the 2G/3G operators. The opex and NBV values determined by the model are closely aligned with the 2G/3G operators. Overall, we consider the model to be well calibrated to an average efficient operator.



Figure 26: GBV comparison between model output and 2G/3G MCP data







Source: Analysys Mason





Source: Analysys Mason

Annex 11

Network cost model outputs

Introduction

- A11.1 The network cost model has been used to calculate the unit costs of incoming voice using both LRIC+ and pure LRIC. The detailed assumptions underlying the model have been discussed in annex 8. The present annex summarises the results of the model under a base case scenario and also under low cost and high cost scenarios, in order to illustrate a range of possible unit cost outputs.
 - We first describe the assumptions of the base case, and then present the corresponding results (the unit costs of incoming 2G and 3G voice calls), calculated using either LRIC+ or pure LRIC.
 - The model has also been used to examine the sensitivity of the unit costs of incoming voice under a wide range of assumptions. This is carried out by means of sensitivity analyses, which are presented in the two following sections, one examining the sensitivity of the results to changes in demand assumptions, and one discussing other assumptions such as technology.
 - Following the sensitivity analyses, we present the results of the model under two other scenarios, high cost and low cost. These scenarios vary the most significant assumptions, as identified by the sensitivity analysis.

Model results for the base case

- A11.2 The base case scenario has the following assumptions:
 - An efficient operator deploying 2G and 3G technologies.
 - The 2.1 GHz spectrum used for 3G has a value of £0.5bn (for 2x10MHz in 2008/09 prices) and the 1800 MHz spectrum used for 2G has a value of £1.5bn (for 2x30MHz in 2008/09 prices).
 - Our medium forecasts (as described in annex 8) are used for all usage and takeup assumptions.
 - Long-term market share for the efficient operator of 25%.
 - Site sharing begins in Q1 2007/08, and all macrocell sites are shared by the end of Q1 2014/15.
 - Costs are in real terms for 2008/09 prices.
 - All LRIC+ values include a contribution to administrative costs
- A11.3 The resulting LRIC+ unit costs for incoming 2G and 3G voice services over time are shown in Figure 29 below.¹³¹ Unless otherwise stated all unit costs are for blended 2G/3G.

¹³¹ Note that in this annex if unit costs are shown only for a single year, this refers to the results for 2014/15.
A11.4 Both 2G and 3G voice are seen to have a decline in unit costs over time: this is due to the declining unit costs of modern equivalent assets which, when using economic depreciation, leads to a fall in unit costs over time. The significant reduction in the unit costs between 2008/9 and 2009/10 is due to a reduction in the assumed WACC for an average efficient operator. 3G services have a higher cost than 2G services until 2009/10, after which 3G services are cheaper. This is due to the more rapid decline in the costs of modern equivalent assets for 3G and the greater impact of the change in WACC upon 3G assets.



Figure 29: LRIC+ unit costs of incoming 2G and 3G voice

Source: Analysys Mason

- A11.5 The results of the model for LRIC+ give a blended LRIC+ unit cost for incoming voice of 1.7 ppm in 2009/10. This is significantly less than the unit cost of incoming voice that was calculated in the previous statement in 2007. This is primarily due to:
 - Higher demand than was previously forecast in 2007.
 - Lower unit costs for major assets.
 - Lower WACC.
- A11.6 The LRIC+ unit costs of incoming voice for 2014/15 are 2.2 ppm for 2G and 0.8 ppm for 3G. This leads to a blended LRIC+ unit cost of incoming voice of 1.5 ppm for 2014/15.
- A11.7 The unit costs for 2G and 3G voice calculated using pure LRIC are shown in Figure 30 below. The pure LRIC unit costs of incoming voice are lower than the LRIC+ unit costs, but show similar trends over time, and between 2G and 3G.

A11.8 The pure LRIC unit costs of incoming voice for 2014/15 are 0.6 ppm for 2G and 0.4 ppm for 3G. This leads to a blended pure LRIC unit cost of incoming voice of 0.5 ppm for 2014/15.



Figure 30: Pure LRIC unit costs of incoming 2G and 3G voice

Source: Analysys Mason

Number of sites

- A11.9 Cell sites are a major driver of network costs. We have therefore examined the number of cell sites that the model deploys. The number of base station sites increases steadily from around 10,800 in 2004/5 to almost 14,000 in 2020/21. The number of microcell and picocell sites increases slightly, but most of the growth comes from macrocell sites.
- A11.10 Sites in the model can be deployed using 2G-only, 3G-only, or both 2G and 3G technologies. Figure 31 below shows the mix of sites by technology. As can be seen, in 2004/5 the majority of sites are 2G-only, but over time as 3G networks increase their coverage and capacity, the mixture of sites evolves so that the majority of sites come to be either 3G-only or 2G/3G.



Figure 31: Number of sites, by technology

Sensitivity analysis: demand assumptions

- A11.1 We have carried out a number of sensitivity analyses to explore the impact of varying assumptions on the model results. This section examines the effect of changes in four demand-side parameters, while the following section considers the impact of changes to technology and market assumptions. The four demand parameters are as follows:
 - Voice usage: the minutes of use per subscriber (with the same number of subscribers).
 - **3G handset data usage**: Mbytes per handset per month of data services on 3G handsets.
 - **Datacard take-up**: the penetration of 3G datacards (with the same usage per device).
 - **Datacard usage**: the average usage (in Mbytes per datacard per month) of datacards (with the same take-up assumptions).
- A11.2 We also considered sensitivities where the forecasts for messaging and the volume of 2G handset data varied. The model was not observed to have any significant change in the unit costs of incoming voice under these sensitivities.
- A11.3 In the following subsections we consider the impact of changing each of these parameters individually, and then examine changing several (or all) of them at the same time. In all cases we compare the results for the base case (using our

medium demand forecasts) with results where the parameter has the value specified in the low or high demand forecasts. These different levels of forecast demand are discussed in more detail in annex 8.

Voice usage

A11.4 Figure 32 below shows the three voice scenarios described in annex 8.

Figure 32: Forecast for monthly outgoing MOU per subscriber



Source: Analysys Mason

A11.5 Figure 33 below shows the impact on the estimated MTR of changing the forecast usage of voice services. It can be seen that when using LRIC+, higher levels of voice usage lead to lower unit costs, with a fall from 1.5 ppm in the medium demand forecast to 1.4 ppm in the high forecast. The pure LRIC results show no change with different voice demand scenarios.



Figure 33: Sensitivity analysis of different voice usage forecasts



A11.6 The pure LRIC results are less sensitive (in both absolute and relative terms) to voice usage than the LRIC+ results as they only capture the network costs that are traffic-driven. The impact of different demand forecasts upon the pure LRIC unit cost is therefore limited to the cost-volume relationship of assets that are already deployed in significant enough numbers to be traffic-driven. As would be expected, this leads to very little variation in the resulting costs of these assets per unit of incoming voice.

Data usage on 3G handsets

A11.7 Figure 34 below shows our assumed high, medium and low scenarios for data usage on 3G handsets.



Figure 34: Forecasts for monthly 3G handset data usage per subscriber

A11.8 The model is fairly insensitive to the usage of data on 3G handsets and 2G handsets.¹³² Figure 35 shows the LRIC+ unit cost of incoming voice is 1.5 ppm under the high demand forecasts and 1.6 ppm under the low demand forecast, while the pure LRIC unit cost is relatively constant at 0.5 ppm.

¹³² Note that values in these charts are shown to 1 decimal place. In some chart there will be a change in the termination rates but this will not be enough to move the value over a rounding boundary.





Take-up of datacards

A11.9 Figure 36 below shows our assumed high, medium and low scenarios for datacard take-up.



Figure 36: Forecast for datacard take-up

Source: Analysys Mason

- A11.10 The LRIC+ unit cost of incoming voice is slightly more sensitive to our different forecasts for take-up of datacards, ranging from 1.6 ppm in the low demand forecast to 1.4 ppm in the medium and high forecasts (see Figure 37 below). The pure LRIC unit cost does not vary.
- A11.11 The forecast penetration of datacards in 2020/21 varies from 18% in the low forecast to 50% in the high forecast. Further details on these forecasts are given in annex 8.





Average datacard usage

A11.12 Figure 38 below shows the assumed high, medium and low scenarios for average datacard usage.



Figure 38: Forecast for monthly 3G data usage per datacard

A11.13 Figure 39 below shows the sensitivity of the unit cost to the average usage of a datacard. The results for LRIC+ range between 1.5 ppm and 1.6 ppm. Of the different demand parameters considered, only the assumption regarding the take-up of datacards has a larger impact than the usage of datacards.¹³³ The pure LRIC results do not vary.

 $^{^{133}}$ However, much of the impact of a change is these sensitivities is lost in the rounding.



Figure 39: Sensitivity analysis of different datacard usage forecasts

Impact of all parameters under the high demand forecasts

A11.14 Figure 40 below shows the impact of each of the main demand parameters upon the unit cost of incoming voice under the high demand forecasts. The parameters with the greatest impact are the level of take-up of datacards, the average usage of datacards (the impact of these two combined is also shown) and average voice usage. The assumptions for the usage of data on 3G handsets has a modest impact upon the unit costs of incoming voice.



Figure 40: Sensitivity analysis of different demand parameters under the high demand forecasts

Combination of multiple demand assumptions

A11.15 The effect of changing the main demand parameters together is shown in Figure 41 below.¹³⁴ With the demand forecasts for all parameters set to high, the LRIC+ unit cost is reduced to 1.3 ppm. There is relatively little impact upon the pure LRIC unit cost, which are all 0.5 ppm in the different demand forecasts.¹³⁵

¹³⁴ It should be noted that applying all of the high forecasts at the same time represents an aggressive set of assumptions. ¹³⁵ The pure LRIC values can vary between 0.45ppm and 0.55ppm and still be rounded to 0.5ppm.





Sensitivity analysis: technology, market and other assumptions

- A11.16 In this section we study the impact of a number of non-demand-related assumptions on the cost to an average efficient operator of terminating a minute of traffic. These assumptions cover both technology and market structure:
 - exclusion of site sharing
 - availability of additional high-frequency spectrum for 3G
 - Modelling the hypothetical efficient operator as a 3G-only operator
 - increased market share for the hypothetical operator
 - Changes in assumptions on the WACC of the hypothetical operator
- A11.17 The impact of different spectrum valuation scenarios is discussed in annex 9.

Site sharing

A11.18 Site sharing is included in our base case scenario, and this sensitivity analysis the impact on the cost of an incoming call if no site sharing takes place. The increase in operating and capital expenditure caused by failing to share site locations causes the LRIC+ unit cost of an incoming call to increase. In the medium and high demand forecast the increase is only slight. The pure LRIC unit cost of incoming termination remains constant at around 0.5ppm under both demand forecasts.



Figure 42: Sensitivity analysis of site sharing

Availability of additional high-frequency spectrum for 3G

A11.19 Our base case assumes that an average efficient operator has access to two paired 5MHz carriers for 3G services. Both of these are used for HSPA services, R99 data and voice services. Vodafone and H3G already have access to three paired 5MHz carriers, and we expect there to be the opportunity for all operators to purchase additional 2.6GHz spectrum in the future. This sensitivity analysis examines the impact upon the unit cost of incoming voice of having additional high-frequency spectrum (2.1GHz or 2.6GHz). It assumes that the additional carrier would cost the same amount per MHz as the first two carriers (i.e. an additional £0.25bn for 2x5MHz). The results are shown in Figure 43 below.





A11.20 When a third carrier is available, network cost reductions come from fewer macro sites having to be deployed. In the medium demand forecast 425 fewer sites are required in 2020/21, while in the high demand forecast 3178 fewer sites are required if an additional carrier is available. However, these cost reductions are not large enough to significantly impact on the cost of termination for LRIC+ or pure LRIC in 2014/15.

3G-only operator

- A11.21 The previous results showed that the unit cost for a 2G/3G operator for 2014/15 to terminate incoming 3G voice services is lower than for incoming 2G voice services. However, a new entrant to the market would not be likely to deploy its own 2G network (though it would probably use national roaming to deliver 2G services beyond its 3G coverage). We have therefore examined the possibility of the average efficient operator being a 3G-only operator. This scenario has different assumptions for market entry, coverage and market share from the case with a 2G/3G operator:
 - The 3G-only operator is assumed to enter the market in 2003/4.
 - It fully deploys its network by the end of 2012/13 to 99% of the population.
 - It grows to reach a market share of 10% by the end of 2009/10 and 25% by the end of 2014/15.

- A11.22 As shown in Figure 44 below, for such a 3G-only operator the LRIC+ unit cost for incoming voice is lower than for a 2G/3G operator in the medium demand forecast, being 1.0ppm compared to 1.5ppm for a 2G/3G operator.
- A11.23 The pure LRIC unit cost for a 3G-only operator is significantly lower than for a 2G/3G operator, at 0.3ppm in the medium demand forecast compared to 0.5ppm for a 2G/3G operator. The lower pure LRIC costs are mostly due to the 3G network being less traffic-driven than the 2G network.



Figure 44: Sensitivity analysis of assuming a 3G-only operator

Reduced market share

- A11.24 The 2007 model considered that the market share of an average efficient operator to stabilise at 20% by the latter years of the model. Due to the recent regulatory approval of the planned merger (via a joint venture) between Orange and T-Mobile, we now considered it more appropriate to use a 25% market share (corresponding to four players) in our base case.
- A11.25 Figure 45 below shows the results if we use a 20% market share (as in the previous model) under the medium and high demand forecasts. As with other sensitivities that impact the demand upon the network it can be seen that reduced market share leads to a significant increase in the LRIC+ unit cost of incoming voice, but has little impact upon the pure LRIC unit cost.





WACC

A11.26 The base case assumes a pre-tax real WACC of 7.6%. We have carried out a sensitivity analysis examining the impact of a higher (8.8%) and lower WACC (6.5%). We find that a higher or lower WACC has only a small impact upon the results for both LRIC+ and pure LRIC.



Figure 46: Sensitivity analysis of changing the WACC

Base case, high cost and low cost scenarios

A11.27 In order to define a range of possible values for the unit cost of incoming voice, we have defined high cost and low cost scenarios alongside the base case. These scenarios combine different assumptions for the two parameters that have been found to have the most significant effect upon the results – namely demand and market share. The different sets of assumptions for the three scenarios are summarised below:

Table 23: Summary of assumptions for the three scenarios

	Base case	High cost scenario	Low cost scenario
Demand	Medium	Low	High
Market share	25%	20%	25%

A11.28 The resulting unit costs for incoming voice under these three scenarios are shown below for both LRIC+ and pure LRIC. It can be seen that the LRIC+ unit cost of incoming voice ranges between 1.3 ppm and 2.0 ppm, while the pure LRIC unit cost remains relatively constant at 0.5 ppm.



Figure 47: Results for base case, low cost and high cost scenarios

Annex 12

LRIC+ vs. pure LRIC

Summary

- A12.1 This annex considers the relative merits of two different cost standards, known as LRIC+ and pure LRIC.
- A12.2 In this particular case, the two methods differ mainly in the common costs that a regulated MCP is permitted to recover from linear (i.e. ppm) mobile termination rates (MTRs):
 - 12.2.1 LRIC+ is an avoidable cost method that calculates the cost of providing termination by considering the costs of an increment of output which in our previous decisions in this area has often been taken to be the total traffic terminated by the operator, irrespective of where it was generated. It also includes a mark-up for any common costs; and
 - 12.2.2 pure LRIC is an avoidable cost method which calculates the cost that could be avoided by the operator by no longer providing termination services to third parties.
- A12.3 In practical terms, because of the difference in the method used to allow for common cost recovery, LRIC+ tends to lead to higher MTRs than pure LRIC.
- A12.4 We have used the four criteria described in the May 2009 consultation document to compare the two cost standards:
 - economic efficiency in its various guises;
 - distributional Impacts on consumers;
 - competitive impacts; and
 - commercial and regulatory consequences.

Preliminary considerations

A12.5 Taking as its starting point the need for some charge control remedy in relation to MCT (as explained in section 6), this annex assesses the arguments and evidence for and against two different types of cost-based methods that have been discussed in the May 2009 consultation, namely LRIC+ and pure LRIC (referred to as LRMC in the May 2009 consultation). It considers the arguments developed in the May 2009 consultation and responses to both that consultation and also relevant submissions responding to the European Commission Consultation¹³⁶ on the Recommendation

¹³⁶ See

http://ec.europa.eu/information_society/policy/ecomm/library/public_consult/termination_rate s/index_en.htm.

on the regulatory treatment of fixed and mobile termination rates¹³⁷ (EC Recommendation).

A12.6 This annex considers primarily the economic case for and against LRIC+ and pure LRIC. The legal issues, such as the weight to be given to the EC Recommendation, are discussed in section 7 of the main consultation.

Framework to assess the options

The May 2009 consultation document criteria

- A12.7 In the May 2009 consultation document four criteria were used to help assess the suggested options:
 - economic efficiency, in its various guises;
 - distributional impacts on consumers;
 - competitive impacts; and
 - commercial and regulatory consequences.
- A12.8 These criteria have a statutory basis (as explained in section 7), and appear to have been broadly accepted by stakeholders in their responses to the May 2009 consultation.¹³⁸
- A12.9 In the remainder of this annex, we use these criteria to assess the two cost methods, and the conditions under which each option may perform better.
- A12.10 Although we consider all four criteria relevant to this assessment, we have assigned a greater weight to economic efficiency and competitive impacts. We consider distributional impacts as important, but only if the choice of cost standard was likely to have a disproportionate impact on disadvantaged groups of consumers. Distributional impacts relate to equity and not economic efficiency considerations and are considered separately in annex 13. Although we believe that it is important to fully consider the regulatory burden imposed on all parties involved, as discussed below, the difference between pure LRIC and LRIC+ in this regard is likely to be marginal.

Defining LRIC+ and pure LRIC

LRIC+

A12.11 'Long-Run Incremental Cost plus' (or LRIC+) is a method of calculating regulated prices that has historically been applied to setting termination rates for wholesale

¹³⁷ See

http://ec.europa.eu/information_society/policy/ecomm/doc/implementation_enforcement/artic le_7/recom_term_rates_en.pdf

EC final Recommendation on termination (EC C(2009)3359).

¹³⁸ 3UK agrees with these criteria but argues that it provides no basis for ranking these considerations and suggests to base this decision on a, more objective, welfare assessment.

mobile termination and a range of other fixed (wholesale) access services.¹³⁹ A regulator calculating a charge cap using LRIC+ seeks to assess the efficiently incurred and forward-looking (or current) incremental costs of providing termination inclusive of an allocation of the common costs. This is intended to mimic, as far as feasible, what happens in competitive markets where prices are set to cover incremental costs and provide a contribution to the recovery of common costs¹⁴⁰.

- A12.12 The main features of LRIC+ as applied to termination services are:
 - 12.12.1 It is an average pricing methodology, where charges are expressed in pence per minute (ppm);
 - 12.12.2 The increment in output which was used in the last market review was total network traffic. In this document we use this as the definition of LRIC+, although the size of the increment could vary.¹⁴¹ The increment considered therefore includes traffic that terminates on the network and originates either from the same network or from other (fixed and mobile) networks; and
 - 12.12.3 It includes a mark-up for common costs which is converted into and added to the ppm charge.¹⁴²

Pure LRIC

- A12.13 In this consultation we define pure LRIC as it is described by the EC Recommendation and accompanying documents (Explanatory Note¹⁴³ and Commission Staff Working Document¹⁴⁴).
- A12.14 Pure LRIC is a method of calculating avoidable cost. It differs from the particular application of LRIC+ we used in the previous market review in that:¹⁴⁵
 - 12.14.1 The output increment used to calculate the total (and ppm unit) costs is limited to the capacity and other costs exclusively required to terminate the traffic from third parties (hence excluding other traffic and traffic that originates from the same network where it terminates);
 - 12.14.2 Common costs (whether intra-traffic common costs or non-network costs such as administration costs) are excluded.

A12.15 The explanatory note states that

¹⁴² See <u>http://www.ofcom.org.uk/consult/condocs/mobile_call_term/statement/</u>.
¹⁴³ See

¹⁴⁴ See

¹³⁹ It was also used to set fixed retail charge controls in the past.

¹⁴⁰ Where both the incremental and common costs would include an appropriate return on capital employed – calculated using the weighted average cost of capital (WACC).

¹⁴¹ We use different increments in different charge controls to address the specific circumstances. For instance, prior to 2002 Oftel set regulated MTRs using a LRIC+ approach that used a third party termination increment and we are aware other NRAs have modelled different traffic increments in their LRIC+ cost models to derive regulated MTRs.

http://ec.europa.eu/information_society/policy/ecomm/doc/implementation_enforcement/artic_ le_7/explanatory_note.pdf.

http://ec.europa.eu/information society/policy/ecomm/doc/implementation enforcement/artic le_7/working_doc.pdf.

¹⁴⁵ See Explanatory Note, footnote 143, pp. 17 and 24.

all of the incremental (avoidable) service-specific fixed and variable costs (as the fixed costs are assumed to become variable over the long run) of providing the wholesale termination service to third parties may be recovered via the regulated termination charge.¹⁴⁶

- A12.16 In other words, the total cost stack to be used is the difference between the costs required to provide the whole set of services, and that of providing the whole set of services minus the provision of termination services to third parties. As a result, the cost stack includes only the avoidable cost of no longer providing termination to third parties.
- A12.17 Specifically, the explanatory note argues that:
 - 12.17.1 Handset and SIM card costs are not traffic-related and should be excluded.
 - 12.17.2 Coverage related costs (and generally any costs that are not traffic-related) should be excluded as they could not be avoided if the network stopped providing termination to third parties.
 - 12.17.3 Investment in capacity increases that are necessary to terminate thirdparty incoming traffic should be included, as long as they are avoidable if that traffic was no longer provided.
- A12.18 In relation to the last point, in particular:
 - 12.18.1 The costs of spectrum usage are initially coverage driven i.e. are not traffic-driven and should therefore be excluded. However, in so far as additional spectrum might be required to provide capacity to terminate traffic from third parties, this should be included.
 - 12.18.2 The same principle is applied to the avoidable costs of business overheads, Radio Access Network equipment and wholesale commercial costs.¹⁴⁷

Comparing LRIC+ and pure LRIC

Economic efficiency

What do we mean by (economic) efficiency?

- A12.19 The concept of (economic) efficiency is critical to this assessment.
- A12.20 Efficiency is a multi-faceted concept, which encompasses:
- A12.21 Static economic efficiency. This is maximised when:
 - 12.21.1 prices are aligned to marginal or incremental costs (a concept known as "allocative efficiency"). This ensures that welfare is maximised by ensuring that the overall benefits to consumers and producers i.e. MCPs are maximised. Achieving such an objective e.g. by moving away from the *status quo* to pure LRIC may have implications for distribution as some parties or groups of consumers may gain while others may lose (though not as much as those who gained). These equity considerations are separately

¹⁴⁶ See Explanatory Note, footnote 143, p. 18.

¹⁴⁷ See Explanatory Note, footnote 143, pp. 24-26 and 28-29.

discussed in the section *Distributional impacts on Consumers* in annex 13; and

- 12.21.2 costs are minimised (a concept known as "productive efficiency"). This ensures that the services are produced with the most cost efficient set of inputs and technologies.
- A12.22 When comparing LRIC+ and pure LRIC, the main focus is on allocative efficiency, as the main question is how best to recover common costs. Origination and termination are jointly produced and, hence, as long as there is sufficient competition at the retail level, mobile operators seek to minimise costs. Furthermore, both LRIC+ and pure LRIC would involve setting MTRs on the basis of the efficient costs incurred and projected. This means that productive efficiency would be unlikely to be a significant concern.
- A12.23 Dynamic efficiency refers to the idea that it is not sufficient that services are produced using the most cost-efficient technology and that prices are close to costs. Firms (i.e. mobile operators) should also have incentives to invest in the quality of their current services, and also to innovate by launching new and better products that consumers value and in minimising costs by adopting more efficient technologies over time.
- A12.24 Below we separately discuss the implication of LRIC+ and pure LRIC in terms of static and dynamic efficiency.

How do LRIC+ and pure LRIC compare in terms of static efficiency?

Setting the wider context

- A12.25 The widely acknowledged 'first-best' approach in the presence of common costs is to set prices equal to the incremental (marginal) costs and have the common cost covered via a government subsidy raised via a (in theory) non-distortionary tax.¹⁴⁸ As this is clearly an unrealistic solution, the need for a practical ("second-best") solution arises. But what principles should shape that solution? This section sets out our views.
- A12.26 First, if what drives the cost of providing termination is capacity (a 'lumpy' cost, over a range of different levels of output) then it would be optimal to use capacity-based charging for MTRs, in whole or in part. This would mean that wholesale MTRs would most likely take the form of two-part tariffs.¹⁴⁹
- A12.27 Among the options considered in the May 2009 consultation, we believe that capacity-based charging (CBC) might in principle best reflect the underlying cost structure of mobile (and fixed) networks. A number of stakeholders acknowledged this. The problems with CBC are practical (as noted in responses). Thus far, there is little appetite apparent amongst industry players to address these practical obstacles. This is why we propose not to adopt (or further explore) CBC in our policy proposals in this market review.

¹⁴⁸ This would lead to an efficient outcome because prices at incremental or marginal costs would provide the correct consumption incentives and the fixed and common cost would be recovered via a tax that ideally would not distort consumption.

¹⁴⁹ The term two-part tariff refers to prices for a product or service structured as a fixed fee with separate (per-unit) usage charges.

- A12.28 Second, if CBC is impractical, and wholesale MTRs can only be structured as linear (ppm) charges, the appropriate contribution to fixed and common costs within the ppm charges needs to be determined. The amount of fixed and common costs to be recovered from termination depends critically on the fact that MCPs can recover such costs from either incoming calls, through MTRs, or from their own subscribers through subscription and call charges. Which of these is more efficient depends on a number of factors, which are difficult to estimate with precision, such as:
 - The elasticity of demand of mobile subscription and calls. A simple application of Ramsey pricing – see below - suggests that a higher proportion of common costs should be recovered via the service with the lower (in relative terms) elasticity of demand; and
 - on the other hand if, given the underlying cost structure, it is more efficient to recover common costs from two-part tariffs i.e. common costs are traffic invariant -, then the fact that this is only practicable on the subscriber-side of the market may be an important factor in this assessment.

A12.29 In the rest of this section we discuss:

- why termination is different from other wholesale (one-way) access services;
- the practical difficulties with the use of Ramsey pricing;
- how LRIC+ and pure LRIC compare in terms of allocative efficiency.

Why termination is different from other types of access charges

- A12.30 We note earlier that mobile providers could recover common costs from either (higher) MTRs and/or from their own subscribers. This is a critical distinction between termination and other access charges. Termination is a form of two-way access while other types of access e.g. charges for local loop unbundling (LLU), carrier pre-selection (CPS) and wholesale line rental (WLR) services are examples of one-way access.
- A12.31 One-way access charges refer to access to essential inputs, without which access seekers would not be able to compete, by one company to one or more downstream competitors, with no services provided 'upstream' by those purchasers to the supplier. For example, LLU, CPS and/or WLR are required by any fixed communications provider who wishes to offer a national service, unless they deploy a new network. The provision of those services by BT to others does not, necessarily, involve any provision of services by those others to BT.
- A12.32 Two-way access refers to services that allow network operators to exchange traffic between them. This refers to the decision (or obligation) to interconnect with each other. The provision of these services occurs via reciprocal arrangements whereby each provides services to the other.
- A12.33 The reason why termination is different relates to the impact that access regulation has on the regulated platform, which differs depending on whether we are dealing with one- or two-way access.
- A12.34 A related concept to two-way access is that of a two-sided market. Two-sided markets are markets where platforms provide services to two or more sets of consumers advertisers and viewers (in broadcasting or newspapers) or callers

and receivers (in telephony). What distinguishes a two-sided from a 'one-sided' market is that consumers on either side derive value from the presence of the other group (in other words, their demands are linked by "cross-group externalities", according to which demand on one side depends on participation or usage on the other side). A vital insight in relation to two-sided markets is that overall output depends not only on the overall price charged to the two sides, but also on the *relative* prices.¹⁵⁰ In relation to the issue examined here, this means that the overall call traffic, for example, does not only depend on the overall level of termination rates and retail charges (subscription and call charges), but also on their relative levels. This means that keeping the overall level of charges constant, the amount of calls varies with the price of MTRs relative to retail charges.

- A12.35 One-way access regulation may affect the overall price to consumers but does not necessarily have an impact on the relative prices of service elements offered (such as calls and access). For example, in relation to LLU, without regulation the overall prices charged by BT for LLU (if BT chose to supply it) may be excessive. Imposing an obligation on BT to provide LLU at regulated wholesale prices is likely to reduce the overall wholesale prices and lead to a reduction in the level of retail prices. If access charges did not allow BT to recover its common costs, BT may not be able to cover its total costs. This is a critical concern in one-way access which has important implications for incentives to invest and dynamic efficiency.
- A12.36 The impact of imposing charge controls on two-way access i.e. in relation to call termination is different. It directly affects the relative prices received by the provider between making a call (the retail call charge) and receiving a call (the MTR) but it does not necessarily affect the overall level of prices to consumers. This 'waterbed' effect means that reductions on one side of the market are likely to lead to increases on the other side (although this effect may not be complete). The overall or combined level of prices may or may not be affected depending on the strength of the waterbed effect.
- A12.37 Therefore, setting low wholeasle charges e.g. by not allowing common cost recovery will have very different consequences in situations of one-way access compared to two-way access:
 - 12.37.1 In one-way access, the access provider may not cover its total costs, with potentially severe consequences in terms of incentives to invest and dynamic efficiency; but
 - 12.37.2 Two-way access is different. Not allowing recovery of most common costs from one side i.e. MTRs would mean a change in the *relative* prices but not necessarily in the *overall* level of prices. This means that the risks in terms of dynamic efficiency i.e. will the operator have sufficient overall returns to continue to invest and innovate? are lower.¹⁵¹ In terms of static efficiency, however, the implications could be substantial. This is because in two-sided markets relative prices affect output and, hence, matter for economic efficiency.

¹⁵⁰ Rochet, J.C. and Tirole, J., "Two-Sided Markets: A Progress Report", *RAND Journal of Economics*, 37, 2006, 645-667.

¹⁵¹ The waterbed effect means that revenues may not decline or not decline by as much as the reduction in MTRs. However, the changes in the relative prices and in the price structure means that traffic and take-up may be affected (See Annex 13).

- A12.38 The critical question is, therefore: What are likely to be the optimal relative prices? In other words, different methods applied to common cost recovery for termination will lead to different relative prices and, hence, have an impact in terms of allocative efficiency.
- A12.39 Most MCPs (e.g. Vodafone, O2, T-Mobile and Orange) express the concern that not allowing them to recover common costs from wholesale termination will force them to recover these costs from their own subscribers i.e. through an increase in the retail tariffs. In particular, they claim that while retail call charges may decline (as a result of lower wholesale termination rates) operators will have to recover the common costs that cannot be recovered from wholesale termination from higher fixed charges (or other mechanisms) at the retail level. The providers, therefore, implicitly recognise that voice telephony is a two-sided market where a waterbed effect exists and, therefore, when prices on one side (in this case wholesale termination) are reduced there is scope for some of the prices on the other side (e.g., fixed monthly charges) to increase.

Ramsey pricing

- A12.40 Allocative efficiency is maximised if costs common to two or more services are allocated in inverse proportion to the demand price elasticity for the underlying services i.e. a higher proportion of common costs should be recovered from the services with the lower elasticity. This general result is called 'Ramsey pricing'. It was originally applied to the optimal pricing policies of a monopolist, but it has been extended to cover the pricing policies of competing suppliers in an oligopoly, such as MCPs setting MTRs and retail charges.
- A12.41 The use of a Ramsey pricing approach to the setting of regulated MTRs has been advocated in a number of responses. O2 considers that adopting pure LRIC would in fact be incorrect because it would allow no recovery of common costs from wholesale termination, while according to Ramsey pricing principles a larger proportion should be recovered from termination (which according to O2 is a more inelastic service). This is equivalent to (implicitly) assuming that the (wholesale) demand price elasticity of termination is lower than that of origination or other retail services.
- A12.42 Vodafone makes a slightly different point by arguing that the use of EPMU (under LRIC+) should be abandoned but not by reallocating common cost between origination and termination but by moving towards a Ramsey pricing approach that estimates the (wholesale) demand price elasticities for voice and data. Vodafone argues that these are simpler to estimate and raise fewer practical concerns than calculating (wholesale) demand elasticities for origination and termination services.
- A12.43 3UK accepts that a Ramsey pricing argument specifies deviations from marginal cost pricing on the basis of the relative elasticity of demand, but it then goes on to argue that this would only be a relevant consideration when firms are unable to recover common or fixed costs from fixed fees.
- A12.44 In our 2007 MCT Statement, we explained why we believed that Ramsey pricing at the wholesale level in such a complex industry was impractical, because of computational difficulties and the consequent risk of errors. We instead allocated network common costs to services implicitly through the use of routing factors within the cost model.

- A12.45 Ramsey pricing in the context of MTR regulation refers to setting the efficient prices for a provider in this case a mobile operator of two or more services e.g. wholesale termination and other unregulated retail (or wholesale) services¹⁵² in the presence of common costs. Ramsey pricing would allow setting the efficient prices subject to the constraint that the firm makes neither a loss and nor excessive returns.
- A12.46 A number of considerations are relevant.
 - 12.46.1 First, MCPs operate in a number of retail market segments (supply of data, voice, SMS etc) and achieve different margins in the supply of these services. The wholesale supply of MCT to competing providers is the only regulated market they operate in. This means the competitive environment is fundamentally different from traditionally regulated monopoly markets before liberalisation (e.g., railways or postal services) where Ramsey pricing by the state-owned monopolist or (regulated) private monopolist would have strong allocative efficiency properties. Dynamic efficiency and competiton concerns are much more important when regulating MCT.
 - 12.46.2 Second, while we accept that the approach has theoretical validity, we are not aware of empirical estimates of the relative price elasticities that could be reliably used in this particular case. As we explained in 2007 we still believe that estimating (retail and wholesale level) individual demand elasticity faced by the different operators is a very time consuming exercise. It is also subject to considerable error, because of the complexity of the tariffs offered in the retail markets. Contrary to Vodafone's arguments, we believe this exercise if anything is becoming increasingly complex due to the growing importance of data and application services. Finally, even if we were to conduct this extremely complex empirical exercise, we would need to make a number of assumptions to link changes in (wholesale) termination rates to likely changes in retail tariffs which would create a significant level of uncertainty in terms of the results. This means we do not believe it would be proportionate for us to carry out this exercise.
 - 12.46.3 Third and critically, while Ramsey pricing has favourable properties in theory, in practice, as discussed above, common cost recovery has historically occurred through appropriately calibrated mark-ups on linear charges. However, common cost recovery at the retail level, if pure LRIC is adopted would allow for reasonably efficient price discrimination. This suggests that from an allocative efficiency point of view there is one argument in favour of LRIC+ (Ramsey pricing) and one argument in favour of pure LRIC (price discrimination at the retai level) and it is quite difficult to compare the two.

Comparing LRIC+ and pure LRIC in terms of allocative efficiency

A12.47 LRIC+ allows recovery of fixed and common costs in two ways. First, in our model we calculate the costs (for termination and other services) over the total output increment. Second, costs that are common to other mobile services are 'allocated' in part to termination – these common costs include, for example, spectrum costs and central office types of costs.

¹⁵² There are also services other than voice that make the framework significantly more complex.

- A12.48 In terms of allocative efficiency one could summarise the choice between the two options as follows. Whether it is more efficient to recover the common costs that pure LRIC excludes from termination (compared to LRIC+) from:
 - 12.48.1 an increase in prices at the retail level (and most likely from fixed charges countered by a reduction in call charges) instead of
 - 12.48.2 a mark-up on a linear per minute charge at the wholesale termination level as is currently the case under LRIC+.
- A12.49 We assess the extent to which the economic arguments included in the EC Recommendation apply to the UK market.
- A12.50 First, taking coverage as given, costs are driven by the capacity required to provide the service and not by minutes of traffic. This was confirmed by a number of stakeholders when they agreed that CBC, despite its practical concerns about implementation, better reflected the underlying costs of mobile networks and termination. LRIC+ is an average cost methodology and suffers from poorly reflecting the underlying cost structure of the service provided. Therefore, it has historically lead to wholesale termination and retail origination tariffs that do not reflect properly the underlying costs and its drivers.¹⁵³
- A12.51 Second, LRIC+ assumes that the proportion of common costs that should be recovered from MTRs must be solely recovered via a mark-up on linear charges. As discussed above, in principle it could be possible to recover fixed and common costs via a fixed charge and any minute related costs could be recovered via a variable charge. Setting some or all of the total cost of termination to be recovered through a non-traffic driven charge would theoretically generate greater allocative efficiency.
- A12.52 On the other hand, we believe that the retail price structure may be more cost reflective with lower termination rates. It is likely that a reduction of wholesale termination rates would lead to lower call charges and an increase in fixed fees by mobile operators i.e. subscription charges, reduced handset subsidies etc. As it might be more efficient to recover fixed and common costs with fixed fees at the retail level the structure of prices that results from pure LRIC may be more efficient. This would also likely lead to lower retail prices for calls from fixed lines.
- A12.53 Third, the adoption of LRIC+ has historically led to high MTRs, compared to other regimes (such as reciprocity in the US or the arrangements that existed in Hong Kong and Singapore as discussed in annex 8.1 in the May 2009 consultation) or compared to fixed termination rates. While this in itself is not necessarily a concern, 'high' MTRs have historically led to retail price structures with per minute call charges being high relative to subscription charges.
- A12.54 At a simple level, a shift from LRIC+ to pure LRIC could improve allocative efficiency if the demand price elasticity of subscription is relatively low while that for calls relatively high. The shift would lead to lower MTRs and most likely to a retail price structure with lower call charges and higher fixed fees, possibly marginally limiting adoption (See para A12.87 and annex 13 for a detailed discussion) but increasing usage. The low elasticity of subscription would ensure that adoption (i.e.

¹⁵³ 3UK argues that (wholesale) mobile call termination rates effectively set a floor for retail mobile ppm charges.

ownership as defined in annex 13) is not significantly negatively affected, while a high elasticity for calls would expand demand for calls.

- A12.55 Subscribers to mobile services will take two decisions:
 - 12.55.1 First, they will decide whether or not to subscribe on the basis of the overall price of having a mobile i.e. they will consider both subscription and monthly fees and call charges. This is important as adoption of pure LRIC may mean higher prices overall (for mobile services alone, with the offsetting reductions in the price of fixed services) but will also mean that the structure of retail prices seems likely to change. Therefore, the elasticity of subscription or adoption is an imprecise measure of this as it focuses solely on the impact on adoption of an increase in price, while here we are also concerned both with a possible price increase and a change in the structure of retail prices.
 - 12.55.2 Second, once they have subscribed the level of call charges (together with how many minutes of calls are included in a bundle) will affect how many calls they will make.
- A12.56 We do not have reliable information from third party studies on demand price elasticity for subscriptions and calls which we could use in the UK. annex 13 provides some references to estimates of demand price elasticities. The available estimates of elasticity of subscriptions and calls tend to be well below unity.¹⁵⁴ Furthermore, estimates are likely to change as different retail services are launched (e.g. smartphones) and technologies change or evolve. More importantly, as discussed in annex 13 these take-up elasticities relate to subscriptions and not ownership. This in itself will tend to overestimate the impact on ownership of any price increases. A switch to pure LRIC would also likely lead to a change in the retail price structure whose impact on take-up could not be directly inferred from demand price elasticities that measure the impact of changes in the price level rather than in the structure.
- A12.57 We believe that mobile communications providers would be able to engage in price discrimination to a significant extent (although probably not perfectly) by looking at their historical ability to sort consumer types by offering an array of tariffs catering for different customer segments and customer types (e.g. high and low volume users within given segments).
- A12.58 H3G argues that when there is no alternative it may be appropriate to recover common costs through usage based charges (such as those set for mobile termination under LRIC+). However, in this case there is a clear alternative in the form of two-part retail tariffs which are already common in the mobile retail side. Research commissioned by Vodafone argues that it would be inefficient to recover common costs via lump-sum subscriber fees, unless consumers are homogeneous.¹⁵⁵ When they are not, the larger fixed fee part will create distortions by discouraging some subscribers from joining the network.

¹⁵⁴ A price elasticity of demand of less than 1 (in absolute terms) means that if MCPs attempted to increase the price of their mobile subscription by 10 percent they would lose less than 10 percent of subscribers. Revenues would increase as a result. Therefore, this suggests that a shift to pure LRIC (to the extent that this lead to an increase in the price of subscription) would not lead to a substantial decline in ownership.

¹⁵⁵ Janusz A. Ordover, "Recovering Fixed and Common Costs for Mobile Networks in Europe", 4 August, 2008.

- A12.59 We agree with Vodafone's submission that mobile consumers are heterogeneous. However, the argument that the increment in the fixed fee component will force some subscribers to drop out appears to rely on the implicit assumption that MCPs would not be able to identify the willingness to pay of their various groups of heterogeneous subscribers and, thus, engage in some (although imperfect) price discrimination. We find this hard to believe, given the detailed knowledge of the heterogeneous customer population developed by large MCPs and the sophistication brought to the task of segmenting customers with targeted offers, services and packages. Where it is possible to identify customers who are more or less price-sensitive, and the costs of retaining subscribers are small – "*a few pence a month*" as reported by the CC in 2003¹⁵⁶ – it seems to us more likely that operators would not enact price increases at the retail level which will result in a significant mobile ownership drop (See annex 13).
- A12.60 It may, therefore, be more efficient in this case from an allocative point of view to recover common costs from the retail side of the market where operators have better information about consumers' demand and can engage in price discrimination.
- A12.61 It follows that with pure LRIC, subscriptions (although not, we believe, ownership) might fall that is consumers may face incentives to use a single subscription rather than have many different subscriptions for different services. Both these effects are relevant to the distributional and consumer impacts and are discussed further in annex 13.
- A12.62 O2 argues that Ofcom has adopted retail price flexibility as a fundamental regulatory objective. O2 argues that in regulating MTRs Ofcom cannot do so with a view to address a concern at the retail level, which (in their submission) Ofcom argued is the reduced price flexibility.
- A12.63 We agree that this review is about wholesale MCT and not the mobile retail market. However, we believe that in order to fully assess the implications of different methods it is also critical to examine the likely impact at the retail level. This is particularly true in two-sided markets where changes to one side of the market affect outcomes in the other. (Indeed, one of the main concerns expressed by stakeholders is that lower termination rates would lead to changes in retail price structure and, they claim, consumers dropping-out.)

¹⁵⁶ "An important determinant of whether marginal current subscribers would leave the network if call termination revenue to the MNO was reduced is how willing the MNOs are to maintain them on their networks. One determinant of this is the incremental cost to the MNO of maintaining on the net-work customers who use their mobile very little or not at all. [] told us this cost is 'a few pence a month' and is the cost of maintaining them on the MNO's HLR system, ie the cost of part of that capacity (emphasis added). Nevertheless, [] said that such customers' tenure might be vulnerable to MNOs limiting the time prepay vouchers were valid as this would have the effect of introducing a periodic subscription fee for people who did not make any calls from their mobile. [] and [] spoke in terms of reintro-ducing time limits on the validity of prepay vouchers to compensate for reduced call termination revenues. However, [] said that, for existing prepay customers, MNOs would be unlikely to increase subscription charges (for example, by introducing an expiry date on vouchers). It said that this reflected the fact that the incremental cost of maintaining a subscriber was low." (Paragraph 8.196), CC, 2003, Vodafone, 02, Orange, T-Mobile: Reports on references under section 13 of the Telecommunications Act 1984 on the charges made by Vodafone, O2, Orange and T-Mobile for terminating calls from fixed and mobile networks, available at: http://www.competitioncommission.org.uk/rep_pub/reports/2003/475mobilephones.htm.

- A12.64 Therefore, the reduced flexibility concern mentioned in the May 2009 consultation is not an end in itself, but a relevant consideration because of the implications it may have for allocative efficiency, as discussed above.¹⁵⁷
- A12.65 Annex 13 also provides some estimates for demand price elasticity of calls. These appear to be low. However, we have similar concerns as those expressed for subscription elasticities regarding their reliability and the inferences one could draw from them. More critically, if a switch to pure LRIC led to larger bundles that would mean that the marginal price of calls within the bundle will be zero. This is likely to significantly expand usage. In the May 2009 consultation we reviewed a number of empirical data on usage. Although the available data suffer from a number of concerns one of the most reliable indicators –average monthly Minutes of Use (MoU) per capita (debiased)¹⁵⁸ shows that countries with low MTRs have a higher usage per capita (but also tend to have lower penetration rates).¹⁵⁹ We believe this is a useful indicator of output.
- A12.66 To conclude, we believe that on the basis of the evidence available one cannot necessarily conclude that a switch to pure LRIC possibly leading to a change in the retail price structure is necessarily optimal. Price discrimination at the retail level is unlikely to be perfect (as operators do not have complete information) and it is possible that as a result of a change in the price structure some mobile users may decide to no longer hold a mobile the take-up demand elasticity is unlikely to be zero. However, observed price discrimination is high and combined with the evidence presented in annex 13 we believe it is unlikely that ownership would materially decline as a result of a switch to pure LRIC. Therefore, although pure LRIC is unlikely to be optimal we believe that it would be efficient to recover, at best, a limited amount of common costs from MTRs. Therefore, as the choice is between two second-best options (LRIC+ and pure LRIC), it is difficult to conclude that either of the two cost standards should be preferred on allocative efficiency grounds.

Externalities

- A12.67 The comparison of the two cost standards has so far implicitly assumed that call and network externalities are absent. The presence of call externalities would imply that MTRs should be set below costs while evidence of network externalities would call for a mark-up on costs.
- A12.68 Network externalities have been extensively examined and calculated by Ofcom (and previously Oftel) and re-examined by the CC. In the past Ofcom had included a mark-up for network externalities i.e. in the 2007 Statement. However, the CC has recently concluded against the inclusion of a mark-up on MTRs for a number of reasons.¹⁶⁰ The CC's reasoning was as follows:

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http://www.ofcom.org.uk/consult/condocs/mobilecallterm/annex5.pdf.
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¹⁵⁹ The per capita and not per subscriber denominator is important as it removes concerns that the presence of multiple subscriptions in countries with high MTRs would depress MoU. ¹⁶⁰See <u>http://www.competition-</u>

¹⁵⁷ H3G argues that high MTRs prevent MCPs from offering flat rates ("all you can eat") tariffs. If this was the case, one may argue that this in itself would reduce flexibility at the level of retail pricing. ¹⁵⁸ See Annex 5 of the May 2009 Consultation Document,

commission.org.uk/appeals/communications_act/mobile_phones_determination.pdf, paras

- 12.68.1 The mark-up for network externalities, if any, should be smaller than the 0.30ppm determined by Ofcom;
- 12.68.2 Mobile operators would still have strong incentives to attract new (and retain existing) subscribers even in the absence of a mark-up;
- 12.68.3 Most of the mark-up is unlikely to be used to attract new (and retain old) subscribers, contrary to the intention of the policy (because of the so-called high 'leakage');
- 12.68.4 The high 'leakage' meant that the mark-up imposed social costs (i.e. excessive prices, inefficiency with the structure of prices and inequitable distributional impacts);
- 12.68.5 These social costs could only be outweighed if the mark-up for network externalities brought some social benefits. It estimated that the latter would be implausibly high for this to be possible.
- A12.69 Essentially the CC considered that a mark-up could only be small and that, in any case, it would be an ineffective policy tool to ensure that new customers were added and existing ones were retained. The reason for this is that it requires that extra profits on termination are channelled and directly used to increase mobile ownership. It is this particular link that the CC found to be weak. In annex 13, we concluded that overall the evidence suggests that the impact of a further decline in MTRs on ownership is unlikely to be material. This is indirect evidence that the level of MTRs does not have a strong impact on mobile ownership.
- A12.70 Call externalities, on the other hand, have not so far been central to regulatory proceedings. Recently call externalities have been extensively discussed in relation to bill & keep (B&K) and remain relevant to setting MTRs. However, we are not aware of any evidence on either the existence or the size of call externalities. One can, therefore, only assess the theoretical importance of this issue.
- A12.71 First, we consider the existence of call externalities. This boils down to whether on average mobile (and fixed) subscribers value positively receiving calls. This is sometimes put starkly in the following terms: consumers must enjoy receiving calls otherwise they will not answer the phone. In general, we believe that on average mobile (and fixed) users value receiving calls (although there may be a lot of variance in the value of the calls they receive). Whether on average consumers value more making or receiving calls is an empirical matter, but it seems a fair assumption that consumers assign a positive value to receiving calls.
- A12.72 Second, even if there are call externalities these may be, at least in part, internalised by consumers' behaviour or by networks' actions. One could distinguish between the following:
 - 12.72.1 Calls between consumers that are part of a 'social network' i.e. calling relationships whereby two consumers call each other by taking turns at originating the call (and, hence, bearing the costs). In this case, these consumers will share the cost of the call and, hence, the choice of wholesale regime has no impact. If there are call externalities these will be internalised under any regimes for this type of calls. Under LRIC+ (and also

^{4.1} to 4.160. This was confirmed by the Competition Appeal Tribunal (CAT), see <u>http://catribunal.org.uk/files/Judgment_1083_1085_MCT_02.04.09.pdf</u>.

pure LRIC), networks may have an incentive to internalise call externalities for on- but not for off-net calls.¹⁶¹ It may also be the case that consumers belonging to a 'social network' coordinate their network choice to take advantage of the lower on-net call charges.¹⁶² Putting these two together, this implies that for these types of calls, calls will be on-net where networks internalise call externalities. Hence, actions by networks and consumers mean that call externalities for these types of calls will be internalised and a mark-down on cost-based MCT charges (regardless of whether these are set using a LRIC+ or a pure LRIC approach) would not be warranted.¹⁶³

- 12.72.2 Occasional calls which the receiver values. Currently, in this case, the caller bears all the cost; hence, he or she makes too few or too short calls. With these types of calls it is likely that the receivers will enjoy a positive call externality. This is unlikely to be internalised by the network. Some internalisation will arise if there is some call-back behaviour. However, call back is generally assumed to apply to consumers belonging to 'social networks' as discussed above. If one accepts that under LRIC+ (or pure LRIC) networks have incentives to internalise call externalities for on-net calls but not for off-net calls, then it follows that call externalities are not internalised for off-net calls. However, there is some evidence that consumers that belong to a 'social network' coordinate their network choice. Hence, it is likely that many occasional calls will be off-net where call externalities are not internalised;
- 12.72.3 'Nuisance' calls i.e. marketing or pre-recorded calls. These are marketing calls or other nuisance calls that receivers do not want to receive. In this case the call externality will be negative. It is possible that the presence of telephone directories makes these calls more frequent on fixed rather than mobile numbers.
- A12.73 The May 2009 consultation raised the concern that lower MTRs (i.e. under pure LRIC) may lead to an increase in nuisance and unwanted calls. This is effectively a concern about an increase in negative call externalities. H3G argues that spam may only become a substantial concern if MTRs are set at zero.
- A12.74 It is difficult to assess *ex ante* how important this risk will be, although we take it seriously. We believe that the correct approach, if concern were to arise in the future, is to increase our efforts on Telephone Preference Scheme enforcement and use of regulatory instruments such as Sections 128 to 130 of the Act to address unlawful marketing activity.¹⁶⁴ As mentioned in the May 2009 consultation, this seems to be the approach adopted in countries with very low termination rates.

¹⁶¹ Hoernig, S., "On-Net and Off-Net Pricing on Asymmetric Telecommunications Networks", *Information Economics and Policy*, 19(2), 2007, 171-188, version read available at http://www.anacom.pt/content.jsp?contentId=476847 and "Tariff-mediated Network Externalities: is Regulatory Intervention any Good?", CEPR Discussion Paper, 2008, No. 6866.

¹⁶² Birke, D. and Swann, G. M. P., "Social Networks and Choice of Mobile Phone Operator", University of Nottingham Occasional Paper Series, 2005, No 14.

¹⁶³ Under the current regime there is a possible market failure in the fact that networks do not internalise call externalities for off-net calls. Consumers may limit this effect by coordinating their network choice. However, their network choice may not be efficient as a result.

¹⁶⁴ For unlawful marketing of telecommunications services themselves, General Condition 14 will also be relevant. For all other services, Ofcom is one of a number of concurrent regulators empowered to enforce consumer law under Part 8 of the Enterprise Act and may work with other agencies such as Trading Standards or the OFT, or pursue legal action against infringing providers directly.

A12.75 Evidence of uninternalised call externalities would suggest that a mark-down on cost-based MTRs is appropriate. From first principles it appears that call externalities may exist, although they may be largely internalised. One difference with network externalities is that, while a mark-up for network externalities was judged an ineffective tool to achieve internalisation, this may not be the case for call externalities. This is because a mark-down on cost-based MTRs (for call externalities) will likely affect retail prices and increase the number of calls. The way a mark-up on the cost of termination provided an incentive to internalise network externalities was significantly more indirect and uncertain, as concluded by the CC. However, in the absence of robust empirical evidence on the extent of uninternalised call externalities, we believe there is no reason why we should make an adjustment for this.

Other relevant considerations for allocative efficiency

- A12.76 There are additional relevant considerations to the question of allocative efficiency implications of the two cost methods.
- A12.77 First, H3G argued that recovery of common costs should be shifted to the retail level (as it would be under pure LRIC) because there they would be subjected to competition while they would not be if they were sheltered in wholesale MTRs which are not (directly) constrained by competition. Pure LRIC, according to H3G, could lead to productive efficiency by increasing the incentives for the different operators to reduce costs.
- A12.78 We argued above that we saw no difference between LRIC+ and pure LRIC in terms of productive efficiency. We believe that joint production should be sufficient to ensure that competition at the retail level provides incentives to reduce costs overall. Because network investment is driven by the need to provide services and compete in both call origination and termination and the retail mobile markets are competitive, the presence of productive inefficiencies seems unlikely. Hence, we do not agree that this is a relevant consideration.
- A12.79 Second, in relation to two-way access each MCP pays others for terminating their traffic and receives compensation for the traffic they terminate. This is why the European Commission's Staff Working Document defines it a zero-sum game. In essence, if traffic was balanced¹⁶⁵ and rates are the same the net payments would be zero irrespective of the levels of MTRs. This argument may be valid for mobile-to-mobile traffic. In reality, this is not the case for traffic between fixed and mobile networks, as fixed termination rates are regulated separately and fixed and mobile retail services are considered to be in separate markets. In this case lower MTRs, all else equal, reduce the net payments from fixed line operators to mobile operators.

How do LRIC+ and pure LRIC compare in terms of dynamic efficiency?

A12.80 Dynamic efficiency refers to the ability and incentives of MCPs to continue to invest in the services they currently provide and to innovate by launching new or improved services.

¹⁶⁵ H3G argues that traffic between the four largest mobile operators (O2, Orange, T-Mobile and Vodafone) is largely balanced. H3G argues that it suffers from a net deficit because it is a relatively new entrant. O2 argues that the traffic patterns ought not be considered exogenous given that operators can have control of such variables not only by acting on MTRs but also by attracting customers with particular call profiles.

- A12.81 LRIC+ does not raise concerns about operators raising insufficient revenues to cover the cost of termination unless perhaps if more costs should be recovered from termination than according to the particular common cost recovery rule.¹⁶⁶ This would ensure that operators have the correct incentives to invest in termination. In practice, however, it is unclear whether this is a strong argument as termination and origination are produced jointly i.e. no investment in termination can be undertaken separately from that in origination. Therefore, an important question to address about cost recovery and dynamic incentives to invest is whether LRIC+ allows operators to achieve an overall level of return that provides the correct incentives to provide jointly both termination and origination.
- A12.82 While it is likely that, if pure LRIC was adopted, MCPs would be able to recover some of the 'lost' common costs from the retail side of the market, the 'waterbed' effect may not be complete, and, hence, recovery may be partial. Mobile operators would lose the revenues they would receive from fixed operators under a LRIC+ methodology. However, the fact that a transfer of resources from the fixed sector existed in the past, is not in itself a valid reason to maintain it. This means that the MCPs' overall profits could decline. In terms of dynamic efficiency, the main concern is whether the decline in overall profits could be of such an extent to trigger concerns about the operators' ability to finance their investment. This relates to investment and innovation in the provision of mobile services (termination, origination, voice and data) by existing operators and potential entrants.¹⁶⁷
- A12.83 An important aspect which has often been discussed, mainly in relation to a comparison of cost-based termination regimes and, for example, B&K, is the so-called 'hot potato routing' concern. Under B&K, an originating network does not pay for termination. It therefore seeks to hand over the call to the terminating network at the earliest possible opportunity. Networks can lower their own costs, and raise their rivals' costs, by handing over traffic rather than carrying it as far as they can. As a result, the risk is that networks could under-invest. As argued above, termination and origination are jointly produced and, hence, the incentives to invest are only in part driven by the (regulated) price of (wholesale) termination. In the May 2009 consultation we argued that this did not seem to have been a concern for regulators in countries with low (wholesale) termination rates.¹⁶⁸ Given that we are not considering B&K in this market review as a preferred option, the scope for this to be a concern is unlikely to be substantial.

Conclusions on allocative and dynamic efficiency

A12.84 Overall, we believe that neither cost standard would provide the perfect solution and, therefore, the choice is between two second-best options.

¹⁶⁶ This would be an important consideration, however, only if the waterbed effect was not present or not very important.

¹⁶⁷ Orange argues that setting wholesale termination rates below cost, as they claim would be the case with pure LRIC, would increase the risk of corporate failure and, hence, have consequences for market structure. Because of the waterbed effect we are not convinced that the reduction in net termination payments some operators would receive with lower MTRs would be sufficiently material to affect their network investment plans (or their commercial viability).

¹⁶⁸ O2 argues that coverage is much lower in the US and implicitly appears to suggest that this may be an indication of under-investment under (very) low MTRs. Vodafone commissioned work from Frontier Economics estimating that population coverage in the US is comparable to that in the EU-27 but geographic coverage is much worse. Ofcom believes that it is difficult and may be potentially misleading to draw inferences from these comparisons. For example, if population density – especially in the areas covered - was higher in the EU-27 than in the US this could imply, everything else equal, that the investment required by US operators would be necessarily larger.
- A12.85 In terms of allocative efficiency, the critical question is whether it is more efficient to recover common costs either from a linear mark-up on MTRs or from retail services where mobile operators have more flexibility. The historical evidence points to the mobile operators' ability to engage in extensive price discrimination at the retail level. Although this is unlikely to be perfect, it suggests that pure LRIC may be more efficient than recovery from a mark-up on linear MTRs.
- A12.86 On dynamic efficiency we do not believe there is much difference between the two cost standards. Although in principle there is a higher risk of setting MTRs too low under pure LRIC this is likely to be countered by the presence of a waterbed effect (even though this may be incomplete).

Distributional impacts on consumers

A12.87 This issue is dealt extensively in annex 13 with the results summarised in section 9. We refer the reader to these sections.

Competitive impacts

Competition between mobile operators

- A12.88 H3G argues that high termination rates, such as those that have emerged, so far, from the application of LRIC+, lead to a substantial call charge differential between on- and off-net calls. It argues that this puts networks with fewer subscribers at a competitive disadvantage and potentially leads to a reduction in the degree of competition (and possibly the number of mobile operators). The European Commission's Explanatory Note also noted this as a potential concern.¹⁶⁹ H3G argues that there is now a 'real' potential for further entry which could be deterred by the presence of an on-/off-net call charge differential. H3G also claims that competition would be weakened as a result of the differential and this will have a negative impact on dynamic efficiency.
- A12.89 A shift to pure LRIC might lead to a reduction in on-/off-net call charge differentials addressing, at least in part, potential concerns about competitive distortions between MCPs, if they existed and were material.
- A12.90 Differences in price for on- and off-net call charges may have had a material impact in the past when those differences were greater. However, currently only a few retail tariffs in the UK have different on- and off-net call charges and, therefore, the impact of this issue is now less likely to be significant. ¹⁷⁰ The reduction in regulated MTRs over the last few years and the projected reduction going forward under either LRIC+ or pure LRIC wold tend to reduce the relevance of this issue.
- A12.91 H3G disagrees with Ofcom on this point and argues that while this differential does not exist in many current retail tariffs, there are alternative and more subtle ways to discriminate between on- and off-net calls. It lists, as examples, business tariffs which often have on-net discounts and tariffs offering free rates to specified on-net numbers and/or the ability to purchase for a (discounted) fixed fee additional on-net minutes. We remain unconvinced that there is evidence of substantial call charge (or other) differentials between on- and off-net calls.

¹⁶⁹ See footnote 143, p. 16.

¹⁷⁰ For an overview see May 2009 consultation, Annex 9.

Competition between fixed and mobile operators

- A12.92 Some stakeholders (e.g. BT) argue that LRIC+ requires the fixed sector to subsidise the mobile sector because wholesale MTRs are higher than fixed termination rates and, as a such, put the fixed sector at a competitive disadvantage (or distorts competition between the two), especially with the prospect of fixed/mobile convergence.
- A12.93 The competitive impact would depend on the extent to which the two services compete with each other at the retail level. In the recent Fixed Retail Narrowband Market Review, we concluded that, both in terms of access (i.e. subscription) and usage (i.e. calls), fixed and mobile services are in separate retail markets. Nonetheless, we found the competitive interaction between fixed and mobile calls to be quite strong (and becoming more significant over time) for some call types (e.g., calls to mobiles).
- A12.94 Adopting either a LRIC+ or pure LRIC standard for *both* fixed and mobile call termination would provide consistency and any differences in costs would be entirely driven by the underlying traffic sensitive costs of the different technologies (with some possible differences discussed below).
- A12.95 Irrespective of the difference in common cost recovery methods between the two services, a shift to pure LRIC either restricted to MTRs or applied to both MTRs and Fixed termination Rates (FTRs)¹⁷¹ is likely to substantially reduce the absolute (i.e. ppm) difference between FTRs and MTRs. Therefore, if there were valid concerns about differences in common cost recovery between fixed and mobile networks given current termination rate charge controls, adoption of pure LRIC would tend to reduce such concerns.
- A12.96 The question of recovery of fixed and common costs from mobile and fixed termination rates raises a number of issues. A substantial proportion of fixed network costs are not recovered through the fixed termination rate, but through a fixed retail access or line rental fee. This reflects the fact that the access line costs are driven by take-up of fixed services. There is no equivalent of the fixed access line rental fee in mobile networks. For example, coverage costs (that is, the costs of the access network) are not directly attributable to any subscriber. Using an extreme example to illustrate the point, a fixed network that offers services nationally to only two customers needs to build access lines to only two locations and not build out further unless other customers sign-up. A mobile network (as long as its subscribers demand such coverage), since (by definition) it does not know where, in the country, those customers are likely to be when they elect to make calls. In other words, the costs of the network are not *subscriber-driven*, as they are in fixed.
- A12.97 This argument may be less clear-cut if examined from a demand-side perspective. Common costs in both types of networks may still be more efficiently recovered via a fixed fee rather than a traffic-related fee, as is done, at least in part, under LRIC+ applied to MTRs. This still leaves open the question on which side of the market fixed and common costs should be recovered from. As discussed in relation to economic efficiency above, it may be more efficient (and practical, absent the ability

¹⁷¹ This is based on the expectation that applying pure LRIC will have a proportionally more marked impact on MTRs than on FTRs.

to do so on the termination side) to do so from the retail level where price discrimination is easier to implement.

A12.98 A different, longer term, question is whether this transfer (i.e. the fact that there is a significant net flow of revenues from the fixed to the mobile sector under LRIC+ determined by the difference in the levels of termination rates) is efficient in the sense that it does not distort investment between the two. However, this is more about long term economic efficiency, and in particular dynamic efficiency, than the shorter-term competition issue discussed above. If, as a result, mobile networks attracted more investment than fixed networks this may provide a long-term advantage to mobile networks which may translate, for example, into better quality of services. While we believe this could be a valid concern, we are not aware of any empirical evidence as to the potential materiality and impact of differences in termination rates between mobile and fixed network investment over time.

Conclusions on competitive impacts

- A12.99 We believe that a switch to pure LRIC for MTRs would ease, any potential concerns about competition among MCPs. However, we have not concluded that this is currently necessarily a substantial concern. In any case any concern would be reduced further as MTRs decline under either of the two cost standards examined here.
- A12.100 Concerns have also been expressed about the impact that high MTRs may have on competition between fixed and mobile networks as they act as a transfer of resources from the fixed to the mobile sector. From a short run point of view the fact that we have concluded that at the retail level the two services are in separate relevant markets limits somewhat such potential concerns. Nonetheless, there is already strong competition for at least some call types (e.g., calls to mobiles) for at least some consumer groups. The adoption of pure LRIC for MTRs would therefore reduce such concerns, even if the same method was later applied also to setting FTRs.

Commercial and regulatory consequences

- A12.101 Imposing and setting cost-based price controls is a complex task, undertaken by regulatory institutions 'in the real world', meaning that a number of practical considerations are appropriate and relevant to consider when choosing our approach. Price-setting and estimating costs (under any method) are a burdensome and lengthy activity for both the regulator and stakeholders the costs of which are ultimately borne by consumers. Decisions have to be made on a number of issues with often imperfect information and, hence, are subject to the risk of regulatory errors.
- A12.102 In comparing LRIC+ and pure LRIC it may be useful to distinguish between:
 - i) the level of burden imposed on operators, the regulator and ultimately borne by consumers;
 - ii) the risk of errors and other regulatory failure; and
 - iii) the consequences of such errors (mainly in terms of efficiency).

<u>Burden</u>

- A12.103 Based on the historic experience in applying LRIC+, this approach imposes a significant regulatory burden on stakeholders and Ofcom. These costs may be small compared to the possible harm to consumers if there was no regulation imposed, but sufficiently significant to be part of the assessment.
- A12.104 In the May 2009 consultation, we noted that pure LRIC raises similar potential drawbacks as LRIC+. In particular, pure LRIC may raise more significant difficulties because it would require an estimate of the cost implications of a specific sub-set of overall network demand.¹⁷² The regulatory burden with pure LRIC may be higher because this would be a new method (as applied to MTRs) whereas LRIC+ has been extensively debated in the past. BT argues that LRIC+ and pure LRIC are very similar in terms of regulatory burden and the risk of errors and not much emphasis should be placed on this criterion. H3G has a similar position on this issue.
- A12.105 Having just gone through the process of estimating MTRs under both LRIC+ and pure LRIC as part of this consultation, if there is perhaps a difference in the burden between the two cost standards it is likely to largely reflect the fact that some aspects of the pure LRIC methodology may be novel. We would expect any difference to be limited and to become immaterial by the time of the next market review. Therefore, we do not think much weight should be placed on this criterion when choosing between the two cost standards.

The risk of errors

- A12.106 All regulation carries the risk of error in relation to MTRs, the risk of setting the cost-based termination rate either too high or too low.
- A12.107 The experience gained in this consultation and the results (set out in section 9) show that pure LRIC estimates are much less sensitive to changes in the cost drivers than those under LRIC+. By definition, LRIC+ requires allocating a substantial proportion of common costs. This requires difficult judgements i.e. which proportion should be recovered from termination which are subject to a substantial risk of error. This is less so for pure LRIC where only avoidable costs are allocated to MTRs.
- A12.108 This suggests that pure LRIC may be less prone to errors. However, we do not believe that substantial differences exist between the two cost standards in this regard, and we do not rely on this factor in proposing to adopt pure LRIC.

The consequences of errors

A12.109 In terms of the consequences of regulatory errors it is generally believed that erring on the upside (i.e. higher rather than lower charges) might be more appropriate. This is because the consequences of setting rates too high (i.e. deadweight loss¹⁷³) is considered less severe than setting them too low (i.e. the risk that innovation and investment may be reduced and, at the extreme, if set too low, that some firms may exit or cease to provide the service in question).

¹⁷² May 2009 consultation, para 6.116.

¹⁷³ This refers to the part of welfare that would be lost if prices were set above costs (and costs not being set at the efficient level) as it would not accrue to either consumers or producers.

- A12.110 From this viewpoint, pure LRIC appears riskier than LRIC+. This is because the risk of setting the rates too low is higher under pure LRIC. It is, however, true that regimes with very low termination rates, such as the US, Hong Kong, Canada and Singapore (that we discussed in our previous consultation), do not appear *prima facie* to have worse outcomes for consumers.
- A12.111 The potentially more severe consequence of getting pure LRIC wrong needs to be tempered by the fact that this is a two-way access situation. Therefore, the risk of setting rates too low is moderated, at least in part, by the ability of MCPs to recover some of the costs from the retail side i.e. the 'waterbed' effect. This was discussed in paras A12.30 to A12.39 above.

Conclusions on commercial and regulatory consequences

A12.112 Although we are conscious of the regulatory burden of imposing cost-based charge controls in general, we do not believe that in this particular case there is any significant difference on this criterion between LRIC + and pure LRIC.

Annex 13

Distributional analysis

Summary

- A13.1 This annex explains our views about the potential distributional impacts of lower MTRs that is, whether changes in MTRs are likely to create 'winners' and 'losers' amongst consumers, and whether particular groups of consumers might be materially adversely affected by a decision that reduced MTRs.
- A13.2 We consider that the distributional impact of lower MTRs (in line with our pure LRIC-based policy proposal) will be modest, with the most significant effects being:
 - 13.2.1 some people who would have multiple subscriptions will face incentives to have fewer subscriptions;
 - 13.2.2 consumers who use fixed (and not mobile) services will be better off; and
 - 13.2.3 consumers who use mobile (and not fixed) services may be worse off depending on how sensitive they are to changes in the prices for subscriptions and calls.
- A13.3 We do not think that lower MTRs are likely to have a disproportionately negative impact on particular groups (for example, the elderly, the young or the disabled).
- A13.4 All consumers will benefit from enhanced prospects for competition between fixed and mobile services, and fixed/mobile convergence, although we have not sought to precisely model these benefits (and do not rely on them in determining our proposals).
- A13.5 We explain why, based on consumer research, we think that under all plausible scenarios, UK mobile communications providers would not seek to charge customers to receive calls ('receiving party pays' or RPP). Consumers would find such a move highly unpopular and competitive pressures on providers to resist RPP (and offer consumers non-RPP options) would be very strong.¹⁷⁴.

Introduction

- A13.6 In this consultation we have considered the two options for setting MTRs for the period 2011-15 (Figure 48), leading to declines in MTRs from a level of about 4.3ppm in 2010/11 (2008/09 prices):
 - 13.6.1 LRIC+ (which our modelling suggests will yield a MTR of 1.5ppm in 2015); and
 - 13.6.2 Pure LRIC (which will result in MTRs of 0.5ppm in 2014/15, in 2008/09 prices).

¹⁷⁴ For example, at least one MCP has specifically ruled out such a move even if the MTR is zero, indicating that retail competition would likely be a significant constraint on MCPs who wanted to lead a move to asking consumers to pay to receive calls.

Our main focus is the impact of falling MTRs under any policy choice

- A13.7 In principle, the relevant comparison to consider distributional impacts is the difference that would be made by adopting pure LRIC, compared to adopting LRIC+. However, we are aware that the decline in MTRs shown in Figure 48 is substantial under either method. Therefore, the impact in terms of distributional impacts of an *overall* reduction in MTRs is much more significant than the incremental impact of switching from LRIC+ to pure LRIC.
- A13.8 Therefore, in part as a conservative assumption (recognising this difficulty) and in part to help inform our overall view about the impact of lower MTRs (which arises under either policy choice) the majority of this annex focuses on this wider question: how do consumers (and different groups of consumers) fare as termination rates fall?



Figure 48: Proposed LRIC+ and pure LRIC glide paths for 2G/3G MCPs

Source: Ofcom

- A13.9 One challenge is that it is difficult to predict, in advance, how operators may elect to turn lower termination revenues into changes in their retail offers (which of course drive consumer choices and outcomes).¹⁷⁵ Thus, we can only make broad inferences about the effect lower MTRs would have on consumers. This also makes it difficult to assess the incremental effect of reducing MTRs to pure LRIC when the counterfactual (reducing MTRs to the LRIC+ level) also represents a considerable fall in MTRs.
- A13.10 For these reasons, we do not consider that the impact analysis presented in this annex is directly relevant for the choice between LRIC+ and pure LRIC, but provides an assessment of the possible impact of lower MTRs that is relevant to the impact assessment of both options.

¹⁷⁵ It is not clear this can be done *ex ante* (and it would be difficult even to try to determine it *ex post*).

A13.11 We also consider the incremental effect of moving to pure LRIC compared to LRIC+, for example in paragraph A13.100.

Distributional analysis needs to be read alongside efficiency arguments

- A13.12 Our analysis in this annex is purely distributional and does not address any economic efficiency gains that a move to pure LRIC might provide see section 9 and annex 12. Even if we concluded that some types of consumers may be worse off (in a distributional analysis), it may still be appropriate to adopt a policy that makes consumers (overall) better off, based on wider efficiency benefits.
- A13.13 A critical assumption that guides this analysis is that a decline in MTRs (and a further decline when adopting pure LRIC) will most likely lead to lower ppm call charges (for off-net mobile-to-mobile (MTM) and fixed-to-mobile (FTM) calls, but not necessarily for on-net MTM calls) but potentially higher fixed charges these could take different forms (higher subscription charges, lower handset subsidies etc) which are difficult to predict. Therefore, the structure of retail prices may change.
- A13.14 This suggests that there is a potential trade off between usage and adoption in setting MTRs. Put simply, high MTRs would likely lead to high call charges and low fixed fees and, as such, would tend to favour adoption compared to usage. annexes 5, 6, 7 and 9 of the May 2009 consultation provided evidence about this trade-off.
- A13.15 When identifying possible winners and losers in this section, we also focus on equity concerns i.e. is it more likely that consumers who lose out belong to vulnerable categories?¹⁷⁶
- A13.16 This annex is organised as follows:
 - 13.16.1 We first consider the possible effect of reducing MTRs on retail prices;
 - 13.16.2 We then consider the implications for consumers of such changes in relative prices. In particular, we will consider the following implications:
 - Whether some subscribers will choose to no longer hold a mobile (and conversely whether fixed subscription penetration could be positively affected); and
 - How subscribers may be affected depending on their usage and whether they are mobile-only, fixed-only or fixed and mobile subscribers.
- A13.17 In each section we will:
 - 13.17.1 describe the main issue;
 - 13.17.2 briefly report what we stated in the May 2009 consultation;
 - 13.17.3 report responses to that consultation; and
 - 13.17.4 provide our assessment of the issue.

¹⁷⁶ We define vulnerable consumers as those that either have a low income or belong to socioeconomic groupings D and E.

What effect would low MTRs have on retail prices?

- A13.18 There appears to be a theoretical and logical link between MTRs and the structure of retail charges. MTRs are a marginal cost for MTM off-net calls and FTM calls. Thus, a reduction in MTRs should lead to lower charges for these types of calls. Overall revenues for MCPs will also likely decline due to receiving less termination revenue from calls received by their subscribers.¹⁷⁷ As termination revenues decline if MTRs decline, operators may attempt to recoup some of this lost revenue through increasing other types of retail tariffs. As call charges are expected to decline, fixed (e.g. monthly) charges may increase.
- A13.19 There are a number of ways higher fixed charges could be implemented, and it is difficult to predict how the mobile communications providers would react.¹⁷⁸ For example, providers could:
 - Charge higher monthly fees for contract users:
 - Reduce handset subsidies:
 - Introduce minimum spend or top-up commitments for pre-pay users;
 - Introduce time limited credit for pre-pay users; or •
 - Charge a flat fee for every day the phone is used.
- A13.20 Alternatively, providers could start charging for users to receive as well as make calls. This would allow them to avoid increasing fixed charges as they would instead recover termination costs/lost revenue from call recipients. For reasons noted above and in our May 2009 consultation, the evidence suggests that this would be unlikely to occur.
- A13.21 While we believe that changes in MTRs are likely to affect the structure of retail mobile prices, they may also affect the overall level of those charges. There is theoretical¹⁷⁹ work suggesting that a 'waterbed effect' is likely to exist, that is, that overall retail prices rise as MTRs decline. The empirical work¹⁸⁰ we are aware of suggests that this effect is incomplete, meaning that as MTRs¹⁸¹ decline overall retail rates may increase but not by the same amount. The likely size of any rise in overall retail prices may be such that overall revenues may decline. In addition, it is not clear how such a rise would be spread across different consumers (e.g. how far operators would price discriminate in applying price increases).

¹⁷⁷ This would hold unless the effect on revenues was mitigated by a substantial increase in the calls received from fixed phones. This would require a high price elasticity of demand for FTM calls. ¹⁷⁸ 'Fixed' means, in this context, charges for non-variable charges like monthly access. Unfortunately, in this discussion the distinction between 'variable' vs 'fixed' charges (that is, between per call charges and other charges) and between 'mobile' vs 'fixed' charges (that is between charges for mobile services, and charges for services provided over a wire) can be at risk of being confused. Where we can, we aim to be clear in the text which sense we mean,

¹⁷⁹ Armstrong, M. and Wright J. (2009), "Mobile Call Termination", *The Economic Journal*, 119(538),

p.F270-F307, (previous version available at <u>http://else.econ.ucl.ac.uk/papers/uploaded/255.pdf</u>.) ¹⁸⁰ Genakos, C. and Valletti, T. (2009) "Testing the 'waterbed effect in mobile telephony", Journal of the European Economic Association (forthcoming), available at

http://www.sel.cam.ac.uk/Genakos/Genakos%20Valletti-Testing%20Waterbed%20Effect.pdf. ¹⁸¹ The study examined the impact of changes in regulated FTM MTRs only (but examined the effect this may have on MTM MTRs) on an index of retail prices.

A13.22 This annex focuses more on the effect of expected changes in the structure of retail charges rather than the total charges levied on consumers.

Our view in the May 2009 consultation

- A13.23 In the May 2009 consultation, we considered that reducing MTRs could have two effects on retail prices. Firstly, reducing MTRs could reduce the price difference between on- and off-net calls. MTRs impose a cost on other mobile providers which they recover through retail prices for calls to the terminating operator. However, providers do not pay an MTR when connecting calls to their own subscribers and so on-net prices tend to be lower. Reducing MTRs reduces the cost of off-net calls and so should reduce the difference in prices between on- and off-net calls. However, we also noted that on-net/off-net price differences had largely but not fully disappeared.¹⁸²
- A13.24 Secondly, reducing MTRs may lead to a rebalancing of retail prices, with increased fixed (e.g. monthly) fees but lower pence per minute (ppm) charges. In the extreme, severe reductions in MTRs could lead to large bundles of minutes offered for a fixed fee, such as those available in the US. We observed that this may have implications for take-up and usage of mobile services, which we explore more in paragraphs A13.62-A13.168 below. However, we did not speculate on how significant these effects may be, although we suggested it may be less than that implied by the mobile operators.

Stakeholders' arguments

- A13.25 Respondents have made a number of points (both in response to the May 2009) consultation and as part of the consultation by the European Commission on the Recommendation on the regulatory treatment of fixed and mobile termination rates on the potential effects of a reduction in MTRs on the structure of retail prices.¹⁸³ Most accept that reducing MTRs is likely to have some effect on retail price structures. H3G and BT both suggested that lowering MTRs will remove an artificial price floor in the price of calls to mobiles. They argued that this would allow operators to offer 'all you can eat' bundles and create simpler, more transparent tariffs. COLT also mentioned that reducing MTRs will increase flexibility in packages and tariff structures. Consumer Focus suggested that it would give operators greater room to offer more competitive call packages at reduced prices. However, it also acknowledged that operators may try to recover revenue in other ways, such as increasing the price of lower priced subscriptions, or changing the structure of prices (e.g. through RPP). In its confidential response, one stakeholder suggested a number of ways tariffs could change, many of which correspond with our hypothesis that the fixed elements of retail prices will increase. Similarly, Tesco Mobile highlighted a number of ways operators may choose to increase revenues, which were mainly based on increasing fixed fees.
- A13.26 However, Vodafone argues that:

"...there [is no] evidence – as Ofcom sometimes suggests – that mobile termination rates predetermine the structure of retail prices or

 ¹⁸² See Annex 9 of the May 2009 consultation, available at <u>http://www.ofcom.org.uk/consult/condocs/mobilecallterm/</u>
¹⁸³ See responses at <u>http://ec.europa.eu/information_society/policy/ecomm/library/public_consult/termination_rate</u> s/index_en.htm.

otherwise constrain them in the UK. Vodafone can find no evidence of greater tariff innovation or choice in the US which might suggest otherwise."

- A13.27 Other stakeholders have argued that falls in MTRs are not necessary to encourage the positive changes identified (e.g. lower call prices). In its response to the May 2009 consultation, Vodafone compared its UK tariffs to those of Verizon in the US, arguing that UK retail offers are better value compared to those available in the US, particularly for pre-pay users and those who wish to use their mobiles less and spend less. It also suggests that, while US bundles are generally larger, some UK bundles are equivalent in size and price to US bundles (with the exception of the availability of an unlimited bundle in the US) despite differences in termination charges. O2 argued that we already observe innovation in mobile retail tariffs and that prices (including for off-net calls) continue to fall.
- A13.28 O2 further argues that not only will operators increase some retail prices, but they will also raise call prices. T-Mobile and Orange also suggest that total retail prices are likely to increase to compensate for falling termination revenues. Neither highlights any particular structural changes, focusing instead on the overall prices faced by consumers.
- A13.29 We now consider comments on the specific changes in retail prices which may occur.

Higher bundle charges

- A13.30 In response to the EC Recommendation, Frontier Economics was commissioned by Deutsche Telekom, Orange, Telecom Italia, Telefonica and Vodafone to produce a welfare analysis of the likely impact of reducing MTRs to €0.01-0.02. This included a comparison of mobile prices and bundles in the EU and US. It noted that the US market was characterised by larger bundles for higher fixed prices, which resulted in higher usage in the US. However, it noted that this resulted in higher expenditure for US consumers, and so this does not necessarily make users better off. Frontier Economics then compared the price implied by US and EU price plans (given in international comparison data) for different usage levels, and found that low and medium EU users would be worse off compared to their US counterparts if retail prices in the EU were to increase in line with the assumptions they use in their model.
- A13.31 Similarly, in its response to the May 2009 Consultation, Vodafone's comparison of tariffs offered by Vodafone UK and Verizon Wireless in the US suggests that US bundles are not cheaper than UK equivalents, and that in particular low-volume users are better served in the UK than the US. In addition, as mentioned above, Vodafone's analysis suggests that some UK bundles are at least equivalent in size and price to US bundles, other than the availability of an unlimited bundle option in the US. It also highlights Teligen pricing data which shows that even a UK customer with average US usage patterns would pay half as much in the UK. Annex 9 in our previous consultation compared UK and US retail prices and packages.

Minimum spend/top-up commitments, time limited credit, flat fee per day when the mobile is used

A13.32 T-Mobile suggested that a move away from LRIC+ would "*destroy the current pre-pay model*". Prepay particularly benefits those who wish to control their expenditure

by varying their usage. These benefits would be lost if consumers were forced to spend a certain amount per month.

- A13.33 Tesco Mobile noted that penetration grew rapidly when equivalent monthly fees were removed, and that reintroducing them may make many decide that mobile is unattractive.
- A13.34 Vodafone found that the cost of pre-pay usage is significantly lower in the UK than the US and, because of the presence of credit expiry in the US, the UK has much lower minimum monthly costs for pre-pay.

Lower handset subsidies

- A13.35 A number of stakeholders mentioned lower handset subsidies as a likely outcome (and some gave estimates on how much handset prices would rise, which ranged between £10 and £130). H3G suggested that this would be a reasonably innocuous way of raising fixed charges, as consumers could take a number of actions to avoid paying more: keeping their handsets for longer, buying them second hand, and purchasing basic handsets rather than those with functionality consumers do not use or value. In its response to the EC Recommendation consultation, Vodafone suggested that the option that would minimise the fall in overall revenues would be to reduce the subsidy on handsets (except for the UK, Spain and Romania, where they argue that minimum pre-pay spend commitments would be the least detrimental).
- A13.36 However, two stakeholders have pointed out potential difficulties with this effect on consumers' willingness to change or upgrade handsets. Firstly, Consumer Focus suggested that this effect could discourage people from switching networks and so may reduce competition. Second, in its response to the Recommendation, Vodafone states that, to the extent that consumers do this, operators would have to turn to other ways of recovering revenues, such as introducing minimum spend commitments.

Receiving party pays (RPP)

- A13.37 All stakeholders who commented on RPP were critical of the effect it would have on UK mobile consumers. Consumer Focus suggested that RPP would be likely to inhibit mobile use and so would not be in consumers' interests. Tesco Mobile noted that it would cause 'dismay' for pre-pay customers who saw their credit depleted by others calling them.
- A13.38 As part of its response to the EC Recommendation consultation, Vodafone surveyed 2,500 pre-pay customers in 5 EU member states (including the UK) about their likely reactions to being charged for receiving calls (among other possible changes to charges). Given Vodafone's position in each of the countries where this survey was carried out, and hence its ratio of incoming to outgoing call volumes, two apparently revenue-neutral packages were compared. The precise rates in the two comparative packages varied from one country to another, depending on Vodafone's position in the domestic market. The preference for the package that included charges for incoming calls was between 14% and 31% lower than the one without these charges. Moreover, there was a consistent negative consumers' reaction to being charged for incoming calls, with adjustments to the level of this charge in the package making little difference to customers' overall response. Vodafone argues that the results suggest that this way of raising revenue would be very unpopular and, for this reason, operators would avoid this option.

- A13.39 In their responses to the consultation, O2 and Tesco Mobile both note that operators may be forced to introduce RPP in order to avoid the risk of arbitrage through call back operations. They surmise that if incoming calls are free and there are no or low wholesale termination charges, it is possible to establish call back services which allow calling parties to become called parties. This means that no payment (or only an inadequate payment) would be made for the use of either network by either end users or the service provider. Thus, operators would have to introduce charges for receiving calls even if customers do not value this and would be negatively affected.
- A13.40 H3G has committed, both in its response and in its publicity material for the 'Terminate the Rate' campaign, not to introduce charges for receiving calls. It suggested that this would exert competitive pressure over other MCPs which would prevent them from introducing RPP.

Our analysis

- A13.41 We consider that the most significant and likely effect that reducing MTRs will have on retail prices is to change the *structure* of prices. On average, we would expect usage (ppm) charges, but not necessarily those for on-net mobile calls, to fall, but fixed (e.g. monthly) fees to increase. We believe the main use of comparing tariffs in the UK and the US lies in the insights that it could provide in terms of likely prevalent price *structure*. We believe that Vodafone's analysis supports our observation that in countries with very low MTRs, retail services generally consist of a bundle of calls (for a monthly access fee) and limited availability of pre-pay or linear tariffs. In other words, low MTRs lead to low call charges and high fixed fees (such as monthly charges). Indeed, work by Frontier Economics on behalf of Vodafone is based on this assumption.¹⁸⁴
- A13.42 However, due to the complexity of competition at the retail level, it is very difficult to predict how lower MTRs may change MCPs' behaviour, in terms of their retail offers. MCPs have options to change the level and structure of their fixed charges, and different MCPs are likely to pursue different strategies. It is also difficult to determine precisely how customers will respond to these changes whether particular groups will favour MCPs which offer particular options, whether they will change their calling behaviour, etc. The final effect will also depend on the overall impact of falls in some prices and rises elsewhere. Therefore, we will only consider the implications for consumers of the most likely reactions by operators. These cover largely the same groups as those commented on by stakeholders, although our conclusions on the effects of these may differ:
 - Reducing (off-net) mobile-to-mobile and fixed-to-mobile call charges;
 - Increased bundle size and monthly subscription fees for post-pay customers;
 - Introduction of some equivalent to monthly fees for pre-pay customers;

¹⁸⁴ The paper commissioned by Vodafone (and other mobile operators) to Frontier Economics – "Assessing the impact of lowering MTRs", July 2008 – argues that a reduction of MTRs to low levels, as implied by a switch to pure LRIC would decrease welfare. Broadly, they identify three effects: an increase in usage from lower call charges, an increase in subscription charges and/or charges for incoming calls and, hence, an impact on penetration. Frontier Economics, therefore, argues that one of the effects of reducing MTRs would be a rebalancing and change in the structure of retail prices leading to an increase in fixed fees and a reduction in call charges.

- Reducing handset subsidies; and
- RPP.

Reducing call charges

- A13.43 Reducing MTRs will lower the marginal cost of providing a call to a mobile number i.e. fixed-to-mobile and off-net mobile-to-mobile calls. We would expect competition at the retail level to put pressure on operators to pass this cost reduction through to consumers and so it is likely that call charges will fall.
- A13.44 O2 argues, however, that MCPs may increase call charges for mobile originated calls in order to recoup revenue they lose from reductions in MTRs. However, we consider it more likely that MCPs will choose to recover revenue through other measures than direct usage charges (such as fixed fees). Figure 49 below shows the proportion of retail revenue earned by MCPs from different services between 2006 and 2008. This shows that revenue from voice (including roaming and international calls, and other calls made out of bundle) has remained static, if not slightly declined, and so now makes up a slightly smaller proportion of total retail revenue (roughly 40% in 2008 compared to 45% in 2006), while revenue earned from rental charges and bundled calls, SMS and data has grown from £4.3bn in 2006 to £5.2bn in 2008. Thus rental charges for bundles make up a similar, and perhaps growing, proportion of retail revenues (34% in 2008 compared to 31% in 2006). This may suggest that there has been more pressure on call charges than on bundle charges over a period in which MTRs have been declining (although MTRs in this period declined by much less than is suggested for this review period, ie April 2011 to March 2015).



Figure 49: Estimated retail revenues by service

Source: Ofcom

A13.45 Few stakeholders expect fixed-to-mobile calls charges to decline. In their responses, T-Mobile and O2 both argue that fixed-to-mobile prices may not fall in response to reductions in MTRs, as fixed operators may not pass these reductions

on to retail customers. They highlight that revenue per minute for fixed-to-mobile calls has actually increased since 2007 (though in earlier years it had closely tracked changes in MTRs) even as MTRs have fallen. However, fixed providers structure their rates for out-of-bundle calls in order to make their headline offering attractive – that is, the margin is lower for calls types that represent the focal point of competition and higher for calls that are not included in the headline bundles (such as calls to mobiles). Similar tactics are employed by mobile providers, although their bundles also typically include calls to other providers' mobile number ranges. Thus, the individual price of fixed-to-mobile calls may be less likely to respond to a decrease in MTRs than prices and revenues overall, as this allows the fixed operator to increase the attractiveness of their focal product (the bundle). We do not think it is the right approach to simply focus on prices (or margins) for specific call types as it is entirely consistent with a competitive market for higher margins on some call types (e.g. calls to mobiles) to be used to offer low prices (and margins) on other call types (e.g. national calls to fixed numbers). Overall retail prices for fixed customers for a bundle of call types have fallen as MTRs have fallen even if retail prices for fixed to mobile calls have decreased proportionally less, as discussed in our recent Statement on Retail Narrowband markets.¹⁸⁵

A13.46 In any event, there is some evidence that competition in the fixed market is increasingly focusing on calls to mobiles, with BT and Virgin both offering packages or add-ons which significantly reduce the price of fixed-to-mobile calls. Thus, changes in wholesale termination rates may feed into the price of fixed-to-mobile calls more directly in the future. This will particularly be the case if, as BT claims, reducing MTRs further will make it more attractive for fixed operators to include calls to mobiles in their focal bundles.

Higher monthly subscription fees

- A13.47 As discussed, the waterbed effect may mean that mobile providers will want to increase their retail prices, which could be achieved by increasing the upfront price of a post-pay bundle. However, reducing MTRs lowers the marginal cost of providing calls to mobiles, and so providers should be able to offer more of these calls for a given bundle price. Therefore, higher bundle charges may be accompanied by an increase in the size of the bundle, by increasing the number of minutes and/or including other call types (e.g. off-net calls) which were previously excluded.¹⁸⁶
- A13.48 It is unclear how much consumers would value such a change, and how they would respond to it. Research carried out on behalf of Ofcom for our May 2009 consultation¹⁸⁷ found that 51% of post-pay respondents claimed that they usually used less than their full allocation of inclusive minutes. It is not clear why this is so. If it is because they simply do not make many calls, it is possible that this type of change will lead to those users paying more. However, if it is because their inclusive minutes exclude certain types of calls (e.g. calls to other mobile networks) then increasing bundle sizes and making bundles more comprehensive may mean that more of their calls fall within their bundles, which may result in them spending

¹⁸⁵ Available at <u>http://www.ofcom.org.uk/consult/condocs/retail_markets/statement/</u>

¹⁸⁶ Reducing the size of bundles while keeping the price of the package the same would effectively increase prices as well. While this would clearly be detrimental to many consumers, as set out above half of consumers reported using less than their full usage allowance. How far these consumers lose out as a result depends on how much bundles were to reduce in size and how far this limits consumers' actual and desired usage.

¹⁸⁷ See annex 10.2, available at <u>http://www.ofcom.org.uk/consult/condocs/mobilecallterm/</u>

less overall due to a reduction in the number of out-of-bundle calls made. However, the research also showed that 84% of post-pay users' inclusive minutes applied to all networks. Alternatively, these users may be highly risk averse, and so limit their usage to ensure they do not exceed their bundle limit. In this case, these users will be able to expand their usage further without risking exceeding their inclusive minutes. Finally, these users may choose a contract as they are better off on a post-pay subscription than with pre-pay, even if they do not fully utilise their bundle. How these consumers respond will depend on how changes in retail prices and structures overall affect their choice between post-pay and pre-pay.

Reducing handset subsidies

- A13.49 Lower handset subsidies are likely to affect both pre-pay and post-pay customers. Research carried out on behalf of Ofcom for our May 2009 consultation¹⁸⁸ shows that 46% of respondents got their current handset for nothing, and the mean spend was £38 (although it was £74 if all free phones were excluded). Mobile only consumers were likely to spend more on their handset, with a mean spend of £50 and a lower proportion (33%) spending nothing.
- A13.50 In mature markets, handset subsidies are used as a competitive tool to attract subscribers to a particular network rather than as a measure to encourage consumers to enter the market at all.¹⁸⁹ It is plausible that providers, when determining their competitive approach, choose to focus more on handset subsidies than on the prices of calls or bundle packages. Retail call prices and monthly subscription prices may have a greater effect on consumer welfare, than a reduction in handset subsidies so that a reduction in the latter might be less likely to push monthly users from the market.
- A13.51 For this reason, we are less inclined to share Consumer Focus' concern that consumers keeping handsets for longer will reduce customer churn and so may negatively affect competition. Since all operators will be affected, they are likely to find other ways to compete to attract customers. For example, the growing popularity of SIM-only deals may encourage consumers to continue switching even without receiving a free, or heavily discounted, handset. More generally, consumers are likely to look at the entire retail offer available from a provider (including the handset price, bundle charge, services included in the bundle and the price of services outside the bundle). Thus, as a result of lower MTRs they will trade-off between a lower handset subsidy now and cheaper call charges later.¹⁹⁰

¹⁸⁸ See annex 10.2, available at http://www.ofcom.org.uk/consult/condocs/mobilecallterm/

¹⁸⁹ See for instance the discussion in Albon, R. and York, R. (2008) "Should mobile subscription be subsidised in mature markets?", *Telecommunications Policy* (32), p.294-306

¹⁹⁰ Behavioural economics research suggests that consumers' decision making is subject to a number of biases and errors which may mean that their final choice is suboptimal. For example, consumers often suffer from limited attention in assessing different options (for example, they may focus on certain aspects of a retail offer and ignore other relevant information, even when it is readily available. See, for example, Hossain, T. and Morgan, J. (2006) "...Plus Shipping and Handling: Revenue (Non) Equivalence in Field Experiments on eBay," *Advances in Economic Analysis & Policy* 6(2), Article 3). The extent to which this occurs depends on how the product is marketed to consumers – for example, where providers focus their advertising more on handsets than call plans, consumers may place more significance on the price of the handset than they would otherwise. However, we consider it unlikely that such biases are so acute that consumers base their purchasing decision entirely on only one factor, such as the price of a handset, rather than taking a more holistic (although probably simplified) view of a number of the most relevant factors.

- A13.52 Prepay users are more likely to enter the market with a second-hand handset.¹⁹¹ In addition, pre-pay customers tend to receive a smaller discount on handsets, as MCPs have more opportunity to recoup this over the course of a post-pay user's contract. This could suggest that take-up of pre-pay may be less affected than claimed by stakeholders by a reduction in handset subsidies.
- A13.53 For some consumers, in the context of an overall benefit, the change in handset subsidy may be immaterial. For those who are more price-sensitive, a variety of options exist including delaying buying a new handset for a longer time¹⁹², purchasing a second-hand handset or electing to purchase a handset that is of a lower functional specification than they would have received in an environment of higher handset subsidies.
- A13.54 However, these potential responses by consumers may reduce the savings from lowering handset subsidies for the operators. Therefore, it is possible that MCPs would also take some other action alongside reducing handset subsidies.

Introduction of equivalent monthly fees

- A13.55 Providers have several options for introducing a fixed (i.e. monthly) component to pre-pay tariffs for example, providers could choose to impose a minimum spend commitment, or a minimum level of top-up per month. In the US, some operators offer pre-pay tariffs with a daily access charge, payable only on days when the phone is used. This is akin to a daily fixed fee independent of the minutes of use. Alternatively, operators could issue credit which expires after a certain period of time.
- A13.56 Prior to 1999, pre-pay top-ups were subject to a credit expiry period. Tesco Mobile suggests that the removal of this restriction led to a major increase in the attractiveness of pre-pay and has encouraged the continued growth of pre-pay subscriptions. It hypothesises that re-introducing such measures will reduce the attractiveness of pre-pay, and so may reduce the use of pre-pay, with potential implications for penetration. However, this ignores the fact that pre-pay has already been slowly declining while penetration and ownership continue to increase (Figure 51). This is discussed in more detail in the section on take-up.
- A13.57 To some extent users may be able to modify their behaviour to minimise the effect on their total expenditure. For example, users could avoid paying more with time limited credit by only topping up in very small increments which they are likely to be able to use up within the expiry period.

<u>RPP</u>

A13.58 With regard to RPP, all the available evidence suggests that this would engender a negative response from most consumers (even those less directly affected). Research carried out for our May 2009 consultation showed that consumers viewed the introduction of RPP significantly less favourably than the other options for raising revenue presented – only 12% of pre-pay and 9% of post-pay customers favoured the RPP option. For this reason, we consider it likely that operators will

¹⁹¹ Albon, R. and York, R. (2008) "Should mobile subscription be subsidised in mature markets?", *Telecommunications Policy* (32), p.294-306

¹⁹² As noted in the May 2009 consultation, 43% of respondents had changed their handsets in the last year, and 80% had changed it in the last two years. It is likely that many of the phones replaced were still functional, and so their owners could have delayed the replacement

avoid introducing RPP as far as possible. Effectively the available information suggests that that the retail elasticity of demand for incoming calls would be very high, making the introduction of receiving party charges very unlikely.

A13.59 While O2 suggests that RPP would be inevitable in order to prevent arbitrage by call back operations, we do not consider this is likely to be the case. We are not proposing to eliminate wholesale MTRs, but instead to set rates which better approximate the cost of termination services. Thus, providers will still receive some cost-oriented payment for the use of their network. As the level of MTRs decline so will the call charges for such types of calls. As arbitrage exploits differences in charges for incoming and outgoing calls, the difference between the two is unlikely to change as MTRs decline.

Other

- A13.60 Another possible effect could be for consumers to choose to pay for double account facilities for a single phone and contract rather than keeping multiple subscriptions. Some consumers need to keep separate mobile numbers and accounts, for example to separate personal and work calls. Increases in subscription prices may encourage these consumers to keep only one mobile contract, but to have this contract split between work calls and personal use. This would reduce the number of consumers with multiple mobile subscriptions.
- A13.61 In the following sections we will expand upon how these potential changes will translate into positive or negative effects for different users e.g. through encouraging greater usage or forcing some users out of the market.

Would low MTRs reduce mobile take-up?

A13.62 A number of respondents claimed that a significant reduction in MTRs will lead to a substantial decline in mobile ownership. Below we provide our assessment of whether the potential impact of lower MTRs is likely to be significant.

Our view in the May 2009 consultation

- A13.63 In the May 2009 consultation we presented a range of evidence on the possible impact of a reduction of MTRs on mobile take-up. We provided cross-country data which suggested there is a potential relationship between MTRs and take-up and usage. Regimes with low MTRs (such as those in the US, Singapore and Hong Kong) have higher usage than CPNP regimes, but tend to have lower subscription (or SIM cards) penetration. The regulatory authorities in these jurisdictions have not expressed concerns about this.¹⁹³
- A13.64 Annex 7 of the May 2009 consultation included an econometric analysis by CEG on the effects of the level of MTRs on measures of welfare in the mobile sector. One of the relationships the research estimated is that between the level of MTRs and the penetration rates for mobile subscriptions (or number of SIM cards). The data that was used for the main set of results is from 39 OECD countries between 2002 and 2007. The research suggests that on average a 1% decrease in MTRs could be expected to lead to a 0.034% reduction in mobile subscription penetration.¹⁹⁴

¹⁹³ See Annex 8.1 of the May 2009 consultation.

¹⁹⁴ Using alternative specifications the estimates range from 0.031% and 0.045%.

- A13.65 This study highlighted, but could not correct for, the fact that a significant minority of users have more than one subscription or SIM card, which means that penetration rates exceed ownership rates. As we discuss in more detail below, this has important implications for our analysis.
- A13.66 We considered that there is a real possibility that some consumers may decide to discontinue their mobile phone use, but were unsure of the size of this effect. We considered that industry concerns about widespread negative effects had to be balanced by evidence of widespread take-up and low barriers to affordability for mobile services in the UK.

Stakeholders' arguments

- A13.67 This issue received significant attention from stakeholders in the consultation by the Commission in June 2008 and the May 2009 consultation.
- A13.68 A number of stakeholders who responded to the May 2009 consultation considered that mobile take-up could be negatively affected by reducing MTRs. O2 pointed to research undertaken on Ofcom's behalf for our consultation¹⁹⁵ to suggest that 5.5m pre-pay customers would not use mobiles if they had to pay to receive calls. O2 also highlighted research from our 2008 Communications Market Report that showed 7.7m pre-pay customers do not make outbound calls, and suggested it is unclear whether the industry would continue to serve these customers, if the main source of revenue earned from these customers (MTRs for incoming calls) were significantly reduced.
- A13.69 In its response to the May 2009 consultation, Vodafone highlights the Jigsaw research findings which show a significant proportion of users would reconsider having a mobile if they were charged an extra £10 for a handset. It also refers to separate Ofcom research which showed that a third of respondents were marginal consumers i.e. would not re-subscribe if the price were to increase significantly.
- A13.70 Vodafone and Tesco Mobile both argued that any policy which may reduce access to mobile services would be contrary both to our duties and to our stated aim to increase access and inclusion. T-Mobile suggested that regulatory authorities in countries such as the US may be less concerned by such issues, as these countries have both higher GDP per head and fewer cultural concerns about social inclusion.
- A13.71 As stated previously, Frontier Economics was commissioned by a number of European and UK operators to investigate the implications (for all of Europe) of reducing MTRs in accordance with the Recommendation. This included modelling the effect of reducing MTRs to €0.01-0.02 on consumer surplus and penetration. They estimated that for a typical Western European country, reducing MTRs to €0.02 would reduce penetration by up to 9% where this resulted in higher fixed fees, depending on the assumptions made about call externalities. Where operators instead introduced RPP, it was found that this could either severely reduce penetration (by up to 37% according to Frontier Economics's model) if call externalities were low, or slightly increase penetration (by 2%) if call externalities were large.¹⁹⁶

 ¹⁹⁵ See annex 10.2, available at <u>http://www.ofcom.org.uk/consult/condocs/mobilecallterm/</u>
¹⁹⁶ Frontier Economics used two different scenarios for the size of call externalities – a "high scenario" where the value of the externality is 0.7, and a "low scenario" where the value was 0.1

- A13.72 Vodafone also responded separately to the Recommendation with a detailed analysis of the implications of reducing MTRs to €0.02. It argued that, in order to maintain the same level of revenue, operators would have to raise prices elsewhere (e.g. fixed charges). In particular, Vodafone considered three options for achieving revenue neutrality: raising handset prices by an average of €25, introducing minimum spend commitments, and charging to receive calls. It then used evidence from surveys it had commissioned to estimate the likely reaction of consumers to these changes.
- A13.73 Vodafone argued that, in particular, low-usage customers would face higher overall retail prices and would be those most likely to give up their mobile phones. It argued that these customers generate little revenue for MCPs other than that raised through terminating calls made to them from other (fixed or mobile) networks. Therefore, if MTRs were to fall substantially Vodafone argues that many low-usage customers would become unprofitable for network operators unless revenues could be raised from them in other ways. It predicted that the price changes which would result from revenue recovery would lead to a fall in mobile ownership by 9.4%, or 39.1 million, across the EU-27 Member States. According to Vodafone's figures, this would take current mobile ownership in the EU-27 down from the current 80-85% on average to around 70-75%.
- A13.74 However, BT submits that mobile operators claimed that negative effects (including on penetration¹⁹⁷) would result from proposed reductions in MTRs at the time of the (2002) CC investigation.¹⁹⁸ Yet, BT observes that, contrary to this, in fact penetration has continued to increase, and prices have fallen significantly since.

Our assessment

Are stakeholders' predictions credible?

A13.75 There are four main reasons why we believe the impact on ownership is likely to be significantly more muted than anticipated by some industry stakeholders and other observers.

Subscriptions vs. ownership

A13.76 The first factor relates to the distinction between mobile subscription (or SIM cards) penetration and ownership.¹⁹⁹ In the UK, 11% of subscribers have multiple subscriptions.²⁰⁰ Lower MTRs may trigger changes that may reduce mobile subscription penetration but not necessarily reduce mobile ownership. For example, consumers holding multiple subscriptions may decide to discontinue one of them. Thus, calculations which attempt to estimate the effect of reducing MTRs on takeup may have overestimated the potential impact on mobile ownership.

¹⁹⁷ Such as subscription and outgoing call prices rising, total call volume falling, pre-pay handset prices rising (possibly by £15-20), millions of marginal customers leaving (particularly pre-pay) and penetration rates falling (one MNO predicted that a quarter of its customers would give up their mobile ¹⁹⁸ In the CC's decision, rates were reduced by 15% as a one-off reduction, followed by yearly

reductions of 14 or 15% below RPI.

¹⁹⁹ We define the "mobile subscription penetration" rate as the average number of active mobile subscriptions per 100 population and "mobile ownership" as the proportion of population who personally uses a mobile. ²⁰⁰ See sction 5.3.3 of the UK Communications Market Report 2008, available at

http://www.ofcom.org.uk/research/cm/cmr08/

- A13.77 We are required to secure the availability throughout the UK of a wide variety of services, including mobile that is, in this context, to ensure that opportunities exist for mobile ownership for all who live and work in the UK.²⁰¹ By contrast, beyond ensuring sufficient competition, we have no specific duty to maximise the use of services nor the number of subscriptions held by each user of mobile services. These duties shape our thinking on this issue, and also accord with common sense: it is more of a concern if people find themselves unable to afford or use mobile services at all, than it is to face market incentives to rationalize multiple accounts into a single (or fewer) accounts. Hence, we place greater weight on concerns about ownership than subscription levels.
- A13.78 Mobile subscription rates are higher than mobile phone ownership in the UK and across Europe. Indeed, the mobile subscription penetration rate in the UK reached 129% in Q3 2009. Data from a number of sources²⁰² suggest that between 7 and 12% of respondents have more than one SIM or subscription. It is possible, and perhaps likely, that it will be customers with multiple subscriptions who would give up only one of several phones or SIM cards in response to higher prices for ownership. The marginal benefit of an extra mobile subscription is likely to be much lower than that endowed by the initial subscription, as it is the latter which gives the user the benefit of being connected. Each additional SIM just allows the subscriber to be contacted on a different number. It is particularly likely that secondary SIMs will be dropped as a result of lower MTRs leading to higher 'ownership' costs (in the form of higher fixed charges) where consumers take out multiple subscriptions to exploit differences between on- and off-net retail call charges. Such differences are likely to disappear as MTRs are reduced further, removing this incentive to have multiple subscriptions. While the main reason given for holding more than one SIM/subscription is to separate business and personal calls, a not insignificant proportion of respondents seem to do so in order to take advantage of differences in call charges.²⁰³ This suggests that at least some of the consumers who indicated in their responses to the Vodafone's survey that they would drop out, may indeed drop one of their subscriptions but still remain mobile users.
- A13.79 The estimated effects for our analysis would be substantially different, depending on the proportion of multiple-SIM users among those giving up a mobile subscription. If we were concerned about the distributional impact of the fall in MTRs, the focus should be on mobile ownership rather than mobile subscriptions. Frontier Economics's model is expressed in terms of both penetration and subscribers (and consumers), and so it is not clear whether it takes this effect into account. Vodafone's survey results are quantified in terms of mobile ownership, but it is unclear whether those responding that they would reconsider a subscription to

²⁰¹ Communications Act, section 2(a).

²⁰² We have information on multiple mobile subscriptions from a number of sources: a Technology Tracker carried out by Ofcom Market Research (available at

<u>http://www.ofcom.org.uk/research/stats/</u>); the Mobile Internet Omnibus Survey 2008 (some of the results of this survey are reported in the UK Communications Market Report 2008, see section 5, available at <u>http://www.ofcom.org.uk/research/cm/cmr08/cmr08_2.pdf</u>); and a survey conducted for Ofcom in January 2006 (see annex 6 of our March 2006 MCT consultation, available at <u>http://www.ofcom.org.uk/consult/condocs/mct/summary/mct.pdf</u>). In addition, research was conducted specifically among H3G customers which was similar to the survey for the 2006 MCT consultation (available at

http://www.ofcom.org.uk/consult/condocs/mobile_call_term/annex.pdf). This found that a higher proportion of H3G customers (35%) had more than one SIM/subscription, although the sample included a minimum quota of multiple-SIM users

²⁰³ See the Mobile Internet Omnibus Survey 2008, annex 6 of our March 2006 MCT consultation and the survey of H3G customers, all of which are detailed in footnote 202.

Vodafone had additional subscriptions with other providers. Of the 7.7m pre-pay users who do not make outbound calls mentioned by O2, it is unclear what proportion are unique mobile users and how many are secondary subscriptions for those who use another mobile more intensively.

Revenue vs. profit neutrality

- A13.80 Some stakeholders (e.g. Vodafone) seem to assume providers will aim for 'revenue neutrality' i.e. revenue maximisation and so will pursue a course of action which will minimise changes in total revenue. However, it is possible that a retail price increase or a change in the retail price structure will lead to some subscribers dropping off the network and revenue decline. It is, however, possible that the providers' best reaction to minimise the loss of revenues from MTR is to increase other prices by less than implied by the 'revenue neutrality' assumption.
- A13.81 In truth, providers are obliged to maximise profits, not revenues. This would likely limit how much they will raise fixed charges and to whom. This is because there may be a substantial difference between the costs to retain and those to acquire customers. While it may be relatively expensive to acquire customers i.e. through marketing and advertising efforts it may not be particularly costly to retain subscribers as it seems unlikely that there are any significant costs that could be avoided by losing subscribers, even if they generate limited revenues. In its report on MTRs in 2003 the Competition Commission mentioned that it had been informed that the cost of keeping an existing customer on a mobile network is equal to "*a few pence per month*".²⁰⁴ Therefore, as long as subscribers generate revenues that cover that cost, it would be rational for a mobile provider to retain them.

Price discrimination

- A13.82 The mobile market is highly complex, with a wide variety of retail offers which allow for customisation of offers to a very great extent. Users are diverse in their needs (heterogeneous) and providers engage in a variety of strategies to win business by tailoring their offers (that is, there is a substantial degree of retail price discrimination). The less able mobile providers are to engage in price discrimination, the more likely it is that mobile ownership could decline if providers increased or changed the structure of retail prices for all consumers. Consumers are highly likely to react differently to similar price increases. If mobile providers had to raise subscription fees uniformly (say a 10% increase) for all subscribers, the most price-sensitive consumers may decide to no longer subscribe. On the other hand, if mobile operators were able to perfectly target each consumer, they would distribute an increase in prices according to each consumer's price sensitivity in order to minimise the impact on their customer base, reducing the impact on their profitability. Given the current widespread practice of retail price discrimination it is likely that operators will be able to tailor their retail tariff structures to some extent in order to minimise (although not eliminate) the impact in terms of lost subscribers.
- A13.83 Most stakeholders commented on the impact of an average increase in retail prices, without considering how the price increase would actually be spread among different types of users. For example, Frontier Economics explicitly assumes that users are homogeneous with respect to everything except their search costs in

²⁰⁴ Competition Commission, 2003, Vodafone, 02, Orange, T-Mobile: Reports on references under section 13 of the Telecommunications Act 1984 on the charges made by Vodafone, O2, Orange and T-Mobile for terminating calls from fixed and mobile networks, pp. 244-245, available at: http://www.competition-commission.org.uk/rep_pub/reports/2003/475mobilephones.htm.

choosing a network. In its submission on the EC Recommendation, Vodafone implicitly assumes that either consumers are homogeneous or operators will not price discriminate, in that they apply a uniform retail price change to all mobile customers as a result of a decline in MTRs.²⁰⁵ This is likely to lead to an overestimation of the stated consumer response given that, in practice, operators will be able to discriminate across consumers on the basis of their willingness to pay. Therefore, they will apply larger price increases where they expect the impact to be less marked. By engaging in price discrimination the mobile operators could help to keep more subscribers on mobile networks and limit the potential reduction in profits.

- A13.84 Furthermore, the absolute price increase assumption used by Vodafone is likely to exacerbate this overestimation even further than in the case where a percentage i.e. 10% price increase was applied to the price mobile consumers currently face. Had the price increase been uniform in percentage terms, high-spending consumers would have faced a higher price increase in absolute terms than those who spend relatively little. However, the opposite occurs if a discrete price increase is applied to all consumers to make the hypothetical scenarios in the market research more realistic i.e. low-spending consumers would face a larger price increase in percentage terms. We believe this is likely to significantly overestimate the impact on mobile take-up if low spending consumers are more price sensitive. We also note that the approach taken by Vodafone was also used in the similar survey commissioned by Ofcom which, therefore, suffers from the same problem.²⁰⁶
- A13.85 One stakeholder submitted a confidential response to the May 2009 Consultation which did take account of consumer heterogeneity, in that it identified that a reduction in MTRs to 2ppm would reduce revenue by different amounts for customers with different usage profiles. However, in its subsequent calculations it then assumed that MCPs would seek to recover exactly the revenue lost from each group from that group, rather than trying to recover more revenue from customers with less price elastic demand. This is likely to have caused the stakeholder to overestimate the revenue recovery from more price sensitive groups and so may have overstated the effect.

Reliability of survey data responses to complex questions

A13.86 An additional concern to take into account when assessing the reliability of estimates is the use of survey data. Surveys are a useful tool to gather information on consumers' reactions to changes, including price changes. However, stated preferences – i.e. what respondents state they will do – often differ from revealed preferences – i.e. what consumers actually do.²⁰⁷ In general, the widely-held belief is that stated preference tools tend to overestimate consumers' reactions. This seems to be the case when comparing the estimates of the price elasticity of mobile subscription obtained through econometric estimates and surveys. The estimated elasticities calculated in the studies mentioned in paragraph A13.95 are roughly 0.5 or less, while the Jigsaw research implies an elasticity of roughly 2.6.²⁰⁸

²⁰⁷ See for example <u>http://www.ofcom.org.uk/consult/condocs/mobilecallterm/annex10_1.pdf</u>.
²⁰⁸ See annex 10.2, available at <u>http://www.ofcom.org.uk/consult/condocs/mobilecallterm/</u>.
Among the pre-pay users, in response to a £10 increase in handset prices with an offset in call

²⁰⁵ As mentioned in paragraph A13.72, in its estimation Vodafone assumed a discrete price increase of €25 across all subscribers to gauge their reaction.

²⁰⁶ See annex 10.2, available at <u>http://www.ofcom.org.uk/consult/condocs/mobilecallterm/</u>.

- A13.87 We were careful to highlight this caveat when using the results of the research prepared by Jigsaw in the May 2009 consultation. Thus, where respondents such as Vodafone and O2 use these results to infer the effect of various changes on consumers' take up of mobiles, the same caveats must be applied to these estimates. For example, O2's suggestion that 5.5m mobile users would give up their mobile if they had to pay to receive calls is likely to be an overestimation caused by consumers exaggerating their reaction when responding to the survey.
- A13.88 Furthermore, there are a number of additional potential concerns that are specific to Vodafone's survey for its response to the European Commission's Recommendation:
 - the surveys that informed Vodafone's predictions are based on Vodafone's own customers and the results are applied to all consumers in Europe. Applying the results in this way will only be accurate if Vodafone's customers are representative of the wider population;
 - respondents may not have been aware that the proposed price increases would be (at least partially) offset, which may have affected their reaction;²⁰⁹ and
 - as our interest lies primarily with the take-up of communications services in the UK, rather than in Europe as a whole, the absence of the UK from the survey on handset prices may also diminish the relevance of these results for our purposes.

Assessing the possible impact on mobile ownership

- A13.89 Lower MTRs are very likely to lead to a change in the retail price structure (with higher fixed charges and lower call charges). This in itself could discourage some low use consumers to continue to hold a mobile phone. It is unclear what the effect on the level of prices may be given the presence of a waterbed effect. The fact that the latter is unlikely to be complete suggest that, overall, retail prices may need to increase.
- A13.90 Those most likely to drop-out consist of 'marginal users' who do not value mobile services enough to pay a higher price to own a mobile phone. For example, users who rarely make outbound calls are most likely to have to pay more as the fixed element of the price they have to pay is either increased (through bundle charges or an equivalent fee (e.g. handset prices)) or introduced without benefiting from falling call prices (unless they change their calling behaviour this is discussed in more detail in the following section on the effect on different mobile users).

²⁰⁹ Ofcom's survey carried out in the course of the mobile call termination market review had scenarios where consumers were made aware that their call charges would decline.

charges, 8% of them stated that they would be likely to stop having a mobile phone (9% when no offset). However, around 75% of them stated that they would delay replacing their handset. Combining this information with survey data on mobile users' spending habits from the Mobile Internet Omnibus Survey: July 2008, a £10 rise in handset prices, spread over 3 years (which is how often we assume consumers replace their handsets) is estimated to be equivalent to a 3.05% rise in monthly prices for pre-pay users. The survey suggests that such a percentage price increase would lead to an 8% reduction in pre-pay ownership. This provides an implicit price elasticity of mobile subscription of - 2.6. However, due to budget constraints and consumer preferences it may not be accurate to compare handset costs with monthly payments, but this conversion must be carried out to make it compatible with the data we have on average expenditure on mobile services. It should also be noted that this is a point elasticity estimate (as opposed to the constant elasticity estimates in the CEG study) and therefore, it is not particularly suited to infer the impact on penetration for a wide range of changes in retail prices.

- A13.91 We examine the following:
 - 13.91.1 Existing empirical studies on the elasticity of mobile subscription;
 - 13.91.2 The implications of the findings of the CEG study; and
 - 13.91.3 Historical trends.

Existing estimates

- A13.92 As mentioned in paragraph A13.69, Vodafone highlighted Ofcom research which showed that a third of respondents were marginal subscribers. This comes from our estimation in the 2007 MCT Statement, used in calculating the appropriate network externality surcharge to apply.²¹⁰ It was based on the number of subscribers who claimed they would not re-subscribe if the cost of subscription were to increase to £70.²¹¹ This was estimated at the time to be equivalent to the price of an unsubsidised entry-level handset.
- A13.93 However, given the uncertainty in how operators will respond to reductions in MTRs with respect to their retail price offers, it is not possible to determine whether subscription price increases to this level are likely to occur. When the question of the network externality surcharge was referred to the Competition Commission, BT argued that SIM-free (and so unsubsidised) handsets were available for much less than £70, and so prices may not increase by this much.²¹² In addition, this estimate does not take into account a number of the factors identified above, since:
 - 13.93.1 this was based on consumer responses to a survey on what they would do if faced with a price increase. It therefore suffers from the problem identified in paragraph A13.86 above that stated preferences may overestimate consumer responses; and
 - 13.93.2 it does not take into account that operators may choose to price discriminate and so offer marginal consumers lower subscription prices by charging more to less price sensitive consumers.
- A13.94 There are a number of empirical studies which estimate the price elasticity of mobile access or subscription. This is an imperfect measure to assess the impact of MTRs on mobile take-up. While the demand price elasticity assesses the impact on output (in this case of take-up) of a price increase, in this case lower MTRs are mainly (depending on the strength of the waterbed effect) likely to lead to a change in the retail price structure rather than its level (even if average retail prices are likely to increase because of the reduction in the net wholesale transfer from the FNOs).
- A13.95 The Competition Commission (CC) was presented in 2003 with different studies which estimated the own-price elasticity of mobile subscription in the UK, the results

²¹⁰ See annex 16, available at

http://www.ofcom.org.uk/consult/condocs/mobile_call_term/statement/statement.pdf²¹¹ All respondents were asked about their response to the same price levels and so the change this would represent would vary for different respondents. The average spend on their previous handset was £44.

²¹² The CC's determination is available at http://www.competitioncommission.org.uk/appeals/communications act/mobile phones determination.pdf . See in particular paragraphs 4.67-4.68

of which ranged between -0.08 and -0.54.²¹³ The CC itself used an elasticity of -0.3 in its calculations, which we subsequently used in our previous MCT review. Ahn and Lee estimated an average elasticity of -0.36 using data from 64 countries.²¹⁴ Madden et al used panel data for 56 countries to estimate that global price elasticity for subscriptions is -0.55 (-0.53 in high income countries).²¹⁵ Madden and Coble-Neal, using data for 56 countries between 1995 and 2000, found that a small decline in mobile price causes an immediate 0.05% increase in subscription growth.²¹⁶ This increase in subscriptions would encourage further subscription growth, and they found that the direct price effect together with this network effect would yield a 3.09% increase in subscriptions within 3 years.

- A13.96 All of these estimates (with the exception of Madden and Coble-Neal's long run elasticity estimate) show that demand for subscriptions is relatively low – a 1% increase in the price of subscription will lead to a proportionately smaller fall in demand. This suggests that, if retail prices were to increase, consumers may not react by dropping their subscription altogether. Furthermore, all these estimates relate to mobile subscriptions and not ownership²¹⁷ which as discussed above in itself may lead to an overestimation of the elasticity of subscription. In addition, where these studies use ARPU or other average revenue figures as a measure of price, this would further reduce the accuracy of the estimate, as average revenue figures are an imperfect proxy for prices.²¹⁸
- A13.97 Higher (average) elasticity estimates may be expected when the mobile sector approaches saturation because of a 'composition effect', with falling prices encouraging those who place only limited value on owning a mobile to enter the market. One could, therefore, argue that if prices were to rise again, many of these consumers may reverse this decision and exit the market. However, it is likely that some who initially perceived mobile as offering only limited value may have discovered that having a mobile gives them greater benefits than initially anticipated, and so some later adopters who were initially attracted by falling prices may remain in the market even if prices were to rise later.

²¹³ See Competition Commission, 2003, Vodafone, 02, Orange, T-Mobile: Reports on references under section 13 of the Telecommunications Act 1984 on the charges made by Vodafone, O2, Orange and T-Mobile for terminating calls from fixed and mobile networks, pp. 244-245, available at: http://www.competition-commission.org.uk/rep_pub/reports/2003/475mobilephones.htm, in

particular see paragraphs 8.7-8.51 for a description and critique of these estimates. ²¹⁴ Ahn and Lee (1999) quoted in Dewenter, R. and Haucap, J., 'Estimating Demand Elasticities for Mobile Telecommunications in Austria', Working Paper 33/2004, Helmut Schmidt University,

Hamburg, 2004. ²¹⁵ Madden, G., Coble-Neal, G. and Dalzell, B. (2004), 'A dynamic model of mobile telephony subscription incorporating a network effect', *Telecommunications Policy* (28), p.133-144 ²¹⁶ Madden, G. and Coble-Neal, G. (2004) 'Economic determinants of global mobile telephony

growth', *Information Economics and Policy* (16), p.519-534 ²¹⁷ The results are framed as subscriptions, although none specifically differentiate between ownership and subscriptions. For example, one of the estimates reported by the CC was based on survey data (and so is likely to overestimate elasticity for the reasons discussed in this Annex), so whether the results can be interpreted as ownership or subscription elasticity depends on how the questions were framed and how consumers interpreted them, while two others were based on Oftel data, which is likely to be subscription data.

²¹⁸ For example, DotEcon's report for the CC explicitly uses average revenue figures for some of its calculations, while for others it is less clear (e.g. Madden et al. Madden and Coble-Neal). However, all of the studies seem to separate access revenue from call revenue and only use the former in their calculations, which improves the quality of the calculation to some extent (but does not completely resolve the issue).

A13.98 This suggests that the price elasticity of mobile subscription is low. In addition, we believe that what matters most for this analysis is the consumers' reaction to changes in the price structure rather than price increases: the former are likely while the size of the latter is uncertain. This points to an impact on take-up which is, at best, limited for both the proposed reductions in MTRs over the period 2011-2015 or the differential between pure LRIC and LRIC+.

What may the CEG's estimations tell us?

- A13.99 CEG analysed the effects of the level of MTRs on measures of welfare in the mobile sector, including the relationship between MTRs and penetration rates for mobile subscriptions.²¹⁹ This provides more direct information than demand price elasticity estimates as it directly estimates the impact of the level of MTRs on penetration, and, hence, takes into account the effect of potential changes in the structure (and possibly level) of prices.
- A13.100 The research suggests that, on average, a 1% increase in MTRs could be expected to lead to a 0.034% increase in mobile subscription penetration. If, for illustrative purposes, we were to apply this result to a potential drop from 4.3ppm the proposed level of MTRs at the start of the charge control to 1.5ppm the level of MTRs in 2015 if we use a LRIC+ methodology to set MTRs (equivalent to a 65% drop), the model predicts a reduction of approximately 2.2% in mobile subscription penetration. If instead we used pure LRIC, the fall in MTRs would be equivalent to 88%. We might expect this to lead to a reduction in penetration of approximately 3%. Thus, the model estimates that the choice between LRIC+ and pure LRIC may only lead to a difference in penetration of 0.8%. Both the LRIC+ and pure LRIC estimates are substantially lower than Vodafone's estimate of a 9.4% reduction in ownership in the EU-27.

A13.101 However, this result needs to be interpreted with caution:

- it may overestimate the decline in terms of mobile ownership because it does not take into account the presence of multiple subscriptions. However, it implicitly caters for changes in both the level and structure of retail prices. This is because it estimates the direct relationship between MTRs and subscription penetration rates using historical data. Therefore, to the extent that reductions in MTRs have led to price changes at the retail level that have occurred through price discrimination, this is reflected in the impact on mobile penetration; and
- we are aware that a 65% or 88% fall in MTRs is so large that it is outside the data range used by CEG and inferences may be inaccurate. The CEG Report estimates a constant elasticity for the relationship between levels of MTRs and mobile penetration rates meaning that this relationship should remain constant at different levels of prices and penetration. This is assumed rather than tested and, therefore, it is possible that the relationship may not be stable over the price range considered.
- A13.102 Therefore, we believe that these assessments are best used only as an illustrative benchmark and considered together with the other available evidence.

²¹⁹ See Annex 7 in the May 2009 consultation.

What can historical trends tell us?

- A13.103 We have also considered past movements in MTRs and measures of mobile takeup. As BT highlights in its submission, when faced with the prospect of MTR reductions in the past, MCPs argued that this would result in falls in penetration rates, and millions of marginal customers leaving the market. However, as shown below, this has not been the case. MTRs have steadily declined with successive regulatory interventions while subscriptions and ownership penetration have risen.
- A13.104 Figure 50 below shows trends in MTRs and mobile subscription penetration rates from 1995 to 2009 in the UK. The mobile providers have different MTRs, so the average MTR is calculated by weighting each provider's charges by the number of their subscribers.

140 25 Active subscriptions per 100 population/personal users of mobile (% of population) 120 20 100 15 80 MTRs (ppm) 60 10 40 5 20 0 2001 2003 2009 1995 1996 1997 1998 1999 2000 2002 2004 2005 2006 2007 2008 Subscription Ownership Average MTRs

Figure 50: MTRs, subscription and ownership

Source: Ofcom

- A13.105 Average MTRs were lowered substantially at the start of this period, falling by over 7ppm from 1995 to 1996 for instance, and have been declining more gradually since then. Meanwhile, take-up of mobile phones has risen steeply and subscription penetration rates have exceeded 100%. The proportion of the population who personally use a mobile has been relatively stable, with a slight growth over the period 2000-2009.
- A13.106 The rate of decline in average MTRs has been slowing more recently. This is partly due to the rising position of H3G in terms of subscriber numbers, giving greater weight to its MTR, which is higher than the other operators'. MTRs were projected to reach 5.1 ppm by 2010/11 (in 2006/07 prices), according to Ofcom's Statement

on Mobile Call Termination in 2007,²²⁰ but the CC has recently concluded that they should be further reduced to 4.0 ppm (in 2006/07 prices).²²¹ Our proposals would see MTRs falling even lower, to around 0.5ppm in 2015 (in 2008/09 prices).

- A13.107 Of particular interest may be the period between 2000 and 2004, during which time MTRs were reduced quite substantially (from around 11.4 ppm to around 6.2 ppm). The absolute decline in the level of MTRs then may be comparable with that possibly implied by the Recommendation. While it is smaller in relative terms (around 46% compared with around 88% if MTRs fell to 0.5ppm), it is greater in absolute terms (around 5.2 ppm, compared to around 3.8 ppm). Importantly, subscription penetration rates had reached relatively high levels by 2000 and appear to have continued to grow at a stable yearly rate since. Ownership levels, meanwhile, experienced growth from roughly 60% to 80%.
- A13.108 Another aspect of mobile take-up that could be of interest is that of pre-pay subscriptions. Most respondents claim that it would primarily be low usage consumers that would drop off the market if MTRs were to decline further. Low usage consumers tend to be more concentrated among pre-pay than post-pay contracts, so it may be helpful to consider take-up of this type of subscription. If MTRs had an impact on subscription rates one may, therefore, expect pre-pay connections to be the most affected.
- A13.109 Figure 51 shows trends in MTRs and in the share of pre-pay subscriptions between 1998 and 2009. Although the proportion of pre-pay subscriptions increased substantially between 1998 and 2000, it has been relatively stable since then, with a modest decline from 70% to 60% over ten years. This has occurred at the same time as continued increases in mobile ownership.

²²⁰ The Statement, published on 27th March 2007, is available at:

http://www.ofcom.org.uk/consult/condocs/mobile_call_term/statement/statement.pdf.²²¹ The CC's determination is available at <u>http://www.competition-</u>commission.org.uk/appeals/communications_act/mobile_phones_determination.pdf.



Figure 51: MTRs and proportion of pre-pay subscriptions

Source: Ofcom Prepay figure for 2009 is an estimate

A13.110 Taken together, this evidence appears to suggest that past changes in MTRs have not had a dramatic impact on subscription penetration rates. However, one needs to be very careful in reaching conclusions from simple comparisons of past trends, given that many other factors could have affected take-up of mobile subscriptions over this period.

Assessing the possible impact on fixed ownership

- A13.111 As set out in paragraph A13.45, reductions in MTRs will also have an effect on fixed operators. Decreases in MTRs will reduce the costs faced by fixed operators for FTM calls, and so will allow them greater flexibility in their retail pricing. This may increase the attractiveness of fixed retail offers, and so it is possible that fixed penetration could be positively impacted (though whether this will reduce a downward trend in fixed subscriptions or lead to an increase in fixed subscriptions is unclear). While affordability is a factor for some people choosing not to have a fixed line, many do so as they do not need one rather than because they consider it to be poor value for money.²²² Therefore, this may be more of a factor for those who are involuntarily excluded from using fixed services due to affordability.
- A13.112 On the other hand, in its response to the May 2009 consultation, C&W suggested that, if reductions in MTRs forced MCPs to raise their subscription charges, consumers who currently subscribe to both fixed and mobile services may be forced

²²² Our 2009 Consumer Experience research report (available at

http://www.ofcom.org.uk/research/tce/ce09/research09.pdf) shows that 6% of respondents voluntarily did not own a fixed line (the main reasons given being "no need for a fixed line" and "happy to use a mobile phone instead"), while half as many (3%) are involuntarily excluded (with affordability being the main reason). In addition, while research for our Fixed Narrowband Retail market review found that price was one of the most important reasons why respondents chose not to have a landline, a similar proportion of respondents answered that they did not see a need for a landline or that they lived in rented accommodation.

to drop one of their connections. This could lead to many consumers choosing to become mobile-only, and so may negatively affect fixed ownership. However, we consider that reducing MTRs should allow fixed operators to adapt their retail offers to maintain or increase their attractiveness to consumers in competition with mobile operators.

A13.113 Overall, while lower MTRs and, in particular, adopting pure LRIC may make fixed offers more attractive, we believe that any impact on ownership of fixed services is likely to be immaterial.

How would low MTRs affect consumers through usage?

- A13.114 Respondents have argued that among those mobile users who do not drop out of the market, it is likely that some will benefit and some will lose due to differences in their usage patterns. For example, it has been claimed that, because of the change in the structure of retail prices triggered by the adoption of pure LRIC (or more generally by MTRs considerably lower than today), those who make a relatively large volume of outbound calls are likely to benefit due to falling usage prices (and are less likely to be negatively affected by higher upfront fees), while those who make relatively few outbound calls are likely to be worse off as they will face higher access fees but do not benefit as much from lower usage charges. Note at the outset that here we focus on those consumers that remain mobile consumers as a result of lower MTRs.
- A13.115 In this section we test these claims and provide an assessment of the potential winners and losers as MTRs fall. In other words, irrespective of the overall impact of lower MTRs which we consider positive for efficiency, we examine the distributional impact on different types of consumers. In the subsequent section, we consider whether there is any evidence that those negatively affected are more likely to be vulnerable consumers.
- A13.116 Although respondents have focused mainly on the impact on different types of mobile subscribers, fixed users are likely to gain from this change and also need to be considered.²²³

Our view in the May 2009 consultation

A13.117 In the May 2009 consultation, we suggested that the net effect of rebalancing call and subscription charges would be likely to favour mobile consumers that make more calls, against those that make fewer calls. However, we noted that the regulatory authorities in countries with low MTR have not expressed concerns about distributional issues.

Stakeholders' arguments

A13.118 O2, T-Mobile, Orange and Tesco Mobile all argued that reducing MTRs is likely to negatively affect low-value pre-pay users who make few outbound calls. Vodafone, in its response to the May 2009 consultation submitted that the UK offers a wider and more flexible range of tariffs than the US. Consumer Focus also expressed concern that low spenders who make few calls may lose out, and considered it crucial that low users and the vulnerable should not be priced out of the market.

²²³ Note that when we refer to users or subscribers we mean individuals and not subscriptions. For example, consumers with multiple subscriptions may end up being better off overall despite being worse off in one of their subscriptions.

- A13.119 H3G accepted that there is a correlation between low users, pre-pay and more vulnerable social groups. However, it considered that this did not necessarily create a cause for concern. It suggested that low users may become high users as per minute charges fall, highlighting that average minutes of use per subscriber are higher in low MTR regimes. H3G argued that there is very little actual evidence on how low users would react to a change in the structure of retail prices. Moreover, it argued that any assessment of historical reactions would not necessarily be conclusive on the likelihood of future reactions as a number of key parameters would also change. It also suggested that operators may be able to find other ways to profitably serve low use consumers, such as offering 'stripped down' voice services, or providing tariffs with higher per minute charges but low (or no) monthly charges.
- A13.120 T-Mobile and Orange suggested that these changes may benefit contract or higher value customers. O2 was less convinced of this, suggesting that medium and some (or all) high users were also likely to see an increase in their monthly bills. In response to the EC Recommendation, Frontier Economics's analysis suggested that the number of low and medium users in Europe who would be worse off in a US-style system is much higher than the number of European high users who might benefit.
- A13.121 T-Mobile, Vodafone and O2 were all critical of the suggestion that fixed consumers would benefit, highlighting the data on FTM retail prices to suggest that it is unlikely that fixed operators will pass cost savings through into retail prices. Vodafone highlighted that, even if fixed consumers do benefit, the number of fixed-only households (7%) is smaller than the number of mobile-only households (11%), and so "the number of unambiguous gainers...will be lower than the number of unambiguous losers....". T-Mobile also suggested that any benefit to fixed customers would be unlikely to offset the cost to consumers of higher mobile prices. On the other hand, H3G commissioned a welfare analysis, which found that the overall welfare loss to the mobile industry of moving from LRIC+ to pure LRIC (which ranged from -£3m to -£800m, depending on the scale of call externalities) would be outweighed by the welfare gain in the fixed market (£967m). Further, the loss of consumer surplus to mobile consumers (between -£385m and -£974m) would be outweighed by the gain to fixed consumers (£900m) if call externalities are positive.²²⁴ It also suggested that the loss to mobile consumers may be overestimated, as it only models post-pay users, for whom the waterbed effect is stronger. H3G suggested that pre-pay users will be less strongly affected by the waterbed effect, with reductions in MTRs instead reducing networks' profits.
- A13.122 T-Mobile pointed to Ofcom's 2007 Consumer Experience research,²²⁵ which found that 82%²²⁶ of households with a fixed line also have at least one mobile phone. It argued that, as the vast majority of fixed consumers also own and receive calls on mobiles, the two consumer groups will inevitably be largely the same people, and *"[i]t follows that there can be expected to have been a very small overall distributional effect arising from termination rates being reduced"*.
- A13.123 Some stakeholders were more positive about the impact that reducing MTRs may have on consumers.

²²⁴ This analysis assumed full pass-through of changes in MTRs to FTM call prices.

²²⁵ Available at <u>http://www.ofcom.org.uk/research/tce/ce07/research07.pdf</u>.

²²⁶ Although T-Mobile actually claims this shows 92% of households with a fixed phone also have at least one mobile phone.

A13.124 COLT argued that in the long run, lower MTRs would benefit both fixed and mobile customers as communications providers will have more flexibility in offering a variety of retail packages and tariff structures. BT suggested that aggressive competition for customers between MCPs will 'squeeze out' any consumer detriment arising from mobile pricing. Similarly, H3G argued that greater competition encouraged by a change in the MTR regime would "*create an efficiency knife*" to puncture the waterbed effect. H3G's welfare analysis focused only on the short run, but it suggested qualitatively that in the medium run reducing MTRs would change the structure of the market, with lower off-net prices and smaller tariff-mediated network effects leading to further convergence in market shares, better exploitation of returns to scale and lower calls costs. Thus, the welfare gains of adopting a low MTR regime (compared to LRIC+) may be greater than suggested by its modelling.

Our analysis

Breakdown of telephony users potentially affected

- A13.125 It may be useful to disentangle the impact on consumers into the following categories:
- A13.126 *Mobile (only) users* Overall there are two factors that affect mobile users. First, they are likely to be worse off because their MCP will receive less money from fixed callers' providers. As long as the mobile retail market is competitive, the reduction in the transfer from the fixed sector means that retail prices to mobile users are likely to increase due to the waterbed effect. Second, however, lower MTRs should benefit mobile users on average as we would expect that costs are more efficiently recovered from the retail side and retail price structures better reflect the underlying costs of provision (see Section 7 and annex 12). The change in retail price structure should increase the usage of mobile subscribers that do not drop out and, hence, they will benefit from making more calls. Respondents have strongly argued that:
 - 13.126.1 Low-usage subscribers will likely be worse off as for their given usage pattern they will end up with higher bills – e.g. if they made a given number of calls the introduction of a fixed fee and a reduction in call charges, which we believe will result from lower MTRs, could make them worse off. This reasoning, however, does not take into account the fact that a reduction in calling charges is likely to increase their usage, particularly since low users may well be sensitive to the price of calls. Starting from their 'new' usage patterns the 'new' retail price structure may make them better-off – i.e. they may pay less than they would have had with the 'old' price structure;
 - 13.126.2 High-usage subscribers will be better off (though O2 argued that they would also lose out). They will also face a retail price structure with lower call charges (or bigger bundles) and potentially higher fixed fees. Their reaction depends on their demand price elasticity for call charges.
- A13.127 *Fixed (only) users* reductions in MTRs will reduce the costs forced by fixed peroviders and the retail charges of FTM calls. Therefore, fixed consumers are likely to benefit; and
- A13.128 *Mobile and fixed users* Those who use both fixed and mobile services (roughly four in five) are likely to face outcomes that reflect a number of effects operating in different directions. The final effect depends on their relative use of the two

platforms and the relative demand elasticities for fixed and mobile calls. Without detailed information on usage patterns and demand elasticities, it would not be possible to identify who would gain and who would lose in more detail (and in any event the exercise would rely on many assumptions about the different retail packages offered by the operators).

A13.129 Given our categorisation of the types of users that may be affected by the change considered in this consultation, we start by providing a breakdown of these using the data available to us. We distinguish between fixed-only, mobile-only and fixed and mobile users.

Table 24: Proportion of the population who use fixed-only, mobile-only and both fixed and mobile services in 2005 and 2009

	Proportion of the population who are		
	Fixed-only	Mobile-only	Fixed and mobile
2005	11%	8%	80%
2009	7%	12%	80%

Source: Ofcom

Figures may not add-up to 100 because of rounding.

A13.130 Table 24 shows that there are slightly more mobile-only users than fixed-only users, the opposite of the situation just five years ago. The proportion of the population who have access to both fixed and mobile has remained unchanged.

The impact on mobile users

- A13.131 Whether mobile users as a whole will benefit depends on two offsetting factors. First, mobile operators will receive reduced funds for FTM calls. The European Commission²²⁷ estimated that for the 27 European Member States this could amount to €6bn less revenue flowing from fixed to mobile. If the retail mobile market is competitive MCPs may be able to recover the lost revenue via higher charges from their own subscribers (though as argued in the previous section on the impact on mobile take-up, retail price rises will fall more heavily on price insensitive mobile consumers).
- A13.132 Second, as discussed previously, there will be a more efficient structure of prices for owning and making calls from a mobile phone.
- A13.133 We believe it is helpful to focus on mobile-only users first either as a separate category of mobile users or by simply considering the impact on mobile consumers but abstracting from the impact these same consumers may be subject to as fixed

²²⁷ Available at

http://ec.europa.eu/information_society/policy/ecomm/doc/implementation_enforcement/artic le_7/working_doc.pdf

users. The focus on mobile-only users is an attempt to distinguish between the effects that this change in policy is likely to have on most consumers that are both mobile and fixed consumers. We recognise that to the extent that mobile-only users are a specific subset of all mobile users, the conclusions may not apply to the latter. Nonetheless, we believe that it is important to distinguish between the effect on consumers as mobile and fixed consumers.

Mobile-only users

- A13.134 For the above reasons we do not agree that, as Vodafone asserts, all mobile-only users will be "*unambiguous losers*". For example, other stakeholders argue that high volume users will benefit from the changes in relative prices.
- A13.135 The question of whether mobile (and mobile-only) users would be better or worse off depends on the comparison one makes. For example, assuming that the consumption pattern would remain unchanged i.e. there will be no change in call traffic it is likely that mobile-only users will be worse off. The majority of stakeholders who suggest that low usage mobile users will be worse off and/or high usage consumers would be better off implicitly assume that both categories would not modify their consumption pattern.
- A13.136 We are not convinced that this will be the case. For example, consider the case of a low usage consumer who faces retail prices consisting of no subscription charges and relatively high call charges (i.e. a typical low usage pre-pay package customer). As a result, they would make few calls and contain their monthly bill. Assume now the same consumer faces a price structure with a monthly subscription fee (inclusive of a bundle of calls) and lower call charges. If their consumption pattern did not change they would have to pay for a subscription charge which would not be compensated by lower call charges. Keeping their usage profile unchanged would, therefore, lead us to conclude that they would be worse off. However, suppose now that the consumer would increase their calls as a result of the lower call charges. Using this 'new' usage profile they could be better off with the 'new' compared to the 'old' price structure.
- A13.137 Hence, the conclusion on this point depends on the starting point of the analysis. In general (i.e. unless caused by a distortion), an expansion of usage would be positive from a welfare point of view. A concern with this analysis is that paradoxically a price reduction that substantially expands demand (i.e. because demand is price elastic) will result in larger consumers' expenditure and, according to the interpretation of some stakeholders, these consumers would be worse off. This clearly does not take into account that consumers are better off because they have expanded their consumption. Although here we are concerned with distributional impacts it is worth keeping in mind that, although there may be some winners and losers, the critical aspect is that consumers as a whole should gain from the change in policy.
- A13.138 Below we examine a number of factors that may be relevant to the assessment of the impact of lower call charges on the demand for calls.
- A13.139 First, mobile-only users may expand their usage as a consequence of falling per minute charges. In Section 6 of the May 2009 consultation we concluded that as a result of a decline in MTRs over the last few years, the differential between on- and

off-net MTM call prices has declined significantly.²²⁸ We believe this has partly been achieved via a reduction of the off-net charges which are directly affected by the level of MTRs (unlike on-net calls). Figure 52 shows that off-net MTM minutes per subscriber have significantly increased relative to on-net call minutes (although they are still lower), which may partly be the result of narrowing retail price differentials between the two types of calls, encouraged by falls in MTRs. This may suggest that historically a decline in MTRs has led to an expansion of calls. In addition, in the May 2009 consultation (annex 5) we provided data showing that usage per capita tends to be higher in countries with low MTRs.

- A13.140 However, it is important not to place too much weight on this as evidence, as there are likely to have been many other factors influencing trends in call minutes within and between countries. In addition, CEG's study for Ofcom (see annex 7 of the May 2009 consultation) found no evidence of a direct significant relationship between MTRs and usage.
- A13.141 We have reviewed the available evidence on the demand price elasticity for calls. The CC reports a range of between -0.3 and -0.62 for the own-price elasticity of mobile originated calls in the UK.²²⁹ The CC itself used an elasticity of -0.3 in its calculations, which has subsequently been used by Ofcom in previous MCT reviews. In response to the New Zealand Commerce Commission's 2001-02 Telecommunications Service Obligations draft determination, Vodafone summarised a number of studies on the elasticity of certain fixed and mobile telecommunications services, including the price elasticity of mobile originated calls.²³⁰ The studies mentioned found demand for mobile originated calls was inelastic (with the exception of one study, where the estimate was so imprecise it was regarded as not statistically significant), with estimates ranging from -0.09 to -0.8. Grzybowski and Pereira estimated a mobile call demand price elasticity of -0.38 in Portugal.²³¹ These estimates suggest that demand to make calls from mobiles is relatively inelastic, and so may not be highly responsive to changes in retail call prices. However, these studies either do not specify which types of calls are included in their calculations, or include both on-net and off-net MTM calls (and in some cases, mobile-to-fixed calls as well). Therefore, these estimates do not refer specifically to the subset of calls which we believe will be most affected - i.e. MTM off-net calls. In addition, some of the calculations use real Average Revenue Per Minute (which also included subscription charges) as a proxy for call prices. Thus, the same caveat applies here as for subscription elasticity - elasticity estimates will focus on the effect of changes in prices overall, not changes in relative prices. Grzybowski and Pereira use data from consumer bills. However, they did not differentiate between the elasticity of demand for different call types.

particular see paragraphs 8.7-8.51 for a description and critique of these estimates. ²³⁰ Vodafone (2003) "Review of price elasticities of demand for fixed line and mobile telecommunications services", available at

²²⁸ See in particular paragraph 6.37 (and supporting evidence in Annex 9) of that document, available at http://www.ofcom.org.uk/consult/condocs/mobilecallterm/

²²⁹ See Competition Commission, 2003, Vodafone, 02, Orange, T-Mobile: Reports on references under section 13 of the Telecommunications Act 1984 on the charges made by Vodafone, O2, Orange and T-Mobile for terminating calls from fixed and mobile networks, pp. 244-245, available at: <u>http://www.competition-commission.org.uk/rep_pub/reports/2003/475mobilephones.htm</u>, in particular see paragraphs 8.7-8.51 for a description and critique of these estimates

http://www.comcom.govt.nz/IndustryRegulation/Telecommunications/TelecommunicationsSe rviceObligations/ContentFiles/Documents/Voadafone%20paper%20on%20price%20elasticiti es%20for%20weighted%20revenues%20approach1.PDF

²³¹ Grzybowski, L. and Pereira, P. (2008) "The complementarity between calls and messages in mobile telephony", *Information Economics and Policy*, vol. 20(3), p.279-287.
A13.142 Furthermore, these estimates (with the exception of Grzybowski and Pereira's) are not very recent. The fact that bundles of calls are becoming more widespread may change how consumers use their mobile phone even if the overall price remained unchanged. This is because as long as subscribers do not drop out, the fact that they face a very low or zero marginal price for calls (other than when getting closer to the maximum of the bundles) is likely to expand usage even if the overall price did not decrease.



Figure 52: Mobile call minutes per subscriber and MTRs

Source: Ofcom, operators

Low and high usage mobile subscribers

- A13.143 In order to assess whether low or high users respectively lose and gain we would need to have some evidence of the relative demand price elasticities of calls e.g. low users will be worse off if their elasticity was low so that there was no increase in demand and they had to pay monthly fixed fees, instead. We are not aware of any studies examining the relative elasticity of demand for calls for different user groups.
- A13.144 We are not convinced by the arguments of stakeholders that low usage consumers must all be worse off and conversely high usage consumers would be better off. For example, low users are likely to be more price sensitive than high users and hence they may benefit more from the lower call charges. Although we have no information in this regard we believe that the decisive factor is the relative degree of price sensitivity of various consumers to a reduction in call prices and not necessarily the amount of usage.
- A13.145 In addition, research suggests that the waterbed effect is stronger for post-pay customers generally high users than for pre-pay customers (who a number of stakeholders use as a proxy for low users, or assume will be worse off in any

case).²³² Further, when MTRs fall, in the short run it is actually post-pay customers who are worse off as a result of the waterbed effect, while pre-pay users are unaffected.²³³ This is similar to one of the conclusions of H3G's welfare analysis. However, H3G's analysis overlooks the fact that MCPs may choose to shift their retail offers away from pre-pay price structures and towards post-pay, as discussed in the previous section. Eventually operators change prices for all customers, and so ultimately pre-pay users are also negatively affected.²³⁴

- A13.146 If we accepted that low usage consumers would be worse off and high usage consumers would be better off, we would need to consider whether this would be a desirable outcome. This question could be addressed either on efficiency or equity grounds:
 - in the absence of a reduction in mobile ownership, the question is whether it is overall more efficient to favour either low or high users. To the extent that this may have some implications in terms of overall output, there may be some efficiency implications. For example, if by favouring high vis-à-vis low usage subscribers the overall call traffic increased, this may be seen as an efficient outcome. This was addressed in annex 12;²³⁵ and
 - on equity grounds it would be difficult to reach a decision on which outcome to prefer, unless perhaps either a substantial drop in mobile ownership occurred or the consumers losing out belonged to vulnerable social economic groups (see below).
- A13.147 As a whole we do not believe that low usage consumers as a category will be necessarily worse off. Some will have a high elasticity of demand for calls and, hence, will be better off as they will make more calls. Hence, while there will be winners and losers from a change in the retail price structure following a reduction in MTRs, we do not think these could be necessarily or precisely identified as low or high usage mobile consumers.

The impact on fixed-line users

A13.148 Perhaps a more certain outcome is that fixed (and certainly fixed-only) users will gain from our proposal. As the wholesale cost of providing calls to mobiles falls, the retail price of fixed-to-mobile calls is likely to fall. In addition, if the view set out in paragraph A13.45 proves to be correct, and the cost savings from falling MTRs have been passed on in reduced prices for calls other than those made to mobiles, it is possible that even fixed customers who do not actually make many calls to mobiles may also benefit. For this reason, and because we do not have usage data granular enough to determine how many fixed-only users make at least some calls to mobiles, we assume here that all fixed-only users will benefit to some extent. As shown in Table 24 above fixed-only users make up 7% of the population. Due to increased take-up of mobile telephony, this figure has fallen rapidly from 33% in 2000, although the rate of decline has slowed more recently (Figure 53).

²³² See Genakos, C. and Valletti, T. (2009) "Testing the 'waterbed effect in mobile telephony", Journal of the European Economic Association (forthcoming), available at

http://www.sel.cam.ac.uk/Genakos/Genakos%20Valletti-Testing%20Waterbed%20Effect.pdf. ²³³ This analysis can be found in the supporting appendix to Genakos, C. and Valletti, T. (2009) "Testing the 'waterbed' effect in mobile telephony", Journal of the European Economic Association (forthcoming), available at <u>http://www.sel.cam.ac.uk/Genakos/Additional%20Results.pdf</u> ²³⁴ Ibid

²³⁵ As argued there, the answer to this question also depends on the cost structure for the provision of these services and it is essentially an efficiency question.



Figure 53: Proportion of population who are fixed-only users

Source: Ofcom

- A13.149 Thus, it is likely that the proportion of consumers who may benefit is slightly outweighed by the number who may lose out. However, while we believe that there is a high probability that fixed-only users will gain, it is unclear what would be the outcome for mobile-only users i.e. as discussed above they may either lose or gain.
- A13.150 This expected gain to fixed (including fixed-only) users, however, depends on fixed operators passing cost savings from lower MTRs into retail prices. Although the data suggests that prices for fixed-to-mobile calls have not been falling in line with MTRs, and have actually increased, as set out in paragraphs A13.45-A13.46 we do not consider that this necessarily means that fixed consumers have not benefited from reductions in MTRs, and would not benefit from future reductions. Cost savings are likely to have been passed on to consumers through reducing the price of focal packages (for which competition is stronger) rather than through reducing the charges for out-of-bundle call types (such as calls to mobiles).

Fixed and mobile users

A13.151 In practice, the distributional impacts of the relative benefits to fixed and mobile customers will be most acute for customers who take one or the other of fixed and mobile service, but not both. The vast majority of the population (currently 80% of consumers) has access to both a fixed line and mobile services. How a fall in MTRs and subsequent changes to retail prices for fixed-to-mobile and mobile-to-mobile calls would affect these consumers would depend upon their use of each service for making and receiving calls, the changes in the retail prices of the two types of

services and consumers' relative price elasticities for (fixed and mobile) calls. As we do not have such data we are unable to determine how many of this group would benefit and how many could lose out. We also believe the exercise would be extremely time-consuming and unlikely to generate robust results as discussed above.

Vulnerable consumers

- A13.152 Identifying winners and losers may be important, but it is insufficient, by itself, to assess any equity concerns. It is also necessary to consider if there is likely to be a higher proportion of vulnerable consumers among the likely 'losers' and 'winners' when compared to the population as a whole.
- A13.153 We consider that for the purpose of this analysis those consumers with low incomes and/or belonging to socio-economic groupings D and E²³⁶ are likely to be most vulnerable, as these consumers will be less able to afford increases in their expenditure (even in return for better service offerings) than other groups.

Our view in the May 2009 consultation

A13.154 We considered that if there were a significant negative impact on some users from lowering MTRs, this issue may be better addressed through alternative policy means, such as broader consumer protection measures. We gave the example of a mandatory social tariff to ensure that mobiles are affordable for low usage subscribers as one such measure.

Stakeholders' arguments

- A13.155 T-Mobile highlighted that amongst those on the lowest incomes, 81% use pre-pay, and almost a quarter of this income group rely on this as their only access to telecommunications services. Consumer Focus also considered it crucial that the vulnerable are not priced out of the market. Both O2 and T-Mobile highlighted that such an effect on the poorest in society would be extremely undesirable, particularly given Ofcom's responsibilities.
- A13.156 As stated, H3G accepted that there is a correlation between low users, pre-pay and more vulnerable social groups. However, as set out above, it considered that this did not necessarily create a cause for concern. It also agreed with the view put forward in the Consultation, that if any adverse distributional impacts did arise, an intervention such as a social tariff would be a more targeted and efficient tool to address this than the MTR regime.

Our analysis

A13.157 We base this analysis on evidence from our survey tracker data. It is important to note that this data should be interpreted carefully, as there are important caveats. In particular, the proportion of people who choose not to provide information about their income fluctuates each year, making it harder to read across trends, and possibly distorting the results. This also means that the proportions in each income bracket will not sum to 100%. In addition, may not accurately report which salary bracket they belong to. The proportion of people in different socio-economic groups

²³⁶ This is based on the NRS social grade system of demographic classification, originally developed by the National Readership Survey. In this system, group D is semi-skilled and unskilled manual workers and group E is made up of those on the lowest levels of subsistence

does not fluctuate in the same way, as we set quotas for the numbers in each group based on census data. Therefore, we suggest that this analysis should be used with caution as only an indication of whether vulnerable consumers are more likely to be affected, not as definitive evidence of this.

A13.158 Figure 54 below shows that a greater proportion of fixed-only and mobile-only consumers are in vulnerable groups compared to the proportion of vulnerable consumers in the total population.²³⁷ Fixed-only and mobile-only consumers are also considerably more likely to belong to vulnerable groups than those who use both services.

Figure 54: Proportion of telecoms users in low income households or in DE socioeconomic group



Source: Ofcom

A13.159 We structure the following section as follows:

- 13.159.1 First we consider whether mobile take-up for this group is more likely to be influenced by the level of MTRs than that of the general population
- 13.159.2 We then consider whether:
- Those mobile users (who retain their mobile service) who are most likely to be negatively affected are more likely to be vulnerable consumers; and
- Those fixed users who are most likely to benefit are more likely to be vulnerable consumers

²³⁷ "Total population" here refers to the population aged 15+ who use any form of phone, either fixed or mobile

Mobile take-up among vulnerable consumers

A13.160 Figure 55 shows how the proportion of the low income and DE populations who personally use a mobile has changed since 2003.²³⁸ It is clear that vulnerable consumers are less likely to own a mobile than the general population. In 2003, just over 50% of those on low incomes and almost 60% of those in the DE socio-economic groups owned a mobile, compared to 75% of the general population. However, the proportion of vulnerable consumers using mobiles has also grown over this period, and the gap is now smaller. In 2009, 76% of those on low incomes and roughly 80% of those in DE owned a mobile, compared to almost 90% of the general population. Therefore, while ownership among vulnerable consumers still lags behind that of the general population, it has been growing at a slightly faster rate than total mobile ownership, and does not seem to have been negatively affected by previous reductions in MTRs. However, as stated above, we should be wary of drawing conclusions on future developments based on simple historical trends as a number of other factors also affect mobile take-up.



Figure 55: Mobile ownership by low income and DE socio-economic groups and MTRs

Source: Ofcom

Possible effect on vulnerable mobile consumers

- A13.161 Although we are not convinced that low mobile users as a category of consumers will necessarily lose and high usage consumers will gain we assume here that they do and attempt to assess whether a higher proportion of these users belong to vulnerable groups.
- A13.162 We undertake two separate comparisons.

²³⁸ All figures relate to those aged 15+

- 13.162.1 First, we examine if mobile-only users are more likely to belong to vulnerable groups than the whole population who have a phone, either fixed or mobile. This matters because if mobile-only users were negatively affected they would be more likely to lose out if they did not have a fixed connection (although perhaps for this reason they will be less price sensitive). This is because fixed users would benefit from a reduction in MTRs (as discussed above) and, as a result, users of both services could see any possible losses on mobiles compensated by gains from fixed services. Figure 54 above shows that a greater proportion of mobile-only users are in vulnerable groups compared to the population as a whole 17% of the total population who use any kind of phone lie in low income households, compared to 39% of mobile-only consumers. In terms of socio-economic group, almost half of mobile-only consumers are in the DE group, compared to 27% of the population.
- 13.162.2 Second, we assume (although as stated we are not fully convinced by this argument) that the mobile-only users that are most likely to be negatively affected are low users. We further assume that low users mostly belong to the current group of pre-pay consumers. We are aware that this is not an accurate proxy for this. However, we do not have detailed information on individual consumers' usage profiles, and so instead must use a proxy for those most likely to be low users. We consider a suitable though imperfect proxy to be pre-pay users. As mentioned previously, in their responses many stakeholders also use a similar proxy, or assume that pre-pay users in general are likely to be worse off.
- A13.163 We begin by considering whether pre-pay users in general are more likely to belong to vulnerable groups than mobile users in general. The data suggests that this is not the case to any significant degree when considering low income users. Among pre-pay mobile users, 20% are in households with incomes less than £11.5k, compared to 14% of all mobile users. Similarly, 32% of all pre-pay users are in the DE group, compared to 27% of all mobile users. However, as pre-pay mobile forms a significant part of all mobile customers, the latter is likely to be influenced by the former and so large differences are unlikely to be found. A fairer comparison is to compare pre-pay users to post-pay users. Among all post-pay users, 7% are in households with incomes less than £11.5k, and 15% are in the DE socio-economic group. This suggests that pre-pay consumers are markedly more likely to belong to vulnerable groups than post-pay users.
- A13.164 Comparing mobile-only pre-pay users to all pre-pay users gives a slightly different picture. The data suggests that 28% of mobile-only consumers who use pre-pay have a household income below £11.5k, compared to 20% of all pre-pay users. Figure 56 and Figure 57 show the trends in these figures since 2003. It should be noted that the number of mobile users and mobile-only users has been increasing over time, so year on year comparisons should be made with this in mind. The proportion of low income users among the mobile-only population seems to fall between 2003 and 2007, but then appears to start rising sharply again. However, as this data is based on very small sample sizes (particularly in the earlier periods, when the proportion of mobile-only customers was very small) firm conclusions cannot be drawn, as we cannot rule out the possibility of survey error causing this effect. The proportion of all mobile pre-pay users who are on low incomes declined slightly from 19% in 2003 to 16% in 2008, but then rose again to 20% in 2009. In every year except 2007, the proportion of mobile-only pre-pay users in low income households has been greater than the proportion of all pre-pay users in low income

households. This suggests that pre-pay users who are mobile only are more likely to be in low income households than the average pre-pay customer.

- A13.165 However, a similar proportion of mobile-only pre-pay and all pre-pay users are in the DE socio-economic group (34% and 32% respectively). The proportion of pre-pay users in the DE socio-economic group has remained relatively constant at roughly 30% (see Figure 57). Up until 2007, this was much lower than the proportion of mobile-only users in the DE socio-economic group, but the large decline in the proportion of mobile-only DE users in that year means that the proportions are much closer now (although as mentioned above, this is based on a small sample and so the results are not necessarily robust). It is unclear whether in the future, mobile-only pre-pay consumers will be more likely to be in the DE group than pre-pay consumers in general, as this has started to increase again. Developments in mobile broadband and the government proposal to levy a £6 tax per year on fixed lines may lead to an increase in mobile-only customers (although it is unclear what the socio-economic profile of these customers will be e.g. whether less well-off consumers would be disproportionately more likely to switch to being mobile-only).
- A13.166 This suggests that mobile-only pre-pay users are more likely to be on low incomes than the total population of pre-pay users and mobile users in general. However, similar proportions of mobile-only pre-pay, all pre-pay and all mobile users are in the DE socio-economic group. However, caution must be applied when using this data (particularly that on the mobile-only pre-pay population), as it is based on only a small sample. In addition, as stated earlier the number of respondents refusing to give their income fluctuates from year to year, which may also interfere with the results. This analysis should therefore be considered as indicative only. In addition, since only 12% of the population are mobile-only consumers, less well-off mobileonly pre-pay users are likely to constitute only a small proportion of the population – the data suggests that those mobile-only pre-pay users on incomes less than £11.5k account for about 3% of the total population, and those in socio-economic group DE make up about 4% of the population.



Figure 56: Proportion of mobile-only users who use pre-pay and are on low incomes or in socio-economic group DE

Source: Ofcom





Source: Ofcom

Possible effect on vulnerable fixed consumers

- A13.167 Figure 58 shows that fixed-only consumers are significantly more likely to belong to vulnerable groups than the total population who use any sort of phone. In addition, 13% of all fixed users (including those who also have a mobile) are on low incomes, compared to 42% of fixed-only users. Fixed-only consumers are also more likely than fixed users in general to be in the DE socio-economic group (46% compared to 24% respectively). This suggests that those fixed users who will be 'unambiguous gainers' are more likely to be vulnerable consumers than those who will face a more mixed outcome due to using both fixed and mobile services.
- A13.168 In addition, a similar proportion of fixed-only users and mobile-only users are on lower incomes and in the DE socio-economic group (see Figure 58). Therefore, while reducing MTRs may disadvantage some vulnerable consumers, it will also benefit other vulnerable consumers. Whether vulnerable consumers, as a whole category defined here, will be worse off is unclear but seems unlikely.



Figure 58: Proportion of mobile-only and fixed-only consumers on lower income and socio-economic group DE

Source: Ofcom

Annex 14

Equality Impact Assessment

- A14.1 We are required by statute to have due regard to any potential impacts our proposals may have on race, disability and gender equality. We fulfil these obligations by carrying out an Equality Impact Assessment (EIA), which examines the potential impacts our proposed policy is likely to have on people, depending on their background or identity.
- A14.2 In annex 13, we suggested that consumers who use fixed services are likely to benefit from reductions in MTRs, while the effect on consumers who use mobile services will depend on their price elasticity of demand broadly, if they have a high elasticity of demand for calls they are likely to benefit, while if they are insensitive to the price of calls they are likely to lose out. Those who use both fixed and mobile may be either positively or negatively affected, depending on their relative use of the two services and their relative price elasticities for both.
- A14.3 We now assess whether the composition of the groups most likely to be affected (either positively or negatively) is skewed with regard to race, disability or gender. We do this in the following way:
 - 14.3.1 First we identify which consumers are most likely to be negatively affected. As set out in annex 13, we consider that mobile-only users with a low elasticity of demand are more likely to be disadvantaged. We also highlighted that we do not have data on the demand elasticities or usage of different groups, and accurately gathering this data would require extensive additional quantitative market research. In the absence of this data, we assumed (though we are not convinced this is correct) that mobile users (including those who also use fixed services) on low incomes or in the DE socio-economic group are the best (although highly imperfect) proxy for this. In addition, we also examine whether mobile-only users in general are more likely to belong to specific socio-demographic groups, as these users are more likely to lose out compared to those who also use fixed services;
 - 14.3.2 We also go through the same process to assess those most likely to be positively affected. As set out, we consider that fixed only users and potentially mobile users with a high elasticity of demand are those most likely to benefit. However, while we can identify fixed only users from our data, we cannot directly identify users on the basis of their elasticity or amount of usage, and we have no evidence on which groups of users are most likely to be price sensitive. Therefore, we focus only on fixed only users in this regard; and
 - 14.3.3 We then compare the composition of these groups to that of the wider population to establish whether there will be any (negative or positive) impact on equality.
- A14.4 Table 25 below shows the proportions of each of the above groups who belong to equality groups.

	Population as a whole (%)	Mobile-only households (%)	Mobil fix househo (<£11.	e and ed olds (%) 5k/DE)	Fixed-only households (%)
Percentage female	52	50	63	58	58
Percentage non- white	8	10	9	10	3
Percentage with a disability	17	16	30	24	42

Table 25: Proportion of total population and proxy groups who belong to equality groups

Source: Ofcom Technology Tracker data, Q2 2009. Total base: 3020 UK adults aged 15+

- A14.5 From the above table, the instances where there are statistically significant differences between specific socio-demographic groups and the general population are:
 - 14.5.1 Females are statistically more likely to be in households with mobile and fixed-line services and with an income of less than £11.5k or in the DE socio-economic group;
 - 14.5.2 Ethnic minority (non-white) groups are statistically less likely to be in households with fixed-only telephony services;
 - 14.5.3 Those with a disability are statistically more likely to be in households with mobile and fixed-line services and with an income of less than £11.5k or in the DE socio-economic group; and
 - 14.5.4 Those with a disability are statistically more likely to be in households with fixed-only services.
- A14.6 Looking at each of these in turn below, we do not consider that these differences should cause concerns that would warrant a change to our proposals.
- A14.7 Females are more likely to be in low income households or households in the DE socio-economic group. However, this reflects the proxy chosen rather than the actual likely effect of lower MTRs on this group. We know of no reason to believe that females are more likely to be insensitive to the price of making calls or retaining a mobile service.
- A14.8 Regarding ethnic minority groups being less likely to have fixed-only services, results relating to non-white consumers are highly sensitive to the exact ethnic composition of the survey due to the differences between ethnic groups in their use of different telecommunications services. Therefore, we cannot be confident that this result is adequately robust to draw particular inferences from. This is particularly true given that this result suggests that ethnic minorities are less likely to gain, rather than more likely to be harmed by a reduction in MTRs.
- A14.9 Regarding points 14.5.3 and 14.5.4, these show that both those consumers who are more likely to benefit (those in fixed-only households) and those who are more likely

to be disadvantaged (those in low income/ DE households with fixed and mobile services) are more likely to be disabled, compared to the general population. It should be noted that, on balance, a greater proportion of those in fixed-only households report having a disability than those mobile consumers on low incomes or in the DE socio-economic group, which may indicate that reducing MTRs could be marginally more likely to benefit disabled consumers as a whole.

- A14.10 Finally, it should be reiterated that the effect of changes to MTRs on consumers will depend on how mobile and fixed operators react with regard to changing retail prices. At this stage it is unclear whether the changes in retail prices we anticipate will necessarily affect any specific socio-demographic groups more than the population in general.
- A14.11 However, to mitigate any risk of consumer harm if we are wrong about the effect on subscription, and to enable us to act quickly if we have underestimated the overall impact, we propose to produce a targeted 'report card' on mobile take-up and subscriptions that would be developed to track the impact, if any, of these policies on a quarterly basis during the charge control.
- A14.12 This suggests that our proposed recommendation will not have a material negative impact on race, disability and gender groups.

Annex 15

Compliance with the proposed charge control

Introduction

A15.1 This section sets out how compliance will be monitored with the proposed charge control and how this differs from an approach to monitoring compliance for the current control.

How the compliance calculation will work under each option

- A15.2 The compliance calculation for each option is covered in section 9. The relevant paragraph references are set out below:
 - i) The counterfactual paragraph 9.119
 - ii) Rate change restrictions paragraphs 9.130
 - iii) Constant time of day rate ratio paragraphs 9.136.
 - iv) Flat rate paragraphs 9.140 to 9.141
- A15.3 The compliance calculation for our preferred option rate change restrictions is also covered in the SMP Conditions.
- A15.4 All of the options use prior year volumes, which allow the MCPs to set compliant rates throughout the year with complete certainty. In the past the national MCPs have set their rates on a monthly basis and for specific day, evening and weekend time periods. We want to clarify that there is nothing particular about a period of one month or the days and hours which are covered by the MNOs definition of 'day', 'evening' and 'weekend'. It is not something we have specified in the current charge control conditions. The conditions for the current and new control are drafted (where appropriate) to say that in the calculation of the average interconnection charge (AIC) or average call termination charge (ACTC in the new control), rates are weighted by the exact corresponding period (even if a rate was set for one hour) in the previous year i.e. the exactly corresponding date and hours.

Ofcom to publish the nominal cap prior to the start of each control year

A15.5 We are only able to explicitly set out the nominal maximum average charge (MAC)/charge ceiling for the first relevant year in the SMP Conditions. For the remaining three years of the charge control the nominal MAC/charge ceiling can only be calculated once the relevant inflation data is published (i.e. the relevant inflation series being based on RPI for the year ending December before the new charge control year). In the interest of transparency and certainty, we will publish on our website the absolute MAC/charge ceiling that the MCPs must comply with for the second, third and fourth relevant years of the charge control. This is for information only and for avoidance of doubt, but the ultimate definition of these MACs is in the SMP Conditions. We will publish the rates as soon as reasonably possible after the relevant RPI data is published.

Rounding

- A15.6 While the number of decimal places to which we monitor compliance should be clear from the MAC/price ceiling figures we publish on our website, we believe it is appropriate to provide clarity on this point. In principle the MAC is an absolute number (potentially to an infinite number of decimal places). To demonstrate compliance, MCPs would need to ensure that their ACTC does not exceed this. This will be incorporated into the SMP Conditions.
- A15.7 The rounding of the ratios in option 3 also needs to be considered. By looking at the number of decimal places to which MNOs have generally set their termination rates in the past, we propose that the weightings must be the same for each price change (not including the first one of the year) when rounded to 3 decimal places.

Market definition and call types included within the scope of the charge control

- A15.8 The market definition determines the types of calls which are included in and excluded from the scope of the charge control.
- A15.9 The proposed definition is set out in Section 3 of the consultation document and is: "termination services²³⁹ that are provided by [named mobile communications provider] ("MCP") to another communications provider, for the termination of voice calls to UK mobile numbers that MCP has been allocated by Ofcom²⁴⁰ in the area served by MCP and for which MCP is able to set the termination rate".
- A15.10 This differs from the previous definition as we are now not specific about how termination is provided by a MCP. For example, in the last control we specified that for a 2G Call it must terminate using the GSM air interface. This is the reason calls to voicemail are excluded from the current control, but will be included in the next control.
- A15.11 We have provided clarification in annex 5 as to how certain call types should be treated in the new charge control because they are not as easily classified as onnet or off-net, or they require special consideration and explanation. There is a different treatment for some call types compared to the current control because of the change to the market definition. The three main call types for which there is a different treatment is voicemail, ported out and inbound international roaming (see Example 4 under the international roaming heading in annex 5), which were out of the previous charge control and are in the new charge control.
- A15.12 Three other call types that we believe require clarification are: calls that terminate on a network announcement, test calls and circuit-switched video traffic. They

²³⁹ Call termination is the service necessary for an MCP to connect a caller with the intended recipient of the call originating from a caller on a different MCP's number range. If call termination was not available, an MCP could only terminate calls to other customers on own number range. This service is referred to as wholesale because it is sold and purchased by MCPs rather than retail customers.

²⁴⁰ Applicable to those mobile number designations and allocations that are made by Ofcom in accordance with the UK's National Telephone Numbering Plan. Further details of our telephone number allocation procedures can be found at,

<u>http://www.ofcom.org.uk/telecoms/ioi/numbers/applying_num/</u>. For the purpose of market reviews 'within the UK' excludes of Jersey, Guernsey and the Isle of Man. Specifically, while Ofcom allocates mobile numbers to these UK protectorates, as a matter of administrative protocol, they operate under their own competition jurisdictions, separate to the UK and the EC.

currently have small volumes and are unlikely to significantly affect the compliance calculation, but we discuss them here for completeness.

Calls terminating on a network announcement are excluded

- A15.13 This call type is defined in the SMP Conditions of the current charge control. It is "a call which terminates on a recorded announcement provided by the mobile operator informing the caller of an inability to complete that call so as to establish a two-way path where the mobile handset used by the called party is switched off, or rings and remains unanswered, or where coverage is not available." Note this does not include calls that end up on voicemail.
- A15.14 This type of call conveys very little benefit to the caller unlike voicemail. The called party won't receive a voicemail message so they won't know the caller wants to speak to them and in most scenarios won't even be informed of a missed call. Additionally this type of call would not be charged for at the retail level and therefore it would seem perverse that we would allow a wholesale charge to be levied. Therefore this call type is also excluded from the new charge control.

Circuit-switched video traffic is excluded

A15.15 The market definition refers specifically to voice call termination and so by its nature video traffic is excluded from the new charge control.

Test calls

- A15.16 There are two types of test call that we have identified; those that occur before the connection between the MCP and an interconnecting partner goes live and those that are made after the connection goes live to test for faults in the network for example. We consider that the MCPs should be able to identify a call made before the connection goes live from those calls made between consumers. But after the connection goes live we understand that these calls will get mixed up with the billions of standard terminating calls in the billing system.
- A15.17 Therefore on this basis and by applying the rule²⁴¹ test calls made before the connection goes live will be excluded from the new charge control and those that are made after the connection goes live will be included.

Demonstrating and monitoring compliance

A15.18 There are some changes to the way in which we propose compliance should be demonstrated and monitored with the new charge control. These are discussed below.

Pre-notification of new rates

A15.19 We propose to require MCPs to submit to us any rate change notifications five working days prior to sending them to the organisation that receives them first. To date it has always been BT that requires 56 days notice of a rate change – this is a commercial not a regulatory requirement.

²⁴¹ This is a discussion of whether other small call types are in or out of the market definition and says that where these calls are made to a mobile number and face the same common pricing constraint as other calls to mobile numbers, we consider that these calls should fall within the market.

Options 2 and 3 – price change restrictions and constant time of day ratio

- A15.20 For options 2 and 3 the pre-notification discussed above will allow us to check whether the new rates will comply with the rules in those options 'quarterly' and '20%' for option 2 and 'quarterly' and 'fixed time of day gradient' for option 3.
- A15.21 If we found that any of those rules were breached we could then write to the MCPs informally to explain this and ask them to change their rate notifications so that they did comply with these rules.
- A15.22 If, however, the MCPs did not take our advice, then as soon as the rates became effective²⁴² we would consider following the process under s94 (and s95 and/or s96 where necessary) in the Communications Act 2003 "Notification of contravention of conditions".
- A15.23 Under options 2 and 3 we would be able to check compliance with the MAC for the relevant year in question immediately after the pre-notification of the final quarter rate (effective from 1 January).
- A15.24 Earlier in the relevant year we would be able to verify the volumes as they relate to the prior year, so as soon as the 1 January rate is pre-notified we could check compliance for the year. If we find that the MCP does not comply with the MAC then we could follow the process under paragraph A15.21.
- A15.25 If the MCP in question decided not to take our advice then we would direct them to make adjustments to its charges in the following relevant year for the purpose of remedying the failure to meet the MAC. These adjustments may include a payment of interest in addition to the recovery of the overcharge. This requirement exists in the current charge control and is set out in the SMP Conditions at annex 7.
- A15.26 In the final year of the charge control we want to be able to deal with any potential non-compliance within the final year because there is no guarantee of a continuing charge control in which any non-compliance could be recovered. Therefore once we are pre-notified of the 1 January changes for the final year and we find that a MCP will be non-compliant, then we can issue a formal direction under the SMP Condition. This will direct the operator to change the rates to be compliant within the final year. This is set out in the SMP Conditions and the same clause appears in the current charge control.

Option 4 – flat rate

- A15.27 Under option 4, as soon as the single flat rate for each relevant year is pre-notified we would be able to assess compliance. If the rate is not compliant we would follow the process set out in paragraphs A15.21 and A15.22.
- A15.28 If however the MCPs do not take our advice then as soon as the rates became effective²⁴³ we would consider following the process under s94 (and s95 and/or s96 where necessary) in the Communications Act 2003 "Notification of contravention of conditions".

²⁴² We expect that it would not get that far as currently BT are in the position to reject new rates notified by the MCPs.

²⁴³ We expect that it would not get that far as currently BT are in the position to reject new rates notified by the MCPs.

Option 1 – the counterfactual

A15.29 Although this option would retain the formula of the current charge control, the monitoring process would change to what we propose for options 2 and 3, including the pre-notification and changes to the timetable for providing the relevant information as set out in Table 26.

Information required to demonstrate compliance

- A15.30 The information required to demonstrate compliance is set out in the SMP Conditions. It includes but is not limited to the calculation of the ACTC and a written explanation of how the calculation has been prepared, including the call types that have been included and excluded.
- A15.31 We will continue to collect the information using our formal s135 powers. As a result of the process we propose to follow in paragraphs A15.19 to A15.29 the deadlines for provision of this information by the MCPs will be different from the current control. This is detailed in the 'Timetable' section below.

Timetable for information requests (s135)

- A15.32 Because of the proposals for the compliance monitoring process we propose the following timetable for the provision of information.
- A15.33 Table 26 below sets out the timings of when we will require the MCPs to provide the various pieces of information that are required for them to demonstrate compliance with the new charge control and for us to monitor this. The information required will be more limited for the flat rate option. The timings for our preferred option are also set out in the SMP Conditions.

Table 26: Timetable for the issue of s135 requests for information for Ofcom to monitor compliance

Information to be provided by MCPs	Timings for MCP to provide information to Ofcom		
Notification of rate changes (OCCNs).	5 working days before they are sent to the organisation which receives them first (in the past this has been BT).		
Volume data used to set prices and written explanation of how it has been prepared	No later than 3 months after the beginning of each relevant year.		
Full compliance return – AIC calculation, price and volume information	Option 1 – April immediately following the relevant year Options 2 and 3 – same time as the MCP pre-notifies the final rate change for the year. Not relevant for option 4.		

Source: Ofcom